

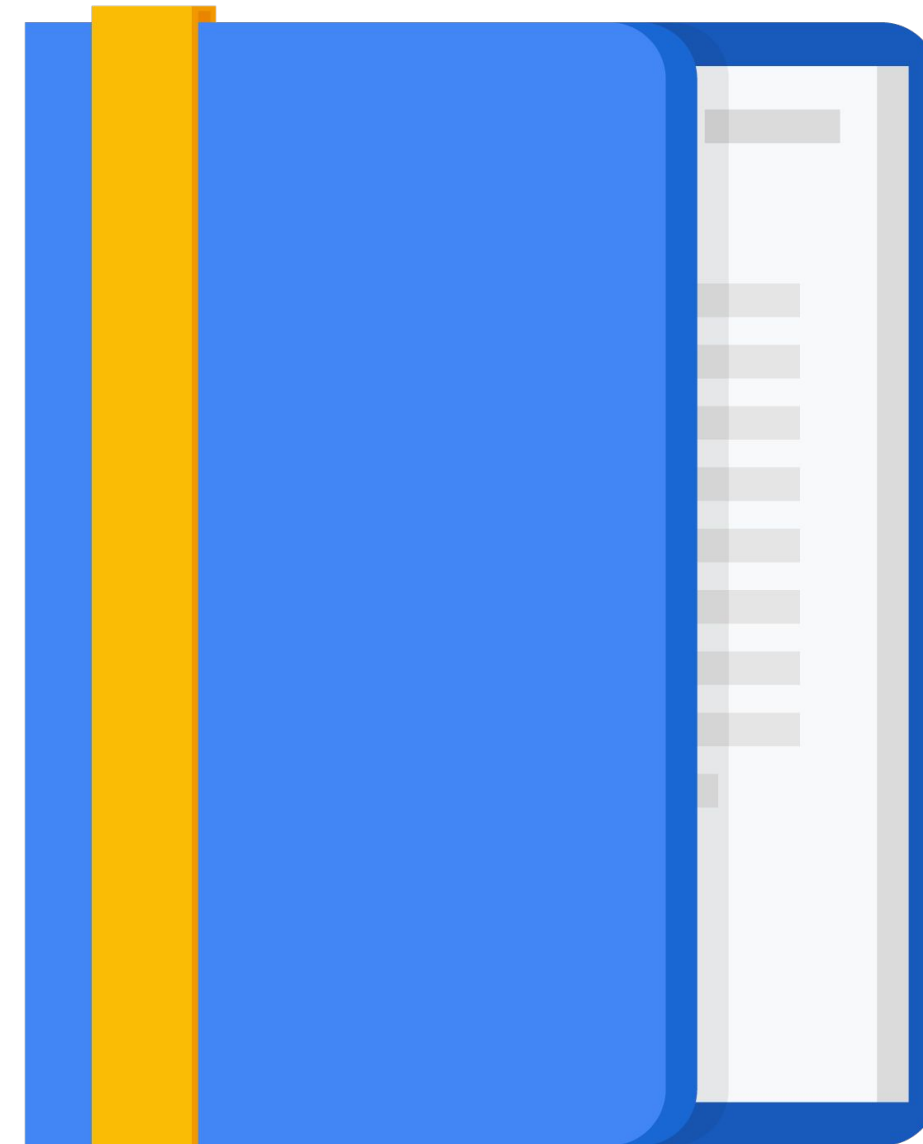


Introduction to Containers and Kubernetes



Objectives

- Understand containers
- Learn options for running containers
 - Kubernetes
 - App Engine
 - Cloud Run
- Create a basic Google Kubernetes Engine cluster



Agenda

Introduction to Containers

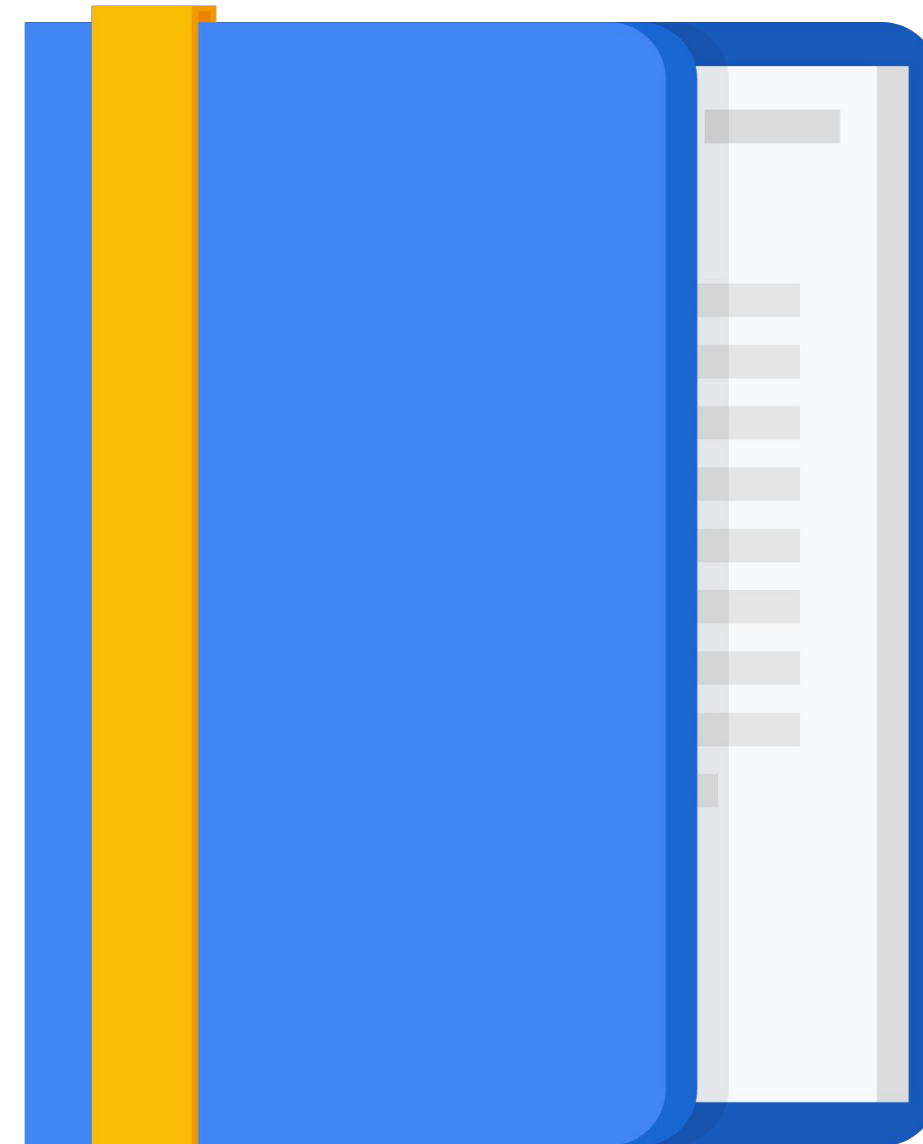
Lab

Computing Options

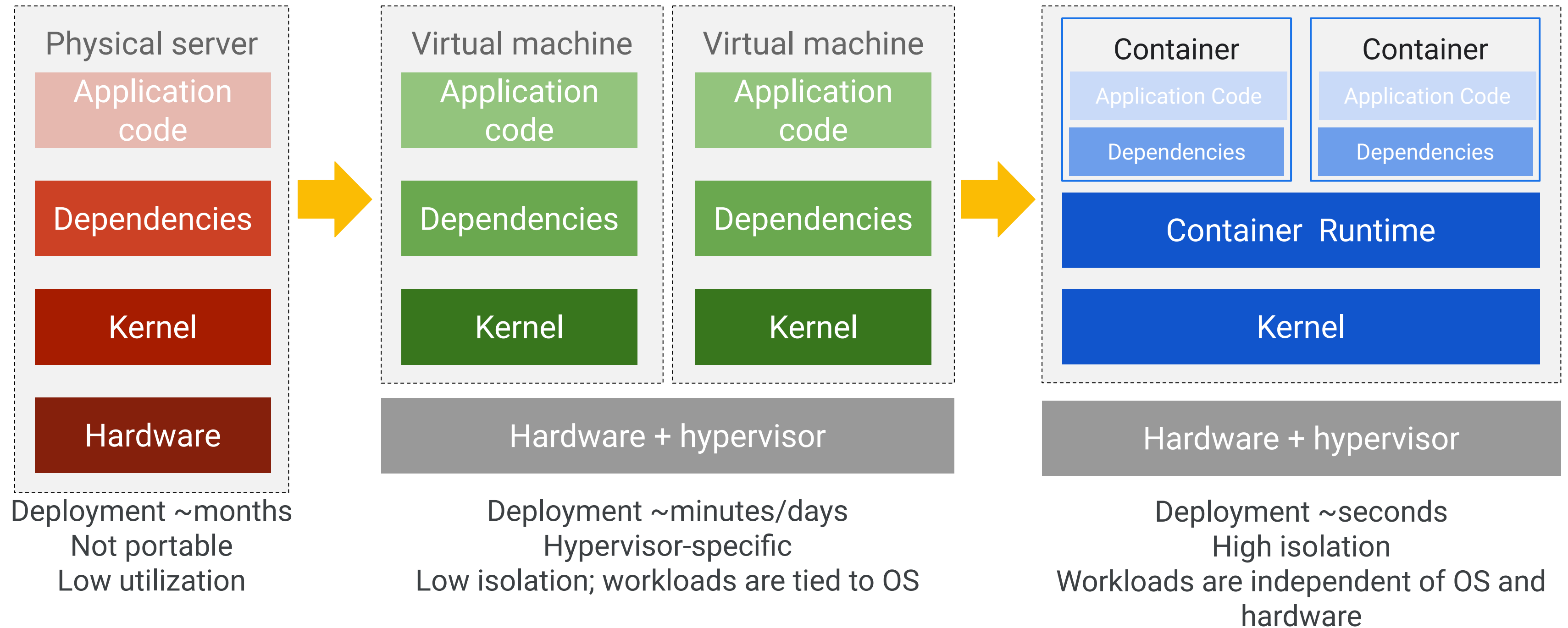
Introduction to Kubernetes

Lab

Quiz



Evolution towards containers



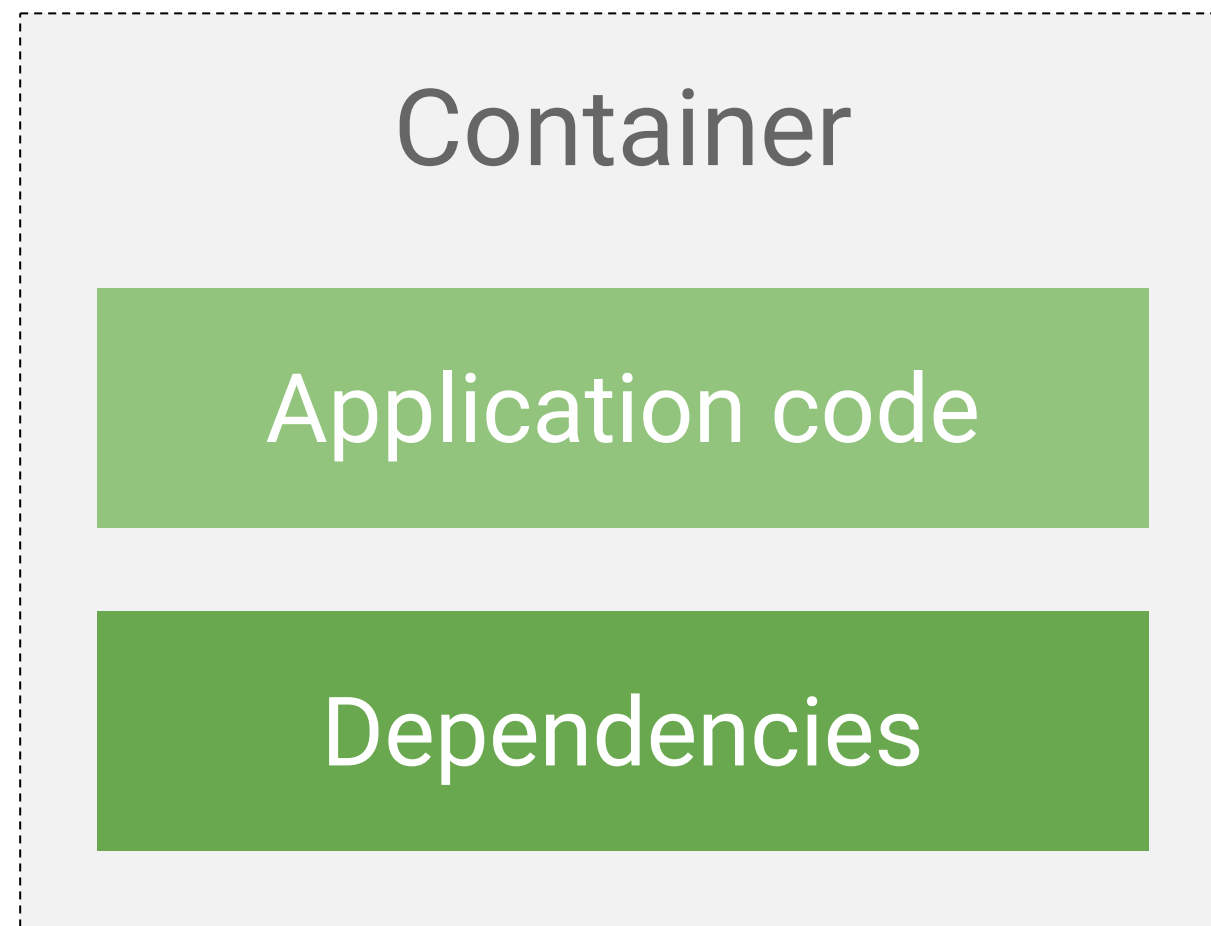
The importance of containers

Containers provide

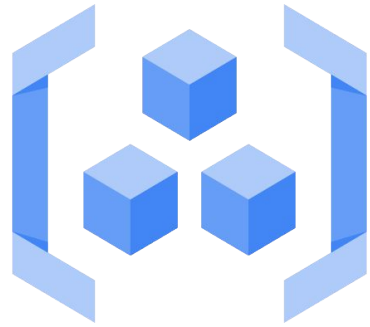
- Portability
- Isolation of workloads
- Reduced overhead
- Ease of automation
- Development support (agile, modular, etc.)

