Google Cloud

Review: Application Development with Cloud Run

Let's review the topics that were discussed and the skills you gained in this course.

Build container images

With Docker	With buildpacks
Build a container image with a Dockerfile.	Build a container image with Google Cloud's buildpacks.

In this course, you learned about containers, and container images. You learned how to build and package container images for your application with Docker, and with Google Cloud's buildpacks.

Continuous integration and delivery

Skaffold	Cloud Build	Artifact Registry
It's a command line tool used to continuously deploy containers to your local or remote Kubernetes cluster, Docker environment, or Cloud Run project.	It's a service to continuously build, test, and deploy your application using a CI/CD pipeline.	It's a service to store and manage container images in private repositories.

We discussed tools like Skaffold, Cloud Build, and Artifact Registry that can be used to implement your CI/CD process to build, test, and deploy containers.

Skaffold handles the workflow for building, and deploying your application, and provides building blocks for creating CI/CD pipelines. Skaffold can be used to continuously deploy containers to your local or remote Kubernetes cluster, Docker environment, or Cloud Run project.

Cloud Build is a service that executes your builds on Google Cloud. With Cloud Build, you can continuously build, test, and deploy your application using a CI/CD pipeline.

Artifact Registry is a service that is used to store and manage software artifacts in private repositories, including container images, and software packages. Artifact Registry integrates with Cloud Build to store the packages and container images from your builds.

Best practices

- Remove unnecessary tools, and build the smallest image possible.
- Run the application as a non-root user.
- Create container images with common layers.
- Scan your container images for software vulnerabilities

By completing this course, you have the knowledge to implement best practices when building your container images, and securely running your containerized applications.

Cloud Run

- Is a fully managed compute platform for deploying and running containers.
- Improves developer productivity.
- Is a scalable, serverless platform for stateless applications.

We discussed Cloud Run, a fully managed compute platform that lets you deploy and run containers directly on top of Google's scalable infrastructure.

Cloud Run works well with other services on Google Cloud, so you can build full-featured applications without spending too much time operating, configuring, and scaling your Cloud Run service.

Google Kubernetes Engine

- Is a managed Kubernetes service.
- Offers advanced scalability and configuration.
- Provides full control of container orchestration, networking, storage, logging, monitoring.
- In Autopilot, GKE automatically manages cluster upgrades and maintenance.

We also discussed Google Kubernetes Engine, a managed Kubernetes service for deploying, managing, and scaling your containerized applications on Google infrastructure.

Cloud Run overview

1 Your container-based application handles web requests.

2 Cloud Run handles the serving of HTTPS requests to your application.

3 Run your application on Cloud Run as a service or as a job.
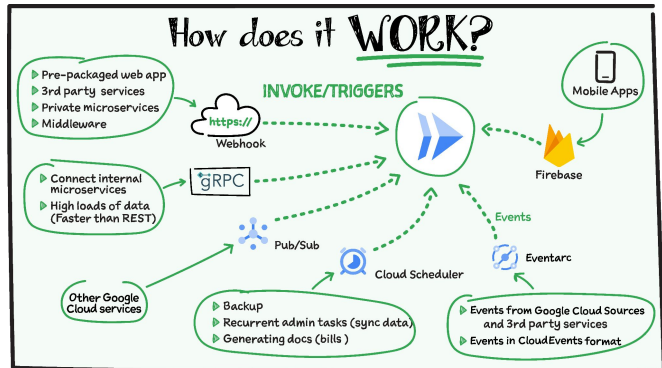
In this course, you also learned about the Cloud Run resource model, and how a service that runs on Cloud Run can be invoked with HTTPS requests.

Cloud Run runs your containerized application as a service or as a job.

Container lifecycle

We discussed the states in the lifecycle of a container running on Cloud Run, from starting to stopped and all the transitions between them.

Scaling configuration

1   Use the minimum instances setting to prevent Cloud Run from scaling to zero container instances.

2   Manage traffic load to your downstream services with the maximum instances setting.

3   To lower CPU, memory usage and related costs, control the number of requests processed by a container instance with the concurrency setting.

We also discussed how Cloud Run automatically scales the number of container instances of your Cloud Run service, based on the number of requests to the service.

Cloud Run has configuration settings to reduce service latency, improve performance with concurrency, and control throughput to downstream services that are used by your application.

Access control

You can control access to your services on Cloud Run with IAM policies and with network settings.

To control access, add individual users or principals (identities) to a Cloud Run service or job with the desired roles and permissions.

To control network access to your service, configure Cloud Run ingress settings at the service level.

