Google Cloud Associate Cloud Engineer Certification Guide

A comprehensive guide to implementing, managing, and monitoring Google Cloud solutions

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Dedicated to

My wife, ***Sudeshna Sarkar***

About the Author

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Preface

Mainly due to the exponential growth of data, organizations need to scale up their IT infrastructure to maximize their business outcome. With the emergence of cloud computing, organizations are moving their workloads to public cloud in order to reduce the capital expenditure towards on-premises IT infrastructure and Google Cloud Platform is one of the major public cloud platforms present today.

This book will guide you to prepare for Google Cloud Associate Cloud Engineer certification with detailed explanation and pictorial demonstrations of GCP services. It contains 16 Chapters and 2 Practice Tests.

Chapter 1: Cloud Computing with GCP - This will introduce the readers to cloud computing with GCP, why cloud computing is needed, the drawbacks of on-premises infrastructure, what are public, private and hybrid cloud, and what are the major public cloud providers available in the market. It will also include Google Cloud Platform's history and list of services GCP provides. It will set the foundation to learn GCP.

Chapter 2: Overview of Google Cloud Associate Cloud Engineer Certification - This will include the details about the Google Cloud Associate Cloud Engineer Certification, how much time, how many questions, questions covering the parts of services etc.

Chapter 3: Understanding GCP Console, Cloud Shell, Billing and APIs - This will introduce the readers to the GCP Console, it will make them familiar with different portions of the console and show how to use those effectively with pictorial examples. It will also show how to enable API and Billing and finally how to use Cloud SDK from the command prompt/ or Cloud Shell.

Chapter 4: Identity and Access Management in GCP - This chapter will include the Identity and Access Management in GCP. It will introduce IAM roles, service accounts, different types of access control mechanisms, IAM best practices etc.

Chapter 5: Storage Solution in GCP (Block, Network File and Objects) - This chapter will discuss Google Cloud Object Storage service, public and private access, object life cycle and versioning. Access using console and Python Programming language.

Chapter 6: Understanding Different Databases in GCP - This chapter will introduce the SQL and NoSQL databases in GCP. It will also help you to identify the correct database choice for different types of requirements.

Chapter 7: Google Compute Engine - This chapter introduces the readers to the first compute services of GCP. Here we will learn about configuring VMs and understand the managed instance group.

Chapter 8: Cloud Run - This chapter introduces the service to build and deploy scalable containerized apps written in any language (including Go, Python, Java, Node.js, .NET, and Ruby) on a fully managed platform.

Chapter 9: Google Kubernetes Engine - This chapter will include the Kubernetes service inside GCP. We will learn about creating and managing the Kubernetes cluster and deploying services into it.

Chapter 10: Cloud Functions - We will study App Engine which is a fully managed, serverless platform for developing and hosting applications at scale.

Chapter 11: App Engine - This chapter will introduce a new concept called Functions as a Service in GCP with Cloud Functions. It is a serverless scalable service that offers event driven processing.

Chapter 12: Networking in GCP – Networking is a very important topic in Computer Science. It deals with communication between two systems. In Google Cloud Platform, Networking takes place via VPC, i.e., Virtual Private Cloud. It is the backbone of various services in GCP to stay connected among each other and communicate internally or outside of GCP.

Chapter 13: Networking in GCP Firewall Rules, Load Balancing, DNS, CDN and NAT– In this part 2 of Networking in GCP, here we are going to learn about Firewall Rules and load balancers and will see how these help in movement of network traffic in Google Cloud Platform along with Cloud DNS, CDN and NAT.

Chapter 14: Big Data Processing, AI, Deployment and Monitoring in GCP - This chapter covers the basic details around some of the services related to Big Data processing, artificial intelligence, deployment and monitoring in GCP. In various industries, Google Cloud Platform is the preferred choice for Bigdata and artificial intelligence. We are going to cover the basic understanding of these services.

Chapter 15: End-to-End Application Lifecycle in GCP Design, Build, Test, Deployment and Monitoring - This chapter covers the End-to-End Application lifecycle in Google Cloud Platform. We will start with requirement gathering and finish with monitoring of an application.

Chapter 16: Specific Topics for GCP ACE Exam - This chapter covers some of the specific topics required for GCP ACE certification exam.

Chapter 17: Practice Test 1- 20 Practice Questions on Certification exam.

Chapter 18: Practice Test 2- 20 Practice Questions on Certification exam.