What is a container?

Containers are lightweight, standalone, resource-efficient, portable, executable packages



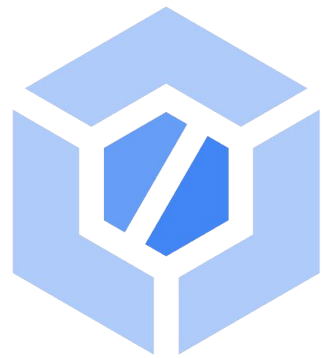
How can you get or create containers?



Download containerized software from a container registry such as gcr.io

docker

Build your own container using the open-source docker command



Build your own container using Cloud Build

Creating a container

Example



Let's build & run an app as a container

- Here is an example of some code.
 - It's a Python app that says 'hello world'.
 - Or if you reach the second endpoint, it gives you the version.
 - You don't need to understand the code to create the container!
 - There is also a requirements.txt file that Python needs to run the app

requirements.txt

```
Flask==0.12  
uwsgi==2.0.15
```

app.py

```
from flask import Flask  
app = Flask(__name__)  
  
@app.route("/")  
def hello():  
    return "Hello World!\n"  
  
@app.route("/version")  
def version():  
    return "Helloworld 1.0\n"  
  
if __name__ == "__main__":  
    app.run(host='0.0.0.0')
```

Creating a container using Docker

Dockerfile

```
FROM ubuntu:18.10
RUN apt-get update -y && \
    apt-get install -y python3-pip python3-dev
COPY requirements.txt /app/requirements.txt
WORKDIR /app
RUN pip3 install -r requirements.txt
COPY . /app
ENTRYPOINT ["python3", "app.py"]
```

Create a Dockerfile to specify such things as:

- A requirements.txt file for dependencies.
- Your OS image and version of Python.
- How to install Python.
- How to run your app.

Then you build and run the container as an image

```
$> docker build -t py-server .  
$> docker run -d py-server
```

- **docker build** builds a container and stores it locally as a runnable image.
- You can upload images to a registry service (like [Container Registry](#)) for sharing.
- **docker run** starts the container image.

Lab Intro

Container Registry: Qwik Start

Duration: 30 minutes





Introduction to



Lab environment

For each lab, Qwiklabs offers:

- A free set of resources for a fixed amount of time
- A clean environment with permissions

You will have access to the labs for 72 hours.

Some labs are optional, and meant for you to do after class.



Logging into Qwiklabs



Logging-into Qwiklabs



Demo: How to login and find our class

Videos are available as well:

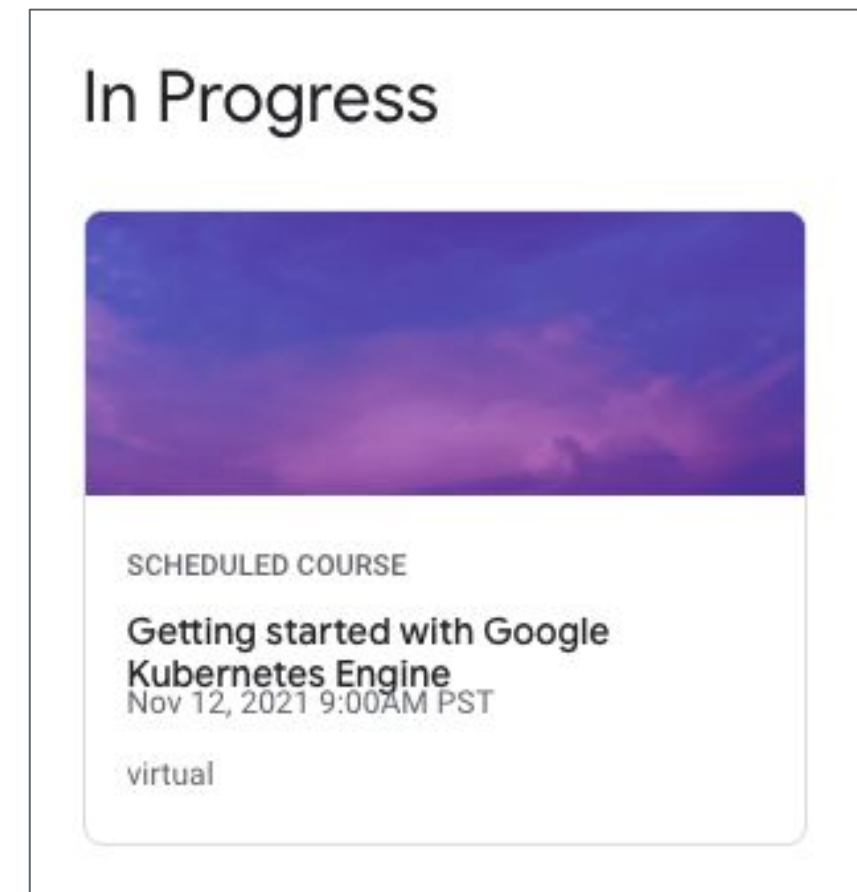
- How to create a Qwiklabs account: <https://bit.ly/createQLaccount>
- How to login to Qwiklabs: <https://bit.ly/loginQwiklabs>
- How to start a Lab: <https://bit.ly/startaqtl>

These can also be accessed from the help site:

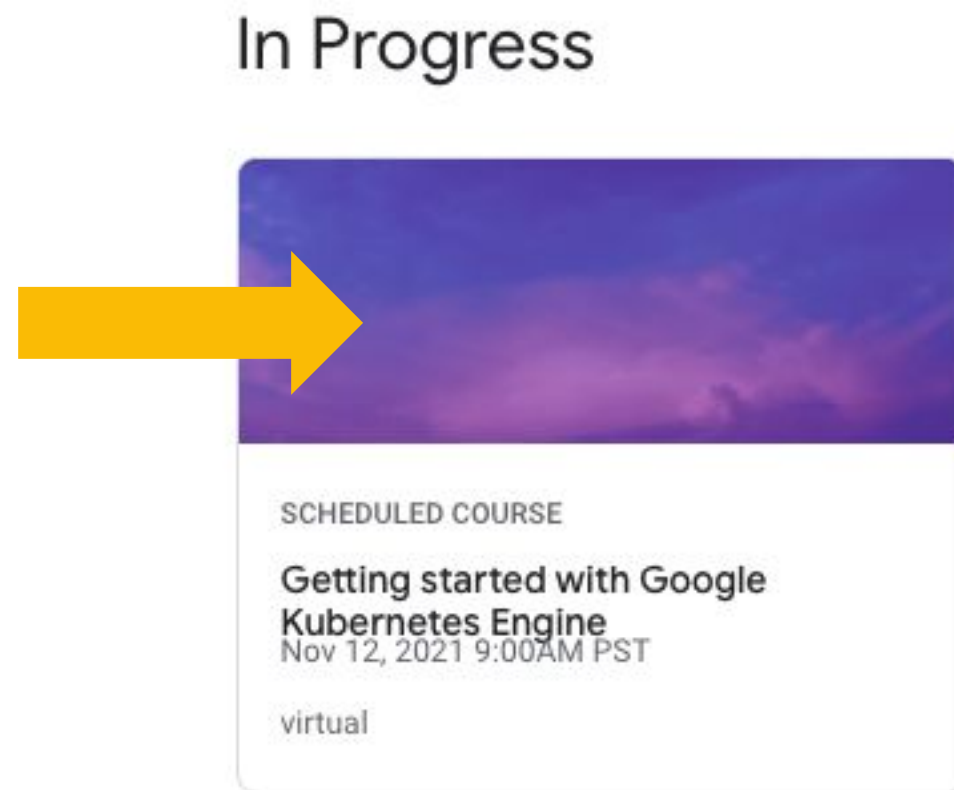
<https://traininghelp.cloudlearning.io>

Open Qwiklabs

- 1 **Open an incognito window** (or private/anonymous window).
- 2 **Go to** <https://googlecloud.qwiklabs.com>
- 3 **Sign In** with existing account or **Join** with new account (with the corporate email you used to register for the course).
- 4 Launch the course from the In Progress section of your home page.



Click the “purple box” for this class...



If you don't see the “purple box”

1. Are you using the right URL?
<https://googlecloud.qwiklabs.com>
2. Are you using the same business email that you used to register?
3. If you still don't see the box, fill out the Troubleshooting Form listed in the chat.

View your labs

Labs		Lecture Notes
✓	Console and Cloud Shell v1.5	
○	Infrastructure Preview v1.5	
⚠	Virtual Networking v1.5	Lab Currently Disabled
⚠	Bastion Host v1.5	Lab Currently Disabled

← Lab Completed

← Available Lab

← Not yet available

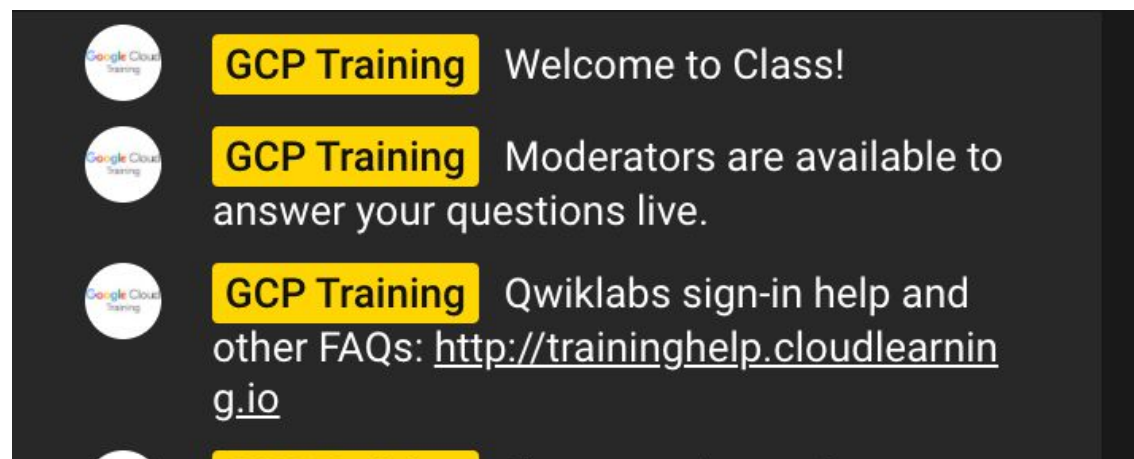
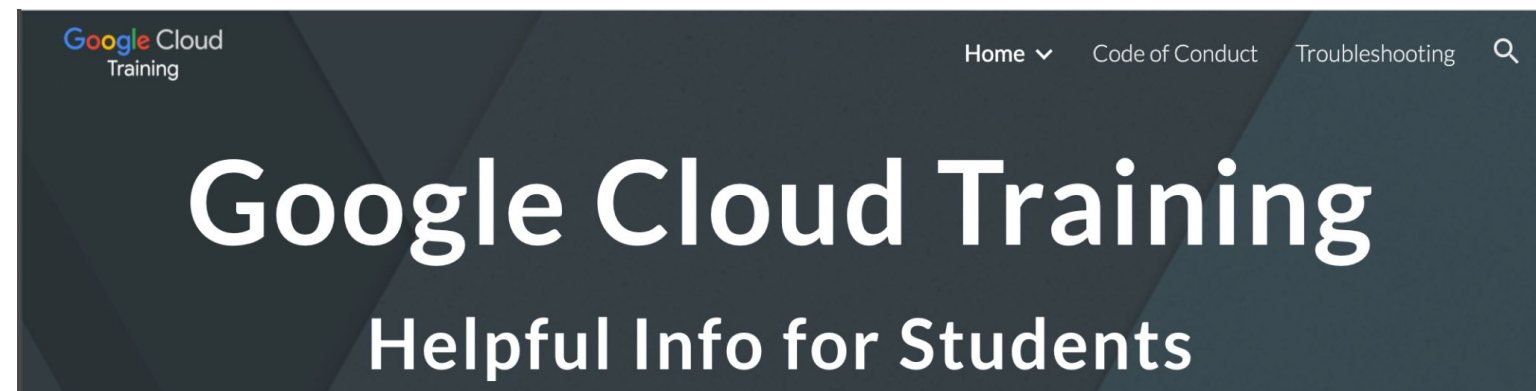
View lecture notes

Labs	Lecture Notes
00 Course Intro	
01 Introduction to GCP	
02 Virtual Networks	
03 Virtual Machines	
04 Cloud IAM	

Getting Help During Class

<http://traininghelp.cloudlearning.io/>

Includes how-tos for Qwiklabs, troubleshooting tips, where to find free training, and more...

