Google Cloud

Application Development with Cloud Run

This course introduces you to the fundamentals, practices, capabilities and tools for modern cloud application development with Cloud Run. Through a combination of lectures, hands-on labs, and supplemental materials, you learn how to develop and deploy applications on Google Cloud by using Cloud Run.

This version of the course consists of three separate courses that include topics on creating containers, developing applications with Cloud Run, and Cloud Run functions.

DURATION
2 days

LEVEL
Introductory

FORMAT
Instructor-led
The three courses that comprise this course can also be delivered individually.

What you'll learn

- Define containers and container images.
- Build and package applications into container images.
- Identify best practices used to create, test, and secure containers.
- Understand the basics of Cloud Run and Google Kubernetes Engine.
- Understand the fundamentals of Cloud Run that include the resource model, container lifecycle, and autoscaling.
- Develop and test applications locally before deploying to Cloud Run.
- Use service identity and IAM with Cloud Run.
- Integrate Cloud Run applications with Google Cloud services.
- Develop, test, and deploy Cloud Run functions on Google Cloud.

Duration	• 0.5 day: Developing Containerized Applications on Google Cloud
	• 1 day: Developing Applications with Cloud Run on Google Cloud: Fundamentals
	• 0.5 day: Developing Applications with Cloud Run Functions on Google Cloud
Overview	12 modules · 9 labs · 10 classroom activities
Who this course is for	Partners and customers who want to learn to use the tools and services on Google Cloud to build and run containerized applications.
Products	Cloud Run, Docker, Google Cloud's buildpacks
Prerequisites	• Familiarity with Linux commands and command line interface.
	• Knowledge of the Google Cloud console, gcloud CLI, and networking.
	• Basic understanding of programming languages such as Node.js or Python.
	• Understanding of shell scripts, HTTP, and experience with HTTP client tools like cURL.
	• Some understanding of other Google Cloud services such as Cloud Storage and Pub/Sub.
	• Completion of the Google Cloud Fundamentals: Core Infrastructure course is recommended.
Not covered	Deep dives on related products and other Google Cloud services.

Module 0   Course introduction

Topics   Introduction to the course structure and agenda

Objectives
• Understand course learning objectives.
• Understand course structure and agenda.

Module 01   Introduction to containers

Topics
• Containers and container images
• Building container images
• Building container images with buildpacks
• Continuous integration and delivery (CI/CD) tools
• Best practices for creating and securing containers

Objectives	• Define containers and container images.
	• Build and package applications into container images.
	• Understand the use of CI/CD tools to build container images.
	• Identify best practices used to create, test, and secure containers.
Activities	• Lab: Creating and Running Docker Containers
	• (Optional) Lab: Creating a Containerized Application with Buildpacks
	• Quiz

Module 02 **Introduction to Cloud Run and Google Kubernetes Engine**

Topics	• Introduction to Cloud Run
	• Features and use cases of Cloud Run
	• Introduction to Google Kubernetes Engine
	• Container-Optimized OS
Objectives	• Understand Cloud Run and its use in running containerized applications.
	• Understand the basics of Google Kubernetes Engine.
Activities	• Lab: Deploying a Containerized Application on Cloud Run
	• Quiz

Module 03 **Fundamentals of Cloud Run**

Topics	• Overview
	• Resource model
	• Container lifecycle
	• Autoscaling
	• Access control with IAM
Objectives	• Understand the fundamentals of Cloud Run.
	• Identify the states of a container's lifecycle on Cloud Run.
	• Control access to Cloud Run with IAM.
Activities	• (Optional) Lab: Hello Cloud Run
	• Quiz

Module 04 **Service identity and authentication**

Topics
- Service account and identity
- Resource hierarchy
- Principle of least privilege
- Secrets and environment variables

Objectives
- Understand the fundamentals of IAM.
- Use IAM and service accounts with Cloud Run services.

Activities
- Lab: Implementing Least Privilege IAM Policy Bindings in Cloud Run
- Quiz

Module 05 **Application development, testing, and integration**

Topics
- Development and testing
- Management of service deployments and revisions
- Integration with Google Cloud services

Objectives
- Understand the process and tools used to develop and test Cloud Run applications.
- Manage service deployments and revisions on Cloud Run.
- Integrate Cloud Run with other Google Cloud services.

Activities
- Lab: Using Pub/Sub with Cloud Run
- Quiz

Module 06 **Introduction to Cloud Run functions**

Topics
- Cloud Run functions
- Features and benefits of Cloud Run functions
- Cloud Run functions use cases
- Supported language runtimes and regions

Objectives
- Define Cloud Run functions.
- Identify the use cases, features, and benefits of Cloud Run functions.
- Distinguish the types of Cloud Run functions, and identify the supported languages for developing functions.
- Develop and deploy a Cloud Run function using the Google Cloud console and gcloud CLI.

Activities
- Lab: Develop and Deploy Cloud Run Functions
- Quiz

Module 07	Calling and connecting Cloud Run functions
Topics	• Cloud Run functions triggers • Connect Cloud Run functions with Workflows • Connect to a VPC network
Objectives	• Understand the different kinds of triggers available, and learn how to specify triggers for functions. • Connect services and functions with workflows. • Connect functions to resources in a VPC network.
Activities	• (Optional) Lab: Connect Cloud Run Functions • Quiz

Module 08	Securing Cloud Run functions
Topics	• Secure access to Cloud Run functions. • Authenticate to Cloud Run functions. • Protect Cloud Run functions.
Objectives	• Secure Cloud Run functions with identity and network-based access controls. • Understand function identity. • Understand how to authenticate and authorize access to functions for invocation and administration. • Protect functions and related data with encryption keys.
Activities	Quiz

Module 09	Integrating with cloud databases
Topics	• Connect Cloud Run functions to Memorystore. • Use environment variables. • Connect Cloud Run functions to Firestore. • Use secrets with Cloud Run functions.
Objectives	• Integrate Cloud Run functions with cloud databases such as Firestore and Memorystore. • Use secrets with Cloud Run functions. • Use environment variables with Cloud Run functions.
Activities	• Lab: Integrate Cloud Run Functions with Firestore • Quiz

Module 10   Best practices for functions

Topics
- Best practices implementing functions
- Improving performance and networking
- Retrying functions
- Configuring functions
- Scaling and traffic splitting

Objectives
- Use best practices when developing and implementing functions.
- Understand how to retry event-driven functions on failure.

Activities   Quiz

Module 11   Review

Topics   Review of module topics

Objectives   Review the topics discussed in the previous modules.