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Chapter 1
Cloud Computing with GCP

Introduction

This chapter will cover the introduction of cloud computing with **Google Cloud Platform** (**GCP**). We will understand why cloud computing is needed, the drawbacks of on-premises infrastructure, the meaning of public, private, and hybrid cloud infrastructure, and the major public cloud providers available in the market. It will also include GCP's history and the types of services it provides. We will also learn a brief description of most of the services in GCP. This chapter will set the foundation for learning the GCP.

Structure

The chapter covers the following topics:

- Cloud computing
- On-premise infrastructure and its drawbacks
- Public, private, and hybrid cloud
- Major public cloud providers
- IaaS, PaaS, and SaaS
- Introduction to GCP

- Google Cloud Platform resource hierarchy
- Brief introduction about different GCP services

Objectives

By the end of this chapter, you will be able to understand the cloud computing concepts, the difference between cloud computing and on-premise-based computing, the drawbacks of on-premise-based infrastructure, the difference between **Infrastructure as a Service** (**IaaS**), **Platform as a Service** (**PaaS**), **Software as a Service** (**SaaS**), a brief about various GCP services solving challenges around storage, computing, artificial intelligence, etc.

Cloud computing

Cloud computing is the on-demand availability of computing resources like storage, infrastructure, etc., without actually owning any of these. It is very much like renting the services which are required. In this way, the capital expenditure towards hardware can be minimized, and users can focus more on the application than on managing and monitoring the hardware infrastructure.

On premise infrastructure and its drawbacks

On-premise infrastructure means owning the computing resources. It requires upfront investment towards hardware, which leads to higher capital expenditure before even focusing on the actual product. Secondly, managing the infrastructure and monitoring these needs specialized resources, which again increases IT expenditure. Upgradation and licensing of this hardware again fall under the IT department of the organization, along with the need for scalability with the exponential growth of data and digital initiatives.

Public, private, and hybrid cloud

In cloud computing, when we are using multi-tenant platforms (hardware) for storage, infrastructure, etc., then it is called a public cloud. To be precise, multiple organizations use the same shared platform (hardware).

When the usage of the cloud service provider's hardware is single-tenant, then it is a private cloud; that is, only a single organization is using the hardware that is rented, and no other organizations are using it.

Sometimes, organizations need to keep their data movement within on-premises hardware due to security restrictions or the governing body's policy. At that time, both on-premises and public cloud are used to deliver a particular business application or solution. This type of arrangement is called a hybrid cloud.

Major public cloud providers

There are many cloud service providers at this moment, but the majority of the market share is with AWS from Amazon, Azure from Microsoft, and GCP from Google. Take a look at the following figure:

Figure 1.1: *Major public cloud providers*

IaaS, PaaS, and SaaS

Starting with IaaS. It is a cloud computing model where you rent the infrastructure. The infrastructure can be **virtual machine** (**VMs**), storage, network, etc. The service provider takes care of hosting and maintaining the infrastructure, and you need to take care of the operating system, data, and applications.

When it comes to PaaS, Cloud service providers will provide a platform, and they will manage the backend infrastructure completely. You do not have to worry about the infrastructure. You just need to write the code for your application and manage the data and applications.

SaaS is a software distribution model that connects its customers mostly by internet. It normally comes with a subscription-based software services. Examples of SaaS are very common to us, like Dropbox, Workplace, Netflix, YouTube, Salesforce etc.

Introduction to GCP

GCP is a cloud computing platform offered by Google. It started its journey in April 2008 with **App Engine** as its first service which was generally available in November 2011.

GCP offers various services, which can be categorized as storage, computing, database, networking, data analytics, security, AI, monitoring and logging, API, etc. It has 11% of the market share at the start of 2023, and it is growing daily.