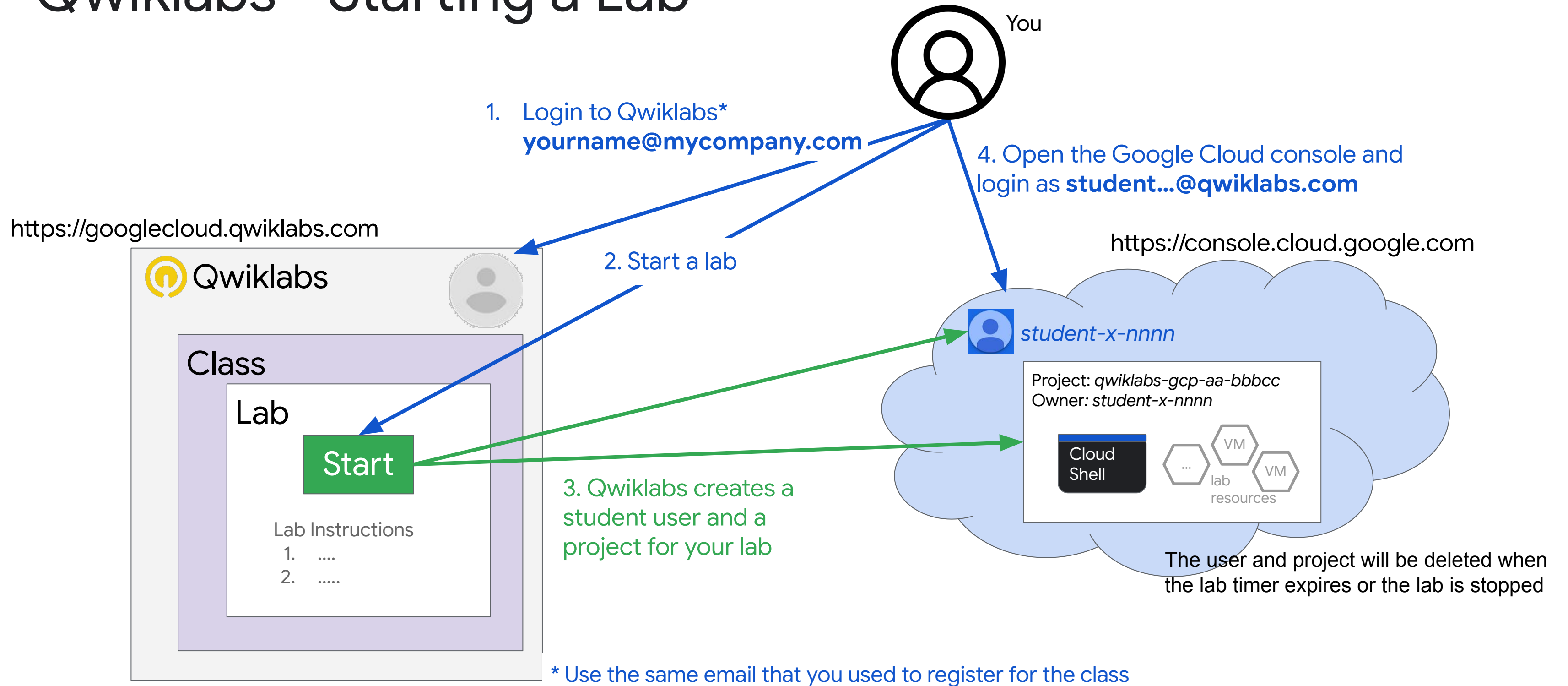


Live Chat

Moderators are live and available to answer questions. Look for the chat on the right side of your YouTube screen.

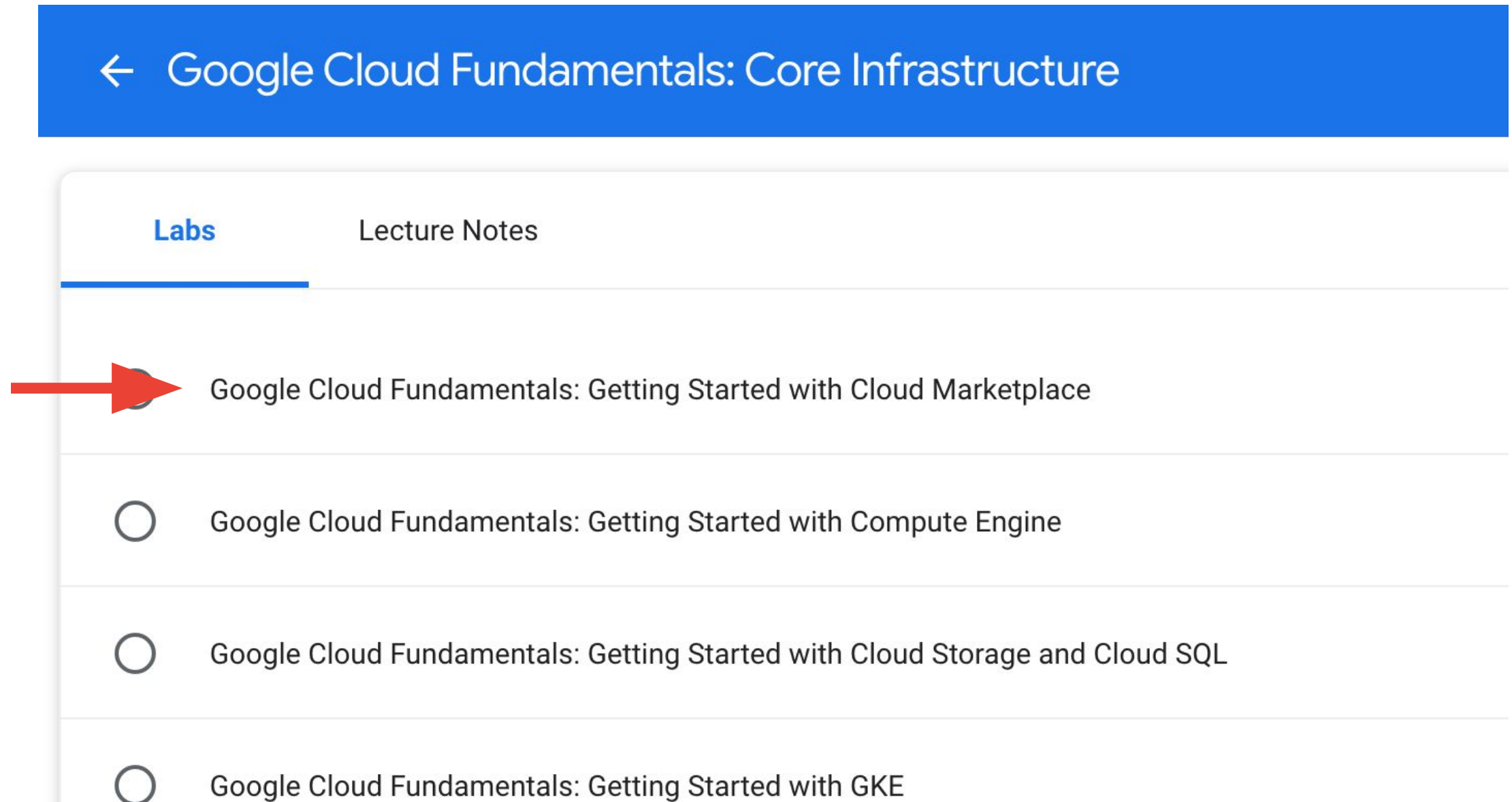
Starting a Lab

Qwiklabs - Starting a Lab



Find the lab and open it

To start a lab, click its name on the list.



← Google Cloud Fundamentals: Core Infrastructure

Labs Lecture Notes

- ☒ Google Cloud Fundamentals: Getting Started with Cloud Marketplace
- ☐ Google Cloud Fundamentals: Getting Started with Compute Engine
- ☐ Google Cloud Fundamentals: Getting Started with Cloud Storage and Cloud SQL
- ☐ Google Cloud Fundamentals: Getting Started with GKE

Start the lab

Click **Start Lab**.

It may take a few minutes for the lab resources to be created.



[← Google Cloud Fundamentals: Getting Started with Cloud Marketplace](#) [?](#)

Start Lab 00:25:00

Google Cloud Fundamentals: Getting Started with Cloud Marketplace

25 minutes 1 Credit ★★★★★

Overview

In this lab, you use Cloud Marketplace to quickly and easily deploy a LAMP

Overview

Objectives

Task 1: Sign in to the Google Cloud Platform (GCP) Console

Task 2: Use Cloud Marketplace to deploy a LAMP stack

Task 3: Verify your deployment

Congratulations!

End your lab

More resources

Prepare to login to the console

Keep this page open!

It contains

- Username
 - Password
 - Project id
- and
- step-by-step instructions for completing the lab.

← Google Cloud Fundamentals: Getting Started with Cloud Marketplace

End Lab 00:24:42

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. [Learn more.](#)

Open Google Console

Username

student-04-66c04eb7c18b@

Password

qtCP5Wv8Y26s

GCP Project ID

qwiklabs-gcp-01-573000de

Region

us-central1

Zone

us-central1-a

Google Cloud Fundamentals: Getting Started with Cloud Marketplace

25 minutes 1 Credit ★★★★★

Overview

In this lab, you use Cloud Marketplace to quickly and easily deploy a LAMP stack on a Compute Engine instance. The Bitnami LAMP Stack provides a complete web development environment for Linux that can be launched in one click.

Component	Role
Linux	Operating system

Overview

Objectives

Task 1: Sign in to the Google Cloud Platform (GCP) Console

Task 2: Use Cloud Marketplace to deploy a LAMP stack

Task 3: Verify your deployment

Congratulations!

End your lab

More resources

0/10

Open the Google Cloud Console

Right-click **Open Console** and choose **Open Link in Incognito Window**.

(Incognito is also known as Private or Anonymous.)

Another tab will open, where you will login to the Google Cloud Console to do the actual lab work.