Service identity and authentication

1 A service account is used to provide the Cloud Run service identity.

2 Use IAM policy bindings with predefined or custom roles to resources that your service needs to access.

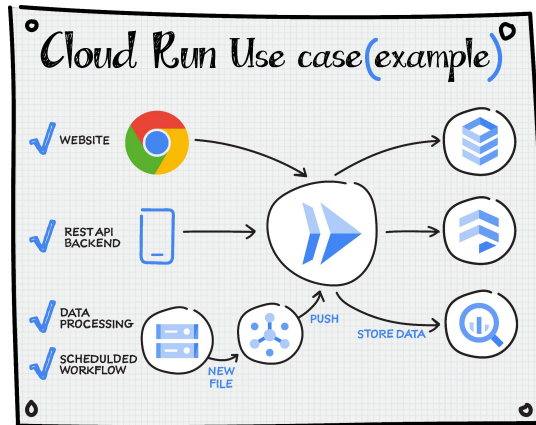**3** Follow the principle of least privilege when granting permissions to access resources.
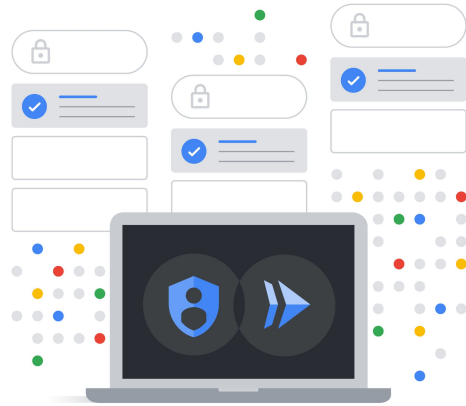
In the module on service identity and authentication, you learned about service accounts and how they can provide your Cloud Run service with its own identity. We discussed the role of the service account when accessing Google Cloud APIs and how they can be used for service to service communication.

Resources in Google Cloud are organized hierarchically. Policy bindings are inherited by resources from their parents, and are used to allow or deny access to resources.

Follow the principle of least privilege when granting roles and permissions to members including service accounts.

Is your application a good fit for Cloud Run?

1 Your service must listen for requests on the configured port, and return a response within a specified time.

2 Use Cloud Code with popular IDEs to easily create, deploy, and integrate applications with Google Cloud.

3 Test your application locally with Cloud Code, the gcloud CLI, or with Docker before deploying to Cloud Run.

Cloud Run Use case (example)

WEBSITE

REST API BACKEND

DATA PROCESSING

SCHEDULDED WORKFLOW

NEW FILE

PUSH

STORE DATA

In the final module, we discussed some of the criteria that you can use to decide whether your application is a good fit for Cloud Run.
As a service running on Cloud Run, your container must listen for requests on the configured port, and return a response within a specified time.

There are multiple ways to build, and test your application before deploying it to Cloud Run.
With the source-based approach, you can build your source code with Buildpacks and deploy to Cloud Run.
You can use Cloud Code with popular IDEs to easily develop, deploy, and integrate your applications with Google Cloud.
You can also test your application locally with Cloud Code, the gcloud CLI, or with Docker before deploying to Cloud Run.

Service revisions

1. A service revision on Cloud Run is immutable.

2. Changing any service configuration settings results in the creation of a new revision.

3. You can split traffic between service revisions based on percentage of requests.

We also discussed how you deploy a service and manage service revisions on Cloud Run.

When you deploy a container image, Cloud Run creates a service revision. A service revision is immutable.

Changing any configuration settings of your Cloud Run service results in the creation of a new revision.
You can split traffic between service revisions based on the percentage of requests received by the service.

Integrating Cloud services

1 Connect to supported Google Cloud services from your Cloud Run application with client libraries.

2 Connect to a Memorystore for Redis instance from your Cloud Run service with Serverless VPC Access.
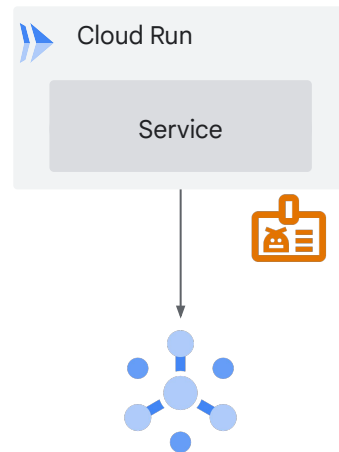
Cloud Run

Service

Finally, we discussed how to integrate with supported Google Cloud services such as Pub/Sub from your Cloud Run application with client libraries.

You can connect to internal resources such as Memorystore from your Cloud Run service with Serverless VPC Access.

What's next?

🎓 **Cloud Developer Learning Path**	**1**	Getting started with Application Development
A curated collection of on-demand courses, labs, and skill badges that provide you with hands-on experience with Google Cloud technologies essential to the Cloud Developer role.	**2**	Developing Applications with Cloud Run on Google Cloud: Fundamentals
	3	**Getting Started with Google Kubernetes Engine**
	4	Service Orchestration and Choreography on Google Cloud

Now that you've completed this course on Developing Applications with Cloud Run on Google Cloud, you might consider learning more about other services such as Google Kubernetes Engine and about Service Orchestration and Choreography on Google Cloud.

Some of these courses are part of a set of courses and quests in the Cloud Developer learning path that you can subscribe to, and expand your knowledge and skills on Google Cloud.