Google Cloud Platform resource hierarchy

For GCP resources, the hierarchy is **Organization** | **Folders** | **Projects** | **Services**. The organization is like a company, say *abc.com*. Folders are specific to the area of services the company provides or the actual products of the company or features. Under a folder, there are different projects, mostly for various environments. These can be defined as per the organization's needs and choices. Take a look at the following figure:

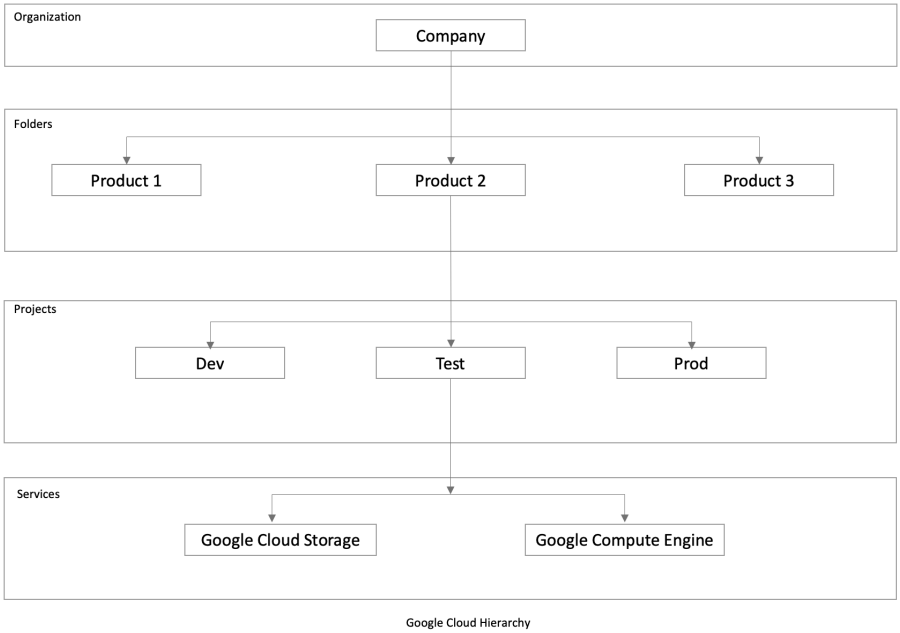

Figure 1.2: *GCP resource hierarchy*

Brief introduction about different GCP services

Let us understand each service one by one. For ease of understanding, we are going to categorize the services in different areas like storage, compute, network, etc.

Storage related services

The storage services are as follows:

- **Google Cloud Storage:** Google Cloud Storage is an object storage service. It can store any type or any amount of data. It is good for building Data Lakes and static content delivery websites like images, video streaming, etc. You can retrieve the data any time you want. It can also be used as a low-cost archival solution.
- **Persistent Disk:** It is a block storage service mainly used with Compute Engines/ VMs and GCP's Kubernetes service **Google Kubernetes Engine** (**GKE**). It can be a storage solution attached to VMs as Disks. It can also be used as storage for installed databases.
- **Filestore:** It is a fully managed service mainly used for file storage for application migration.

- **Data transfer services**: It is a service that transfers data between one cloud service provider to GCP or from on-premises to GCP. The data transfer services are as follows:
- **Transfer appliance:** It is used to collect and move data from limited connectivity areas or bandwidth-constrained locations.
- **Local SSD**: It is an ephemeral locally attached block storage for VMs and containers.
- **Google Cloud Backup and disaster recovery (DR):** It is a service for managed backup and DR to protect file systems, databases, and VMs. It can also be used to keep a backup of on-premise workloads to GCP.
- **Artifact registry:** It is used as a centralized repository of container images, OS, and language packages. It is mostly used with CI/CD pipelines in various environments.

Compute related services

The compute services are as follows:

- **Compute Engine:** It is a general-purpose VM. It can be used for web server hosting, **Extract, Transform, Load** (**ETL**) and application servers. It can integrate with various GCP services. It can be used as a replica of an on-premises VM.
- **Google Kubernetes Engine:** It is a Google-managed implementation of Kubernetes, which is actually an open-source container orchestration platform. It is a reliable and secure way to deploy containerized applications.
- **Cloud Run:** It is a highly scalable service to deploy containerized applications. It comes with two versions, one is fully managed Cloud Run, and another is Cloud Run for Anthos. We will discuss this in more detail in later chapters.
- **App Engine:** It is a fully managed and serverless platform to build applications using common programming languages.
- **Batch:** It is a fully managed and dynamically scalable batch service to schedule, queue, and execute containerized or script-based batch jobs on Compute Engine.

Database related services

The database services are as follows:

- **Cloud SQL:** A fully managed MySQL or PostgreSQL or SQL Server database. It can used as a regular RDBMS application database.
- **AlloyDB for PostgreSQL**: It is a PostgreSQL compatible GCP's database service.
- **Spanner:** Cloud Spanner is a very highly scalable global cloud native database with 99.999% of availability.