← Google Cloud Fundamentals: Getting Started with Cloud Marketplace

End Lab 00:24:42

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. [Learn more.](#)

Open Google Console

Username

student-04-66c04eb7c18b@

Password

qtCP5Wv8Y26s

GCP Project ID

qwiklabs-gcp-01-573000de

Region

us-central1

Zone

us-central1-a

Google Cloud Fundamentals: Getting Started with Cloud Marketplace

25 minutes

1 Credit



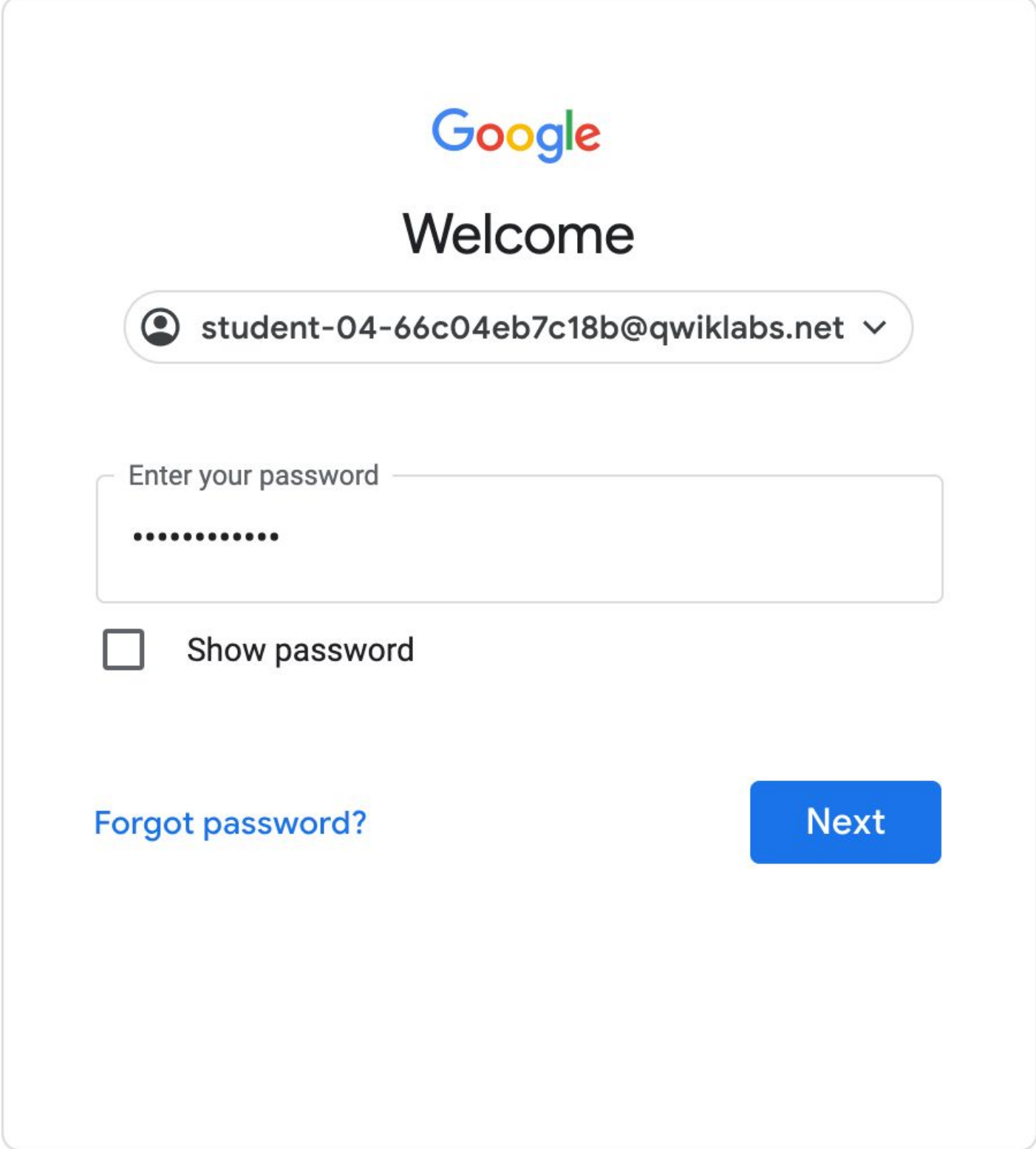
Overview

Login to the Google Cloud Console

Copy/paste the user account and password information from the previous page into the login.

If you are asked, do not create any recovery information.

Do not use your corporate email!

A screenshot of the Google Cloud Console login interface. At the top is the Google logo, followed by the word "Welcome". Below this is a rounded rectangular field containing a user icon, the email address "student-04-66c04eb7c18b@qwiklabs.net", and a dropdown arrow. Underneath is a password input field with the placeholder text "Enter your password" and a series of dots representing the masked password. To the left of the password field is a checkbox labeled "Show password". At the bottom left is a blue link that says "Forgot password?". At the bottom right is a blue button with the text "Next".

Google

Welcome

student-04-66c04eb7c18b@qwiklabs.net ▾

Enter your password

.....

☐ Show password

[Forgot password?](#)

Next

Complete the login

If prompted, accept the terms and conditions in order to continue.

(Because this is a brand-new Google Account!)



Welcome to your new account

Welcome to your new account: student-04-66c04eb7c18b@qwiklabs.net. Your account is compatible with many [Google services](#), but your qwiklabs.net administrator decides which services you may access using your account. For tips about using your new account, visit the Google [Help Center](#).

When you use Google services, your domain administrator will have access to your student-04-66c04eb7c18b@qwiklabs.net account information, including any data you store with this account in Google services. You can learn more [here](#), or by consulting your organization's privacy policy, if one exists. You can choose to maintain a separate account for your personal use of any Google services, including email. If you have multiple Google accounts, you can [manage which account you use](#) with Google services and [switch between them](#) whenever you choose. Your username and profile picture can help you ensure that you're using the intended account.

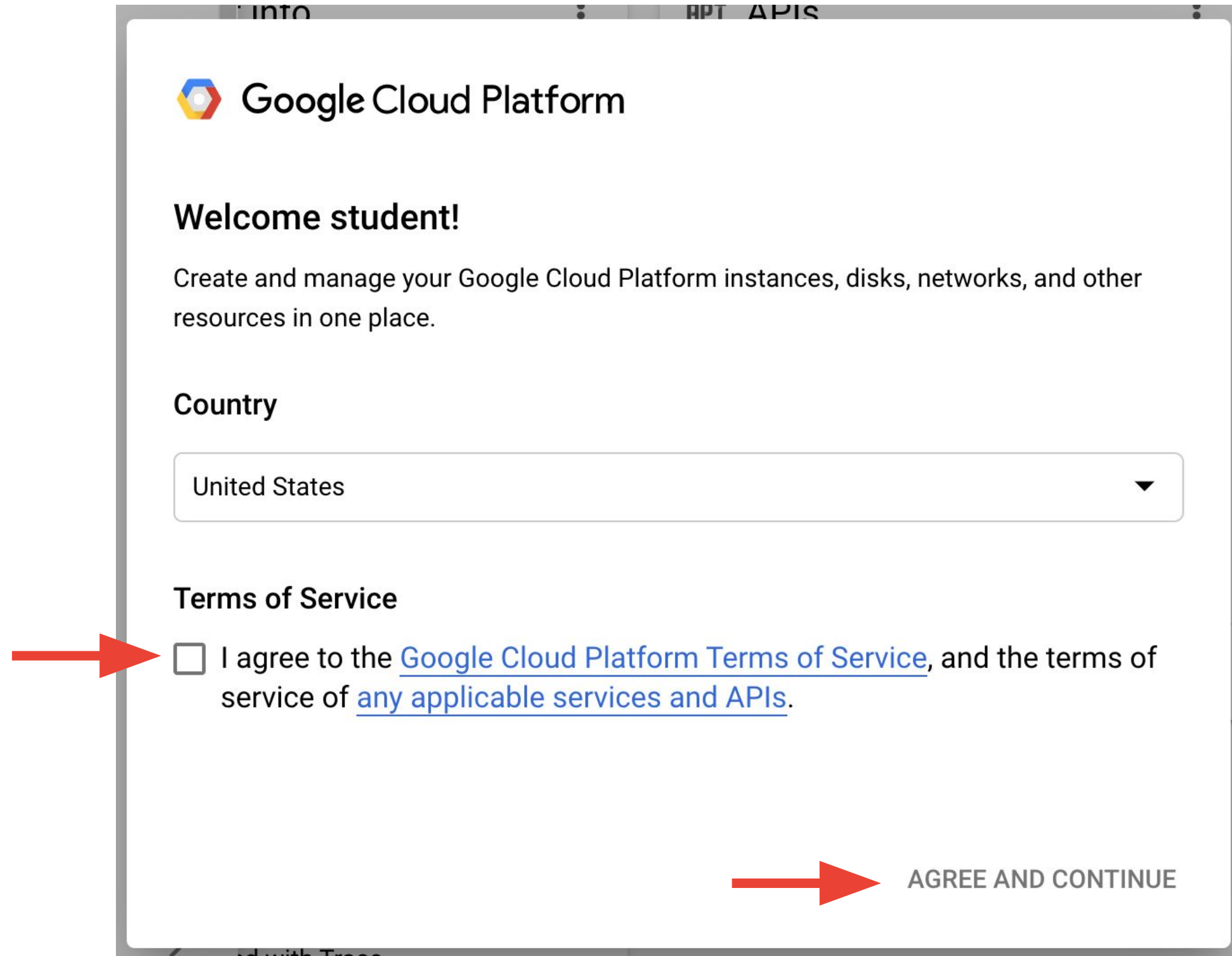
If your organization provides you access to the Google Workspace [core services](#), your use of those services is governed by your organization's Google Workspace agreement. Any other Google services your administrator enables ("Additional Services") are available to you under the [Google Terms of Service](#) and the [Google Privacy Policy](#). Certain Additional Services may also have [service-specific terms](#). Your use of any services your administrator allows you to access constitutes acceptance of applicable service-specific terms.

Click "Accept" below to indicate that you understand this description of how your student-04-66c04eb7c18b@qwiklabs.net account works and agree to the [Google Terms of Service](#) and the [Google Privacy Policy](#).

Accept

In the console, accept the Google Cloud Terms of Service

Accept the terms and conditions in order to continue.



The screenshot shows the Google Cloud Platform console interface. At the top, the Google Cloud logo and 'Google Cloud Platform' text are visible. Below this, a 'Welcome student!' message is displayed, followed by a description: 'Create and manage your Google Cloud Platform instances, disks, networks, and other resources in one place.' A 'Country' dropdown menu is set to 'United States'. The 'Terms of Service' section contains a checkbox that is currently unchecked. A red arrow points to this checkbox. The text next to the checkbox reads: 'I agree to the [Google Cloud Platform Terms of Service](#), and the terms of service of [any applicable services and APIs](#).' At the bottom right, there is a button labeled 'AGREE AND CONTINUE' with a red arrow pointing to it.

Google Cloud Platform

Welcome student!

Create and manage your Google Cloud Platform instances, disks, networks, and other resources in one place.

Country

United States

Terms of Service

☐ I agree to the [Google Cloud Platform Terms of Service](#), and the terms of service of [any applicable services and APIs](#).

AGREE AND CONTINUE

Verify your user account and project

The screenshot shows the Google Cloud Platform console interface. The top navigation bar is blue and contains the Google Cloud Platform logo, the project ID 'qwiklabs-gcp-01-573000de390f', a search bar, and user account icons. The left sidebar lists navigation options: Home, Marketplace, Billing, APIs & Services, Support, IAM & Admin, Getting started, and Compliance. The main content area has tabs for DASHBOARD, ACTIVITY, and RECOMMENDATIONS. The DASHBOARD tab is active and displays three panels: Project info, a central lab interface, and Google Cloud Platform status. The Project info panel shows the project name, ID, and number, with a link to 'Go to project settings'. The central lab interface, highlighted with a green border, includes an 'End Lab' button, a timer at 00:24:42, a caution message, a link to 'Open Google Console', and input fields for Username, Password, GCP Project ID, and Region. The Google Cloud Platform status panel shows the status of Google Compute Engine and a link to 'Go to Cloud status dashboard'. Two red arrows are overlaid on the image: one points from the 'Go to project settings' link in the Project info panel to the project ID in the top navigation bar, and the other points from the 'Go to Cloud status dashboard' link in the status panel to the user account icon in the top navigation bar.

Google Cloud Platform

qwiklabs-gcp-01-573000de390f

Search products and resources

Home

Marketplace

Billing

APIs & Services

Support

IAM & Admin

Getting started

Compliance

DASHBOARD

ACTIVITY

RECOMMENDATIONS

CUSTOMIZE

Project info

Project name
qwiklabs-gcp-01-573000de390f

Project ID
qwiklabs-gcp-01-573000de390f

Project number
994393853420

Go to project settings

End Lab

00:24:42

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. [Learn more.](#)

Open Google Console

Username
student-04-66c04eb7c18b@

Password
qtCP5Wv8Y26s

GCP Project ID
qwiklabs-gcp-01-573000de

Region
us-central1

Google Cloud Platform status

Google Compute Engine

Price for E2 Free Tier core is set incorrectly

Began at 2021-08-03 (13:28:25)

All times are US/Pacific

Data provided by [status.cloud.google.com](#)

Go to Cloud status dashboard

Google Cloud

Enjoy the lab!

Some labs may provide the ability to self-check your progress as you complete them.

Click *Check my progress* to verify the objective.



Use Cloud Marketplace to deploy a LAMP stack

Check my progress

Finish the lab

Click **End Lab.** 

(The lab will automatically end when the timer expires.)

When the lab ends, the project and user are deleted. They are not reused.

← Google Cloud Fundamentals: Getting Started with Cloud Marketplace

?

🌐

👤

End Lab00:24:42

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked.
[Learn more.](#)

Open Google Console

Username

student-04-66c04eb7c18b@

📄

Password

qtCP5Wv8Y26s

📄

GCP Project ID

qwiklabs-gcp-01-573000de

📄

Region

us-central1

📄

Zone

us-central1-a

📄

Google Cloud Fundamentals: Getting Started with Cloud Marketplace

25 minutes1 Credit★★★★★

Overview

In this lab, you use Cloud Marketplace to quickly and easily deploy a LAMP stack on a Compute Engine instance. The Bitnami LAMP Stack provides a complete web development environment for Linux that can be launched in one click.

Component	Role
Linux	Operating system

0/10

Overview

Objectives

Task 1: Sign in to the Google Cloud Platform (GCP) Console


Task 2: Use Cloud Marketplace to deploy a LAMP stack

Task 3: Verify your deployment

Congratulations!

End your lab

More resources

Google Cloud

Agenda

Introduction to Containers

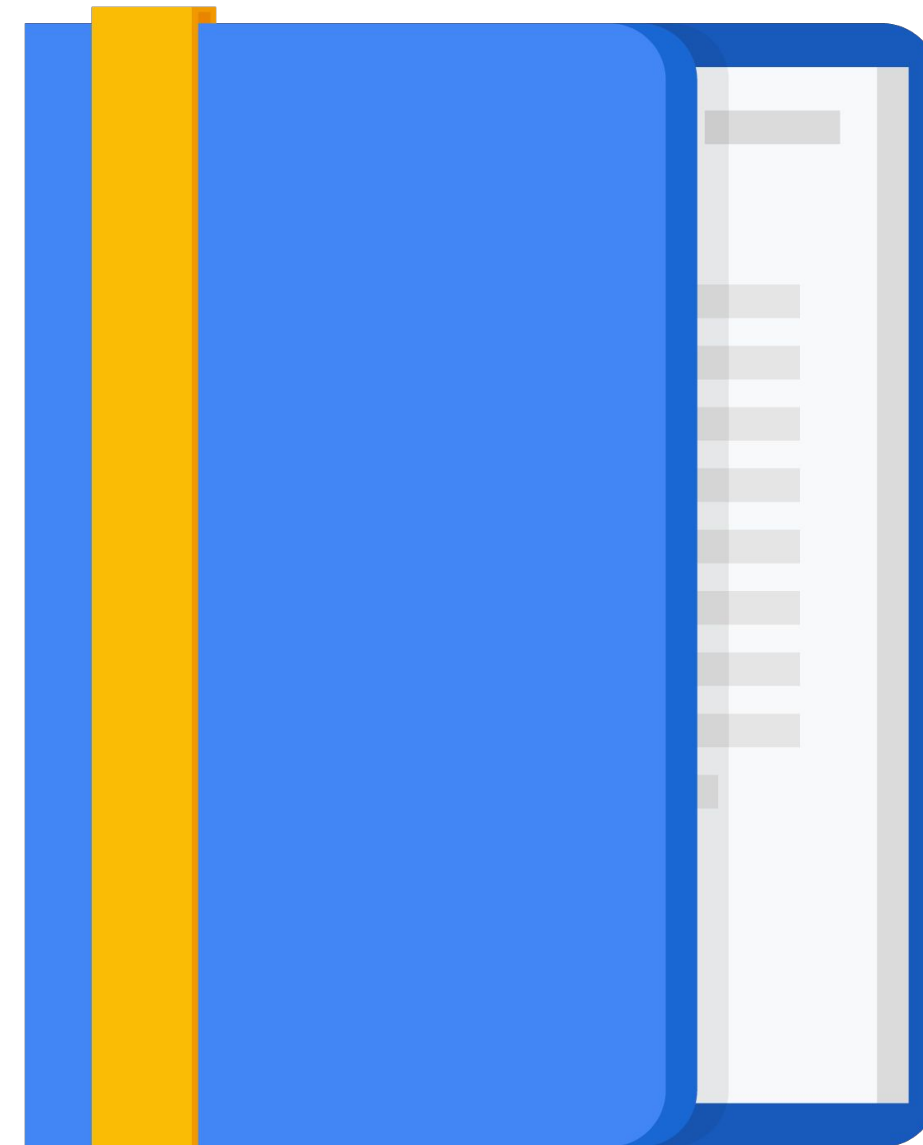
Lab

Computing Options

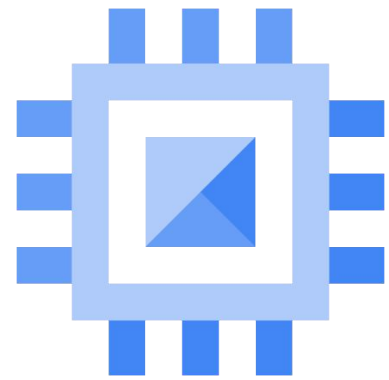
Introduction to Kubernetes

Lab

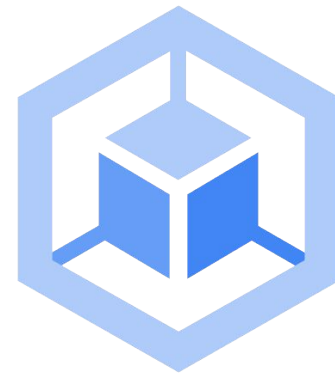
Quiz



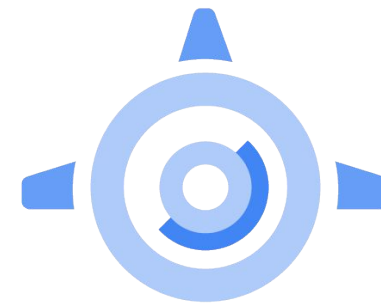
Where can I run containers?



Compute
Engine



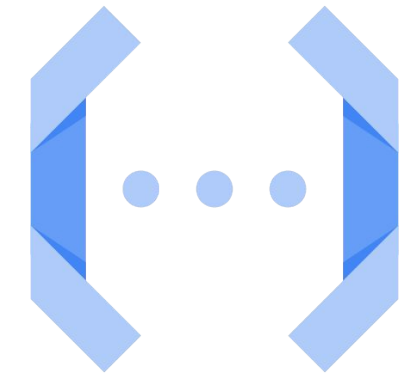
GKE



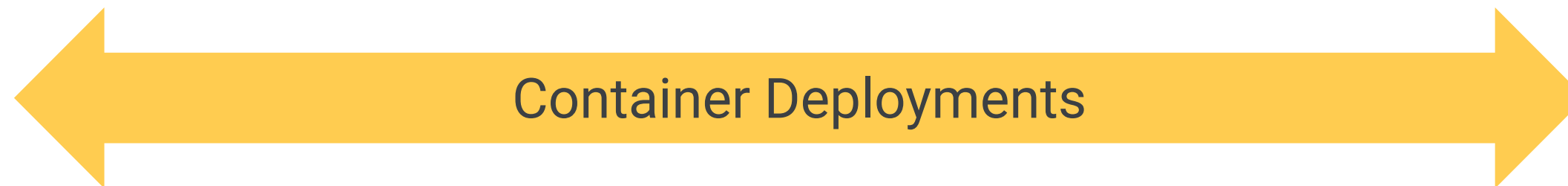
App
Engine



Cloud
Run



Cloud
Functions



IaaS

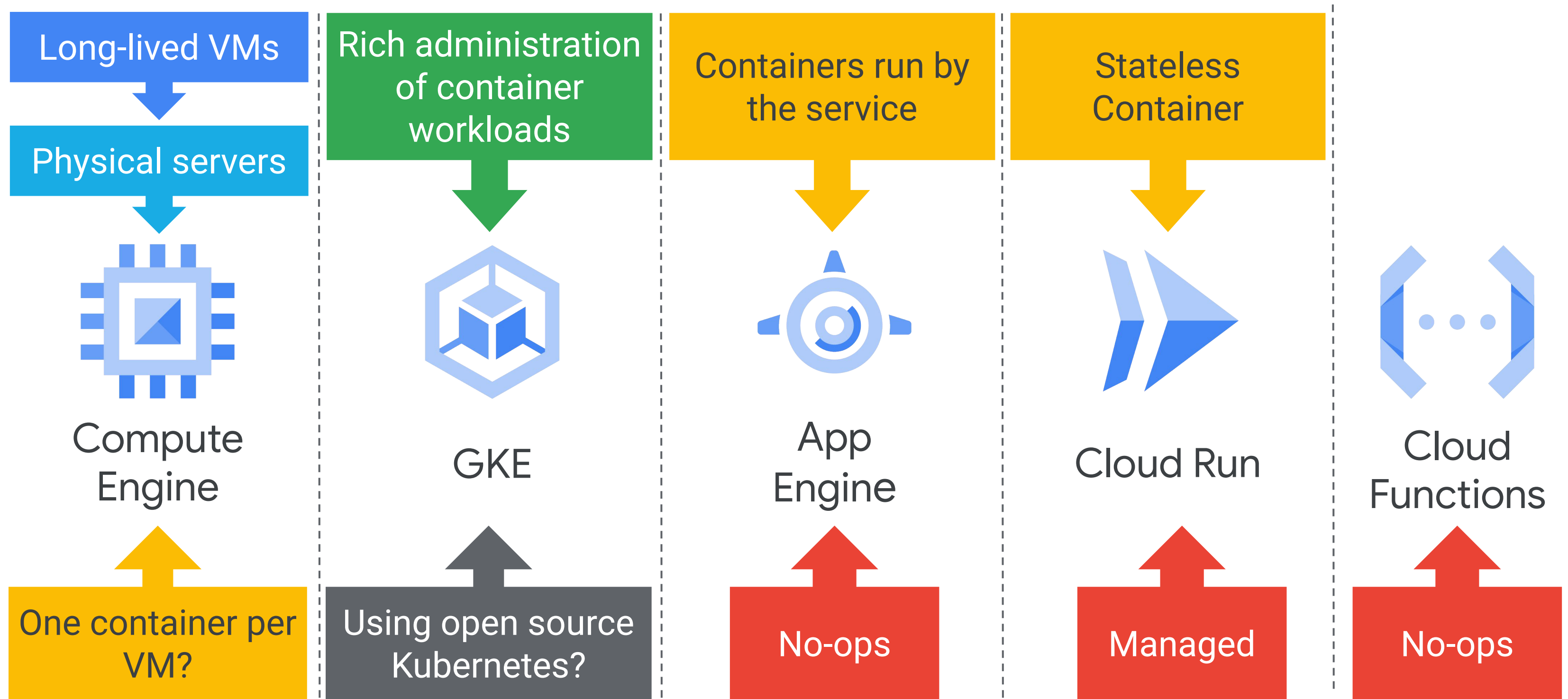
Hybrid

PaaS

Stateless

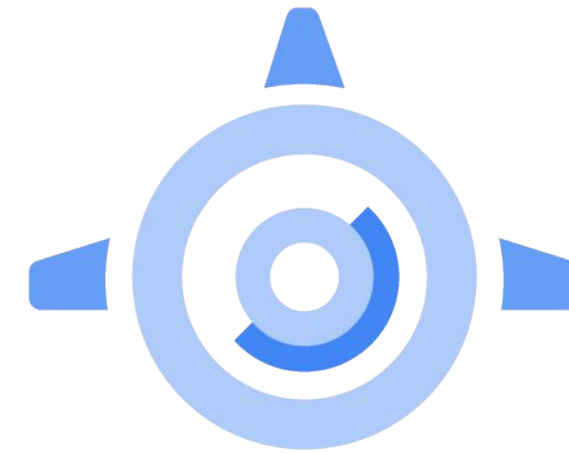
Serverless
logic

Which compute service should you adopt?



App Engine

- Provides a fully managed, code-first platform.
- Streamlines application deployment and scalability.
- Provides support for popular programming languages and application runtimes.
- Supports integrated monitoring, logging, and diagnostics.
- Simplifies version control, canary testing, and rollbacks.



Use Cases

- Websites
- Mobile app and gaming backends
- RESTful APIs

Cloud Run

- Enables stateless containers.
- Abstracts away infrastructure management.
- Automatically scales up and down.
- Open API and runtime environment, built on Knative

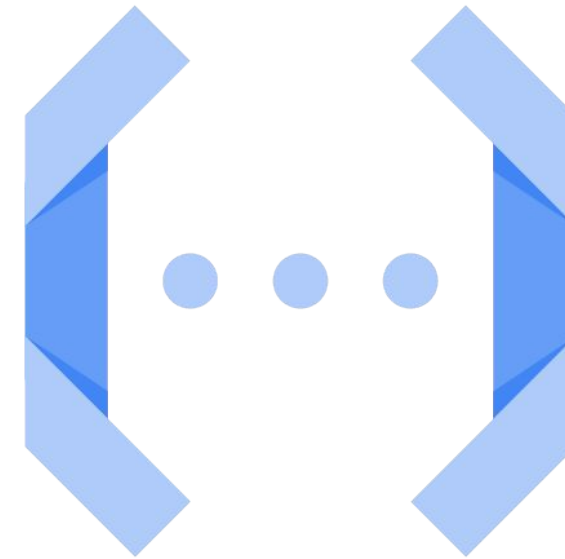
Use Cases

- Deploy stateless containers that listen for requests or events.
- Build applications in any language using any frameworks and tools.



Cloud Functions

- Event-driven, serverless compute service.
- Automatic scaling with highly available and fault-tolerant design.
- Charges apply only when your code runs.
- Triggered based on events in Google Cloud services, HTTP endpoints, and Firebase.



Use Cases

- Supporting microservice architecture
- Serverless application backends
 - Mobile and IoT backends
 - Integrate with third-party services and APIs
- Intelligent applications
 - Virtual assistant and chat bots
 - Video and image analysis.

Agenda

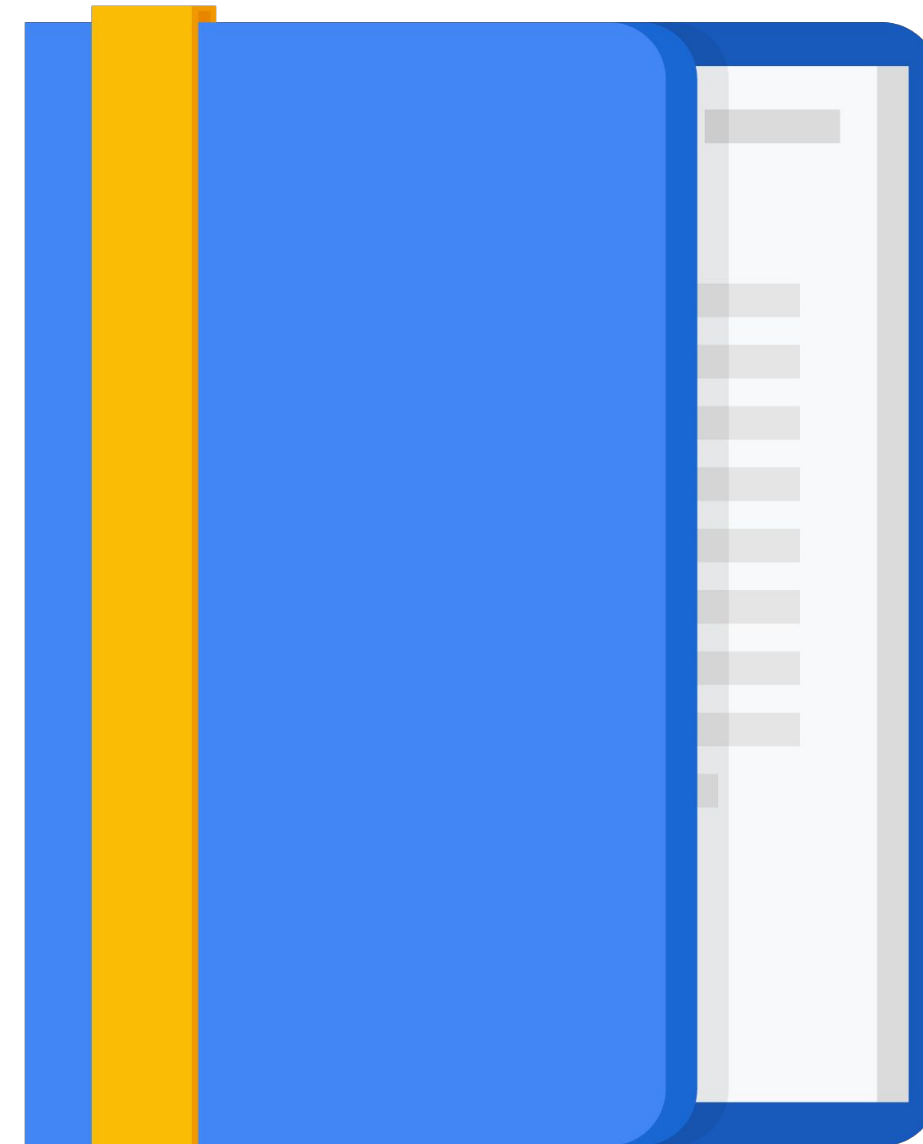
Introduction to Containers

Computing Options

Introduction to Kubernetes

Lab

Quiz



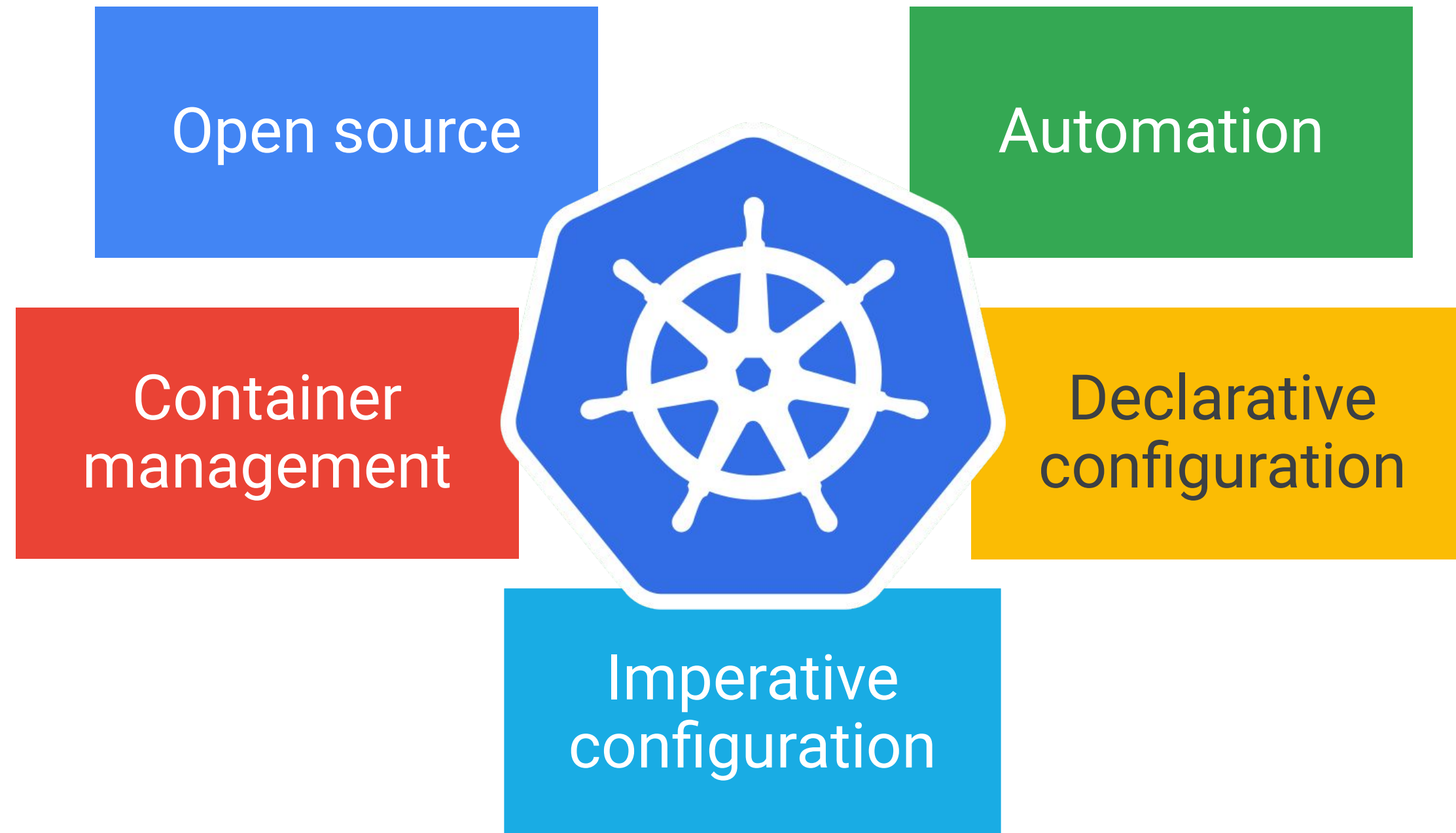
Managing your container infrastructure

You've embraced containers, but managing them at scale is a challenge

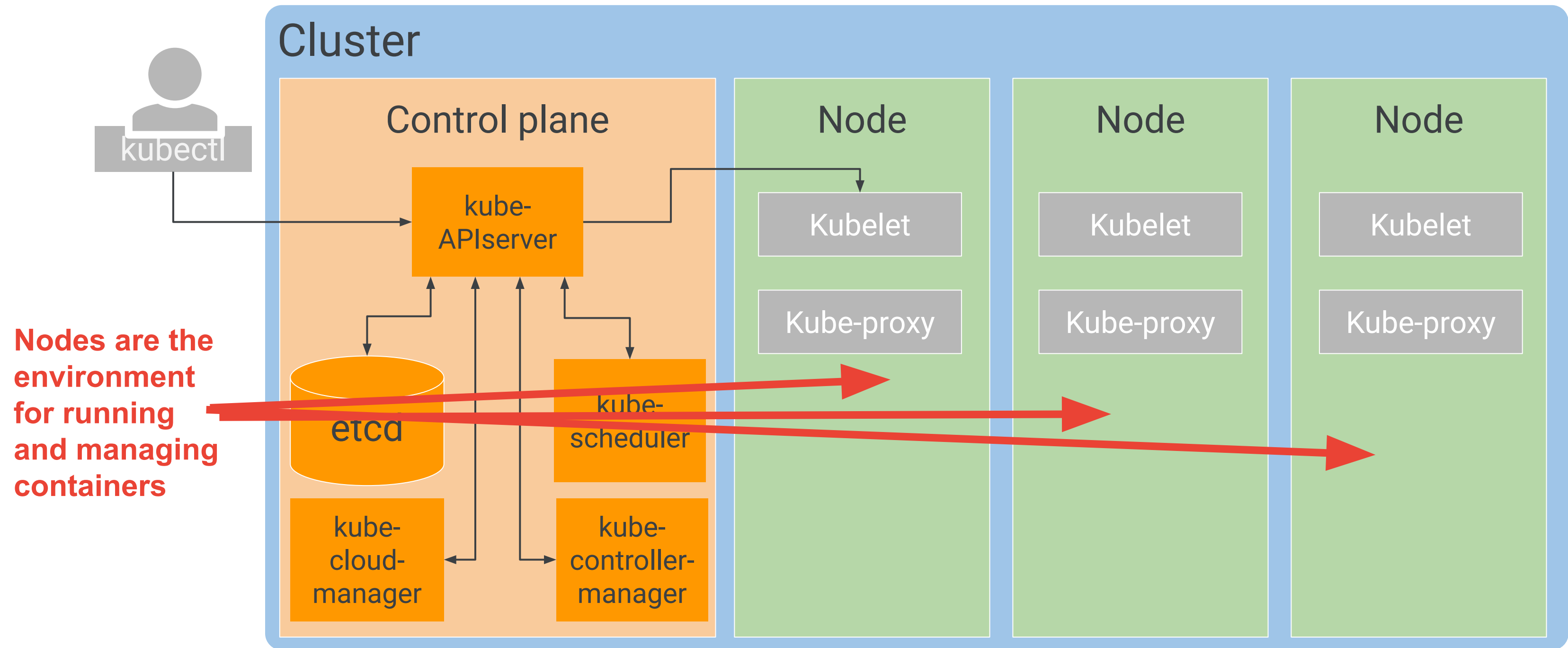
What can you do to better manage your container infrastructure?

Kubernetes!

What is Kubernetes?



Kubernetes provides an infrastructure...



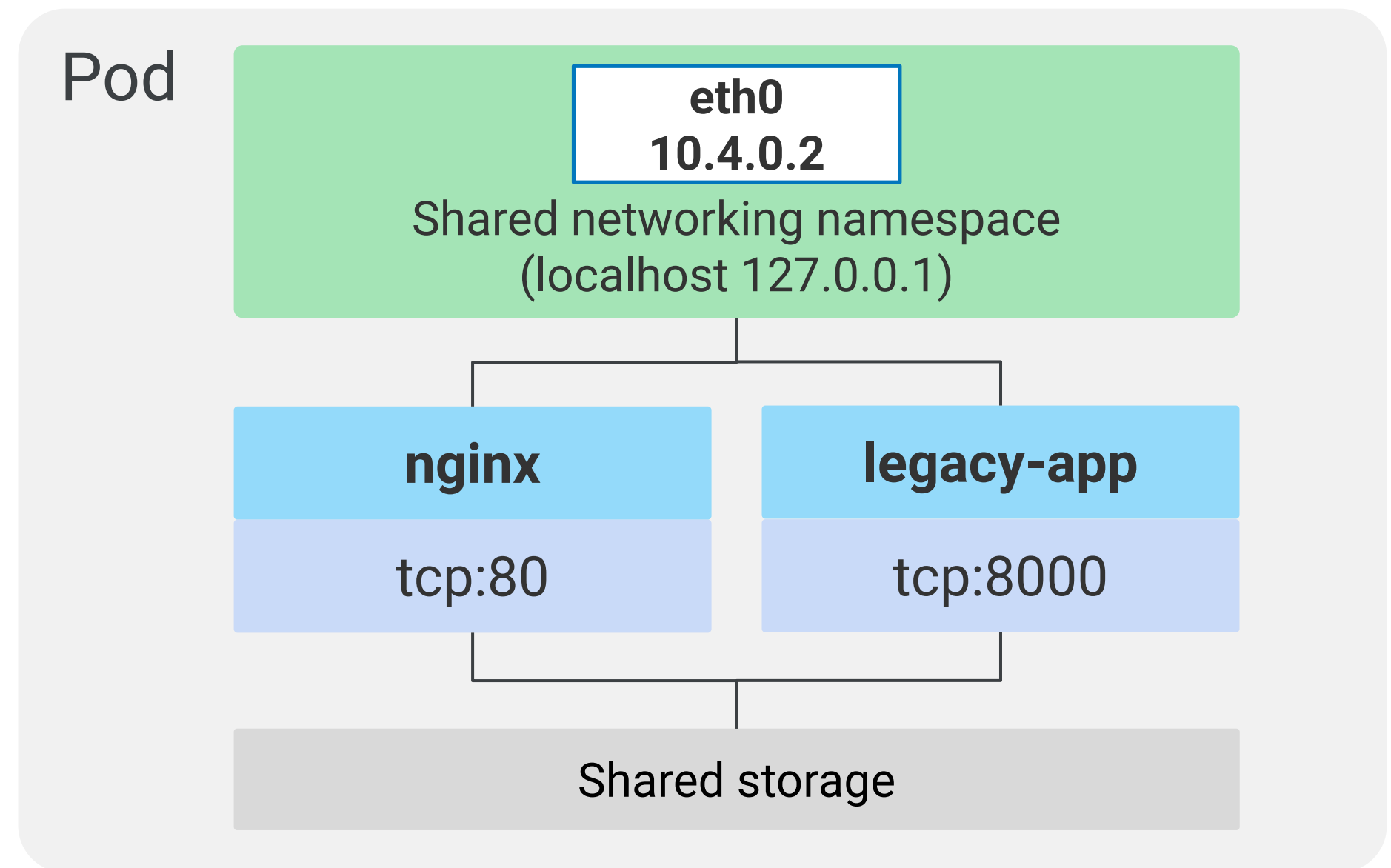
When you deploy containers on nodes you use a wrapper called a **Pod**

The pod provides

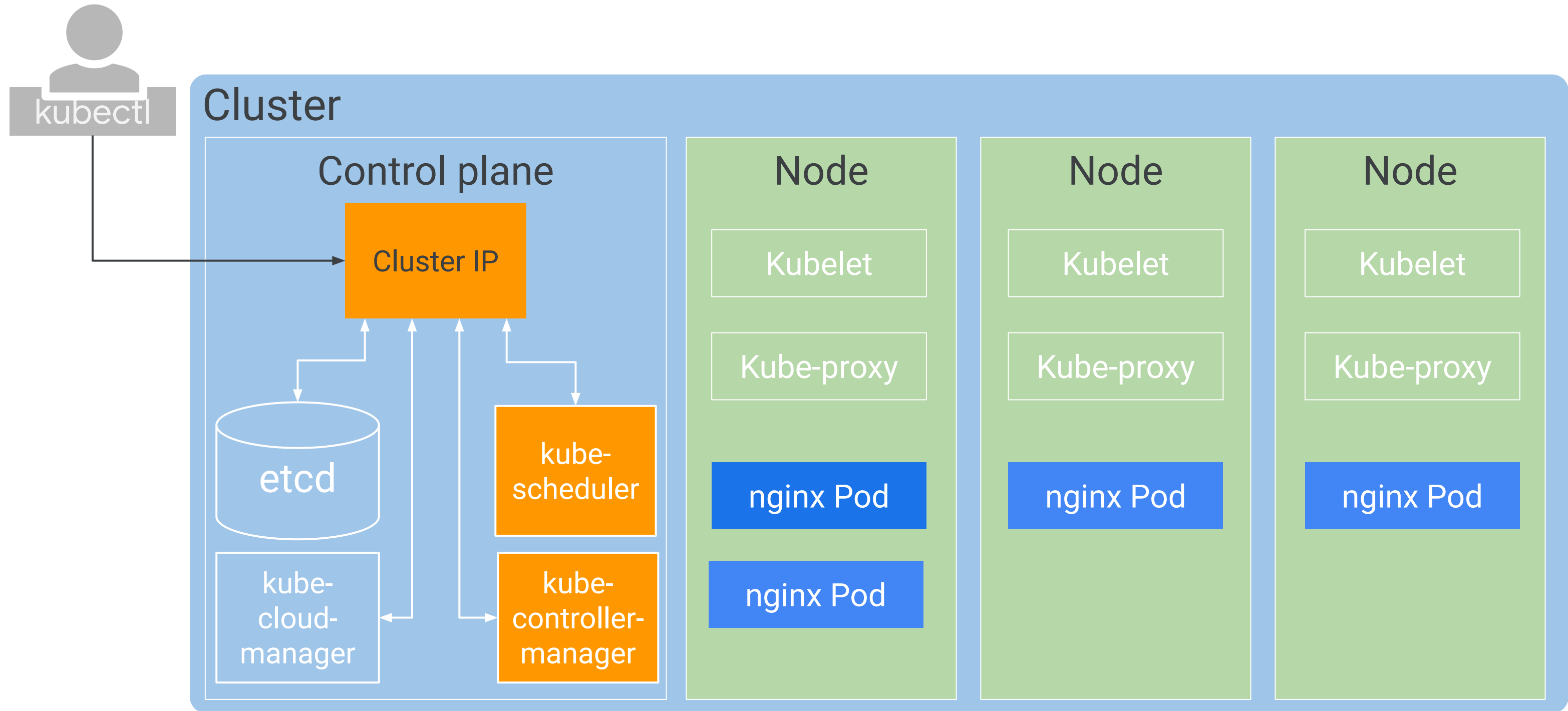
- isolation from other pods
- networking and other services

in a consistent way, regardless of the physical environment

Pods are the basic unit of deployment in Kubernetes



Pods run on nodes



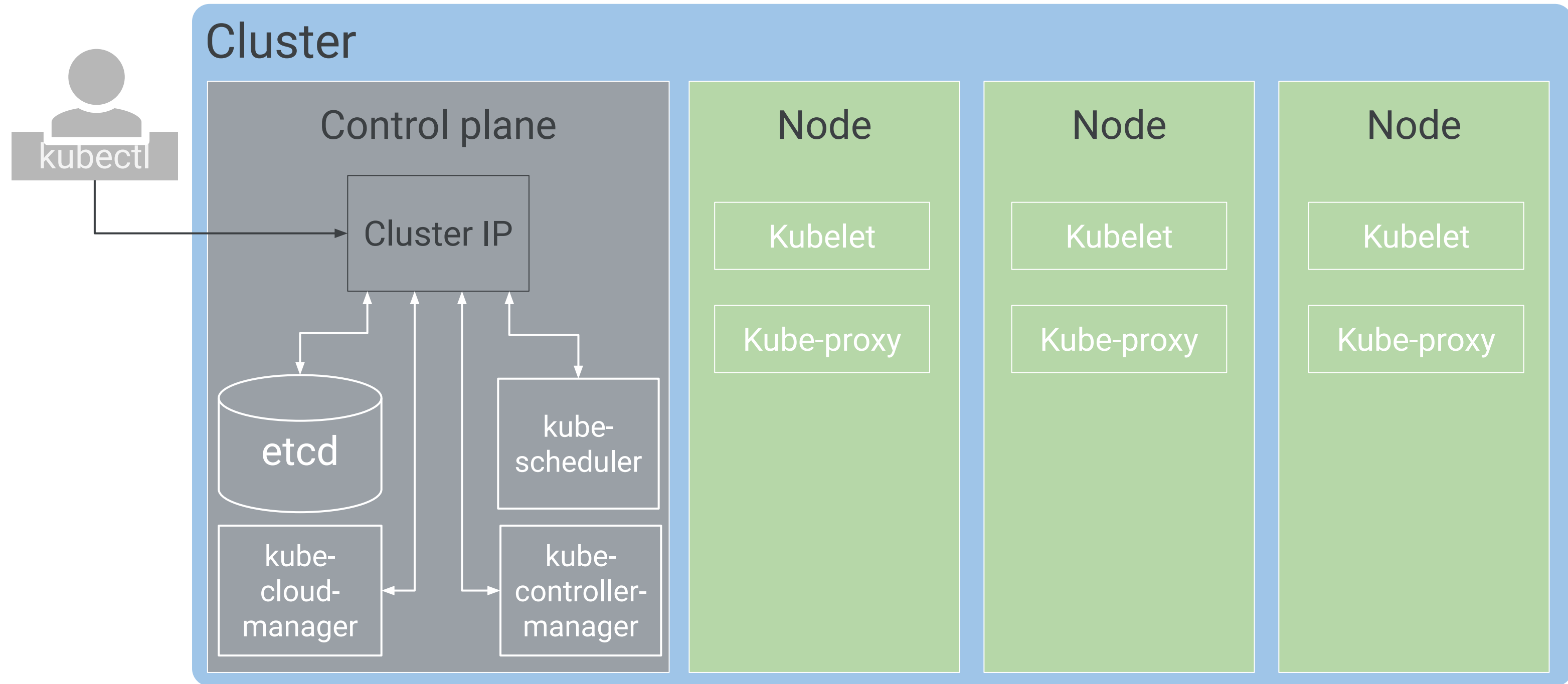
Managing Kubernetes within Google Cloud

Kubernetes is powerful, but managing the infrastructure is a full-time job

Is there a managed service for Kubernetes within Google Cloud?

Yes! Google Kubernetes Engine

GKE manages all the control plane components



GKE has many features

Fully managed

Container-
optimized OS

Auto upgrade

Auto repair

Cluster scaling

Seamless integration

Identity and access
management

Integrated logging and
monitoring

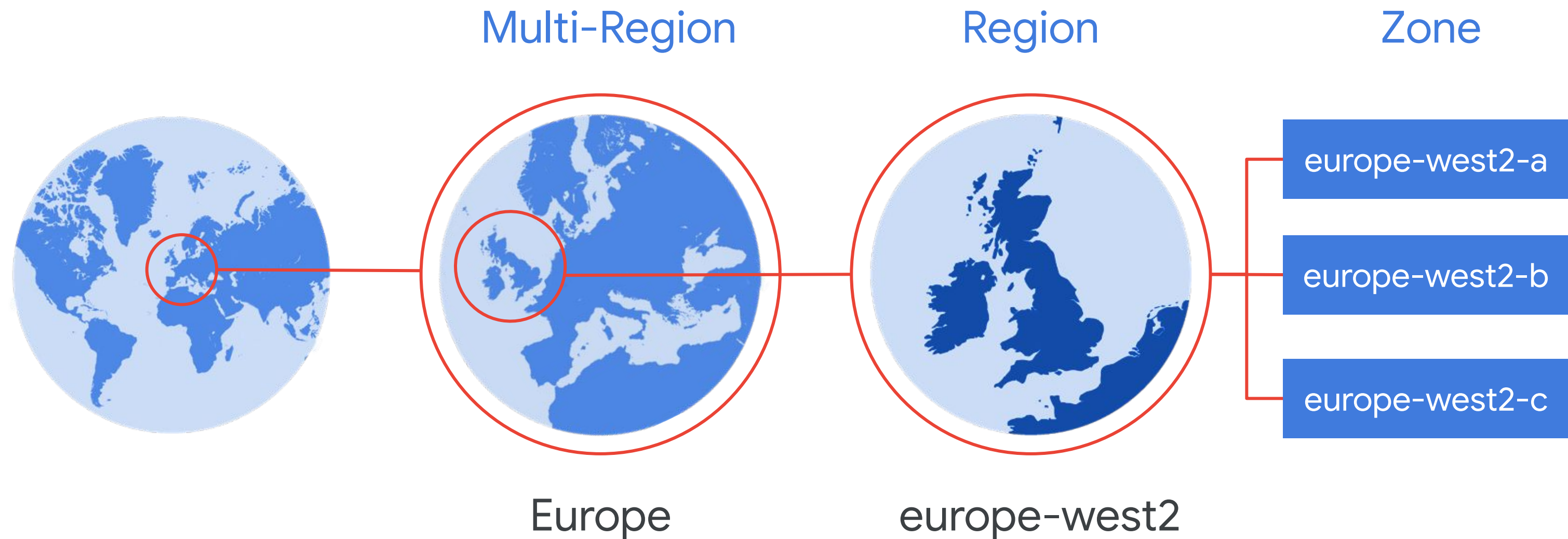
Integrated networking

Cloud Console

GKE Cluster Options

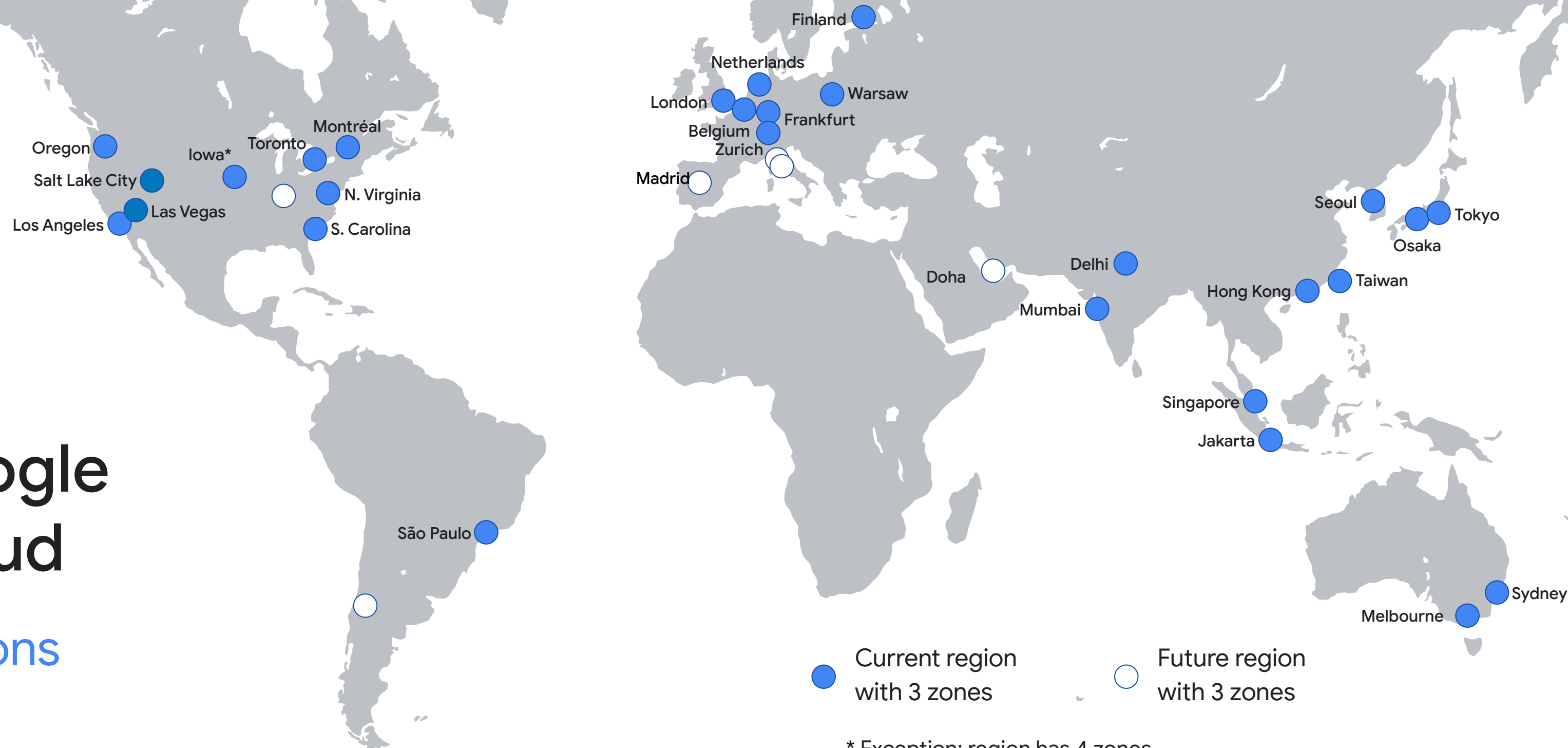
- **Autopilot**
 - GKE manages the entire cluster and node infrastructure
 - You pay by the pod
- **Standard**
 - You manage the node infrastructure
 - You pay for the nodes regardless of utilization
 - Additional standard options
 - Availability: *regional or zonal cluster*
 - Networking routing and isolation
 - Automatically scale nodes
 - Automatically apply updates to nodes

Google Cloud is organized into regions and zones



Google Cloud

Regions



<https://cloud.google.com/about/locations/>

Lab Intro

Deploying Kubernetes Engine

Duration: 30 minutes



Agenda

Introduction to Containers

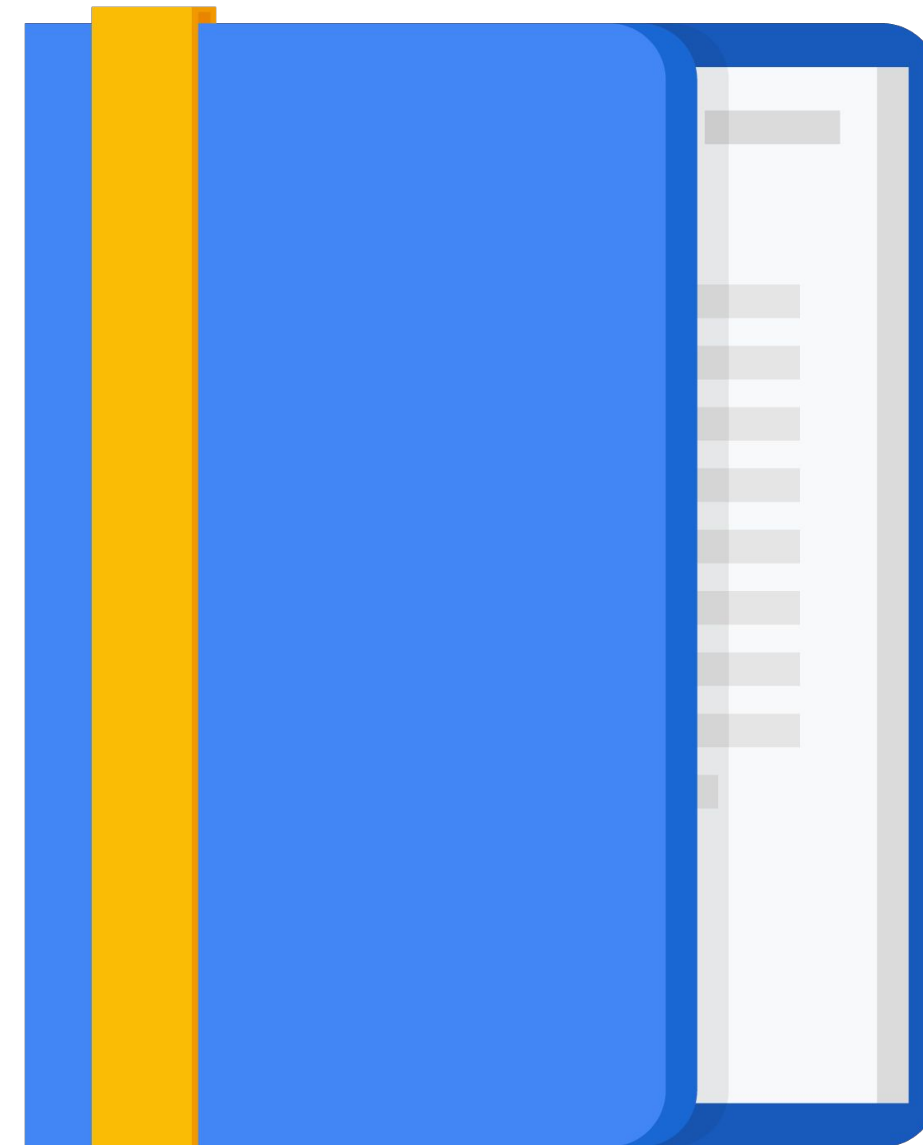
Lab

Computing Options

Introduction to Kubernetes

Lab

Quiz



Question #1

Question

Which of these problems are containers intended to solve? Mark all that are correct (3 correct answers).

- A. Applications need a way to isolate their dependencies from one another.
- B. It's difficult to troubleshoot applications when they work on a developer's laptop but fail in production.
- C. Packaging applications in virtual machines can be wasteful.
- D. Some developers need parts of their applications to be Linux-based while other parts are Windows-based.

Question #1

Answer

Which of these problems are containers intended to solve? Mark all that are correct (3 correct answers).

- A. Applications need a way to isolate their dependencies from one another.
- B. It's difficult to troubleshoot applications when they work on a developer's laptop but fail in production.
- C. Packaging applications in virtual machines can be wasteful.
- D. Some developers need parts of their applications to be Linux-based while other parts are Windows-based.



Question #2

Question

You are choosing a technology for deploying applications, and you want to deliver them in lightweight, standalone, resource-efficient, portable packages. Which choice best meets those goals?

- A. Containers
- B. Executable files
- C. Hypervisors
- D. Virtual Machines

Question #2

Answer

You are choosing a technology for deploying applications, and you want to deliver them in lightweight, standalone, resource-efficient, portable packages. Which choice best meets those goals?

- A. Containers
- B. Executable files
- C. Hypervisors
- D. Virtual Machines



Question #3

Question

When you use Kubernetes, you describe the desired state you want, and Kubernetes's job is to make the deployed system conform to your desired state and to keep it there in spite of failures. What is the name for this management approach?

- A. Containerization
- B. Declarative configuration
- C. Imperative configuration
- D. Virtualization

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Answer

When you use Kubernetes, you describe the desired state you want, and Kubernetes's job is to make the deployed system conform to your desired state and to keep it there in spite of failures. What is the name for this management approach?

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- B. Declarative configuration
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Question #4

Question

What is a stateful application?

- A. An application that is not containerized.
- B. An application that requires data to be stored persistently.
- C. A web front end.

Question #4

Answer

What is a stateful application?

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- B. An application that requires data to be stored persistently.
- C. A web front end.



Question #5

Question

You are classifying a number of your applications into workload types. Select the stateful applications in this list of applications. Choose all responses that are correct (2 correct responses).

- A. A gaming application that keeps track of user state persistently.
- B. A shopping application that saves user shopping cart data between sessions.
- C. Image recognition application that identifies product defects from images.
- D. Web server front end for your inventory system.

Question #5

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Question #6

Question

What is the relationship between Kubernetes and Google Kubernetes Engine?

- A. Google Kubernetes Engine is a closed-source variant of Kubernetes.
- B. Google Kubernetes Engine is Kubernetes as a managed service.
- C. Kubernetes and Google Kubernetes Engine are two names for the same thing.

Question #6

Answer

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Question #7

Question

What is the name for the computers in a Kubernetes cluster that can run your workloads?

- A. Containers
- B. Container images
- C. Control Planes
- D. Nodes

Question #7

Answer

What is the name for the computers in a Kubernetes cluster that can run your workloads?

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- B. Container images
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- D. Nodes



Question #8

Question

You are developing a new solution and want to explore serverless application solutions. Which Google Cloud compute services provide serverless compute resources that you can use with containers?

- A. App Engine
- B. Cloud Functions
- C. Compute Engine
- D. Google Kubernetes Engine

Question #8

Answer

You are developing a new solution and want to explore serverless application solutions. Which Google Cloud compute services provide serverless compute resources that you can use with containers?

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- C. Compute Engine
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Question #9

Question

You are deploying a containerized application, and you want maximum control over how containers are configured and deployed. You want to avoid the operational management overhead of managing a full container cluster environment yourself. Which Google Cloud compute solution should you choose?

- A. App Engine
- B. Cloud Functions
- C. Compute Engine
- D. Google Kubernetes Engine

Question #9

Answer

You are deploying a containerized application, and you want maximum control over how containers are configured and deployed. You want to avoid the operational management overhead of managing a full container cluster environment yourself. Which Google Cloud compute solution should you choose?

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- B. Cloud Functions
- C. Compute Engine
- D. Google Kubernetes Engine



