

PROJECT REPORT

On

“Google Cloud Computing Foundations”

(CSE CC IV Semester Mini Project)

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1. ABOUT PROJECT

1.1. Introduction

"Digital Transformation" has been a buzzword over the previous few years, with small and medium organizations in addition to huge firms transferring operations to the cloud and adopting on-line productivity and collaboration services.

The global pandemic has created major shifts inside the methods businesses perform and innovate. For many agencies, a heavy reliance on cloud packages and cloud services has come to be the new every-day, with cloud packages being praised as “An Unsung Hero”.

However, cloud computing isn’t just for purchasers or for employees who are working from home. In fact, migrating offerings and software program to the cloud has emerged as one of the next steps to a hit virtual transformation.

Simply put, the cloud is the Internet—more specifically, it's all of the things you can access remotely over the Internet. Just knowing the importance and need of migrating enterprises to cloud is one aspect of a scenario whereas knowing how to do that, is a completely different thing. This is where systems like Google Cloud Platform (GCP) comes into picture.

Google Cloud Platform is a suite of public cloud computing services offered by Google. The platform includes a range of hosted services for compute, storage and application development that run on Google hardware. In order to ensure proper training and understanding of GCP, Google offers a variety of training curriculums, one of them being Google Cloud Computing Foundations (GCCF).

1.2. Introduction to Curriculum

Google Cloud Computing Foundations or GCCF, provides a comprehensive, customizable course curriculum. This curriculum enables learners to develop technical proficiency in cloud computing and to launch careers in a cloud-first world. It aims at student learners and professionals with little to no cloud background or knowledge. GCCF, is a series of courses, and provide an overview of concepts central to cloud infrastructure, application development, big data, and machine learning, and where and how Google Cloud fits in. It consists of 4 parts namely:

- Cloud Computing Fundamentals
- Infrastructure in Google Cloud
- Networking and Security in Google Cloud
- Data, ML, and AI in Google Cloud

Each course had modules inside it, which further were made of study material, reference videos, hands-on lab sessions and quizzes. At the end of each course, digital badges were awarded. To further demonstrate our capabilities, we were to complete Challenge Labs, to earn a digital Skill Badge.

1.3. Curriculum Objectives

- Discuss what the cloud is and why it’s a technological game changer
- Describe the different ways a user can interact with Google Cloud
- Implement various aspects of services such as security, networking, automation, big data, machine learning and artificial intelligence in Google Cloud

1.4. Motivation

As discussed earlier, Cloud Computing is future of technology and this might actually be the main motive behind opting for Google Cloud Computing Foundations curriculum. The procedure of developing cloud skills and especially enhancing them on renowned platforms like GCP and Qwiklabs, that too using a customized curriculum will definitely make an engineer industry- ready. It is then highly recommended to at least have a basic go-to knowledge about Cloud and its operations.

1.5. Contributions of Learning

Gaining an understanding of Cloud and GCP might actually contribute towards a better understanding of a student or an engineer in following ways:

- Better and Innovative approach towards understanding upcoming tech streams such as Machine Learning, Artificial Intelligence, Blockchain, etc.
- Wider perspective while dealing with security threats and attacks
- Enhanced field of research and project to pursue

2. PRE-REQUISITES

2.1. Technical Requirements

- Personal Computer or Laptop
- Internet Connection

2.2. Functional Requirements

- Have basic IT knowledge
- Have competency in at least one language (such as Python, Java).

3. CURRICULUM CONTENT

3.1. Modules

The GCCF series of course contains 10 modules in all.

- So, What's the Cloud Anyway?
- Start with a Solid Platform
- Use GCP to Build Your Apps
- Where Do I Store This Stuff?
- There's an API for That!
- You Can't Secure the Cloud, Right?
- It Helps to Network
- Let Google Keep an Eye on Things
- You have the Data, but What Are You Doing with It?
- Let Machines Do the Work

Each module includes:

- Module Learning Objectives
- Agenda Outline
- Lecture Topics
- Hands-on Lab Sessions
- Quiz
- Summary

4. CURRICULUM MODULES

4.1. GCCF: Cloud Computing Fundamentals

4.1.1. Course Description

This is the first course out of the four courses under GCCF. It included 3 course modules and an introductory module as well.

- Introductory Module: Welcome to the Course
 - Brief introduction of Google Cloud Computing Foundations course
 - Explanation of course modules
 - Explanation of course objectives
- Module 01: So, What's the Cloud Anyway?
 - Discuss Cloud Computing
 - Compare and contrast physical, virtual, and cloud architectures
 - Define Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)
 - Detail advantages to leveraging the cloud
- Module 02: Start with a Solid Platform
 - Discuss how to navigate the GCP environment with the GCP Console
 - Explain the purpose and process of creating GCP projects
 - Explain how billing works in GCP
 - Detail how to install and set up the Cloud SDK
- Module 03: Use Google Cloud to Build Your Apps
 - Discover the different compute options in GCP
 - Explore the role of compute options in the cloud
 - Describe building and managing virtual machines
 - Explain building elastic applications using autoscaling
 - Explore PaaS options by leveraging App Engine

4.1.2. Badges

- Google Cloud Computing Foundations: Cloud Computing Fundamentals is awarded after completion of all three modules
- Create & Manage Cloud Resources Skill Badge is awarded after completion of Getting Started: Create & Manage Cloud Resources Challenge Lab

4.2. GCCF: Infrastructure in Google Cloud

4.2.1. Course Description

This is the second course out of the four courses under GCCF. It included 3 course modules.

- Module 04: Where Do I Store This Stuff?
 - Compare and contrast the different Cloud Storage options

- Distinguish between structured and unstructured storage options in the cloud
- Compare the role of the different Cloud Storage options
- Explore the use case for Relational versus NoSQL storage options
- Module 05: There's an API for That!
 - Discuss the purpose of APIs
 - Explain the format of a REST API
 - Compare and contrast Cloud Endpoints and Apigee
 - Explore the use case for a managed messaging service
 - Discuss how Cloud Pub/Sub is used as a managed messaging service
- Module 06: You Can't Secure the Cloud, Right?
 - Describe the shared security model of the cloud
 - Discuss Google's security responsibility versus a customer's responsibility
 - Explore the different encryption options with GCP

4.2.2. Badges

- Google Cloud Computing Foundations: Infrastructure in Google Cloud is awarded after completion of all three modules
- Perform Foundational Infrastructure Tasks in Google Cloud Skill Badge is awarded after completion of Perform Foundational Infrastructure Tasks in Google Cloud Challenge Lab

4.3. GCCF: Networking and Security in Google Cloud

4.3.1. Course Description

This is the third course out of the four courses under GCCF. It included 2 course modules.

- Module 07: It Helps to Network
 - Explore basic networking in the cloud
 - Discuss how to build virtual private clouds (VPCs)
 - Explain the use of public and private IP addresses in the cloud
 - Describe the Google Network
 - Explore the role of firewall rules and routes
- Module 08: Let Google Keep an Eye on Things
 - Introduce Infrastructure as Code (IaC)
 - Discuss Cloud Deployment Manager as an IaC option
 - Explain the role of monitoring, logging, tracing, debugging, and error reporting in the cloud
 - Describe using Stackdriver for monitoring, logging, tracing, debugging, and error reporting

4.3.2. Badges

- Google Cloud Computing Foundations: Networking & Security in Google Cloud is awarded after completion of both modules
- Build & Secure Networks in Google Cloud Skill Badge is awarded after completion of Build & Secure Networks in Google Cloud Challenge Lab

4.4. GCCF: Data, ML and AI in Google Cloud

4.4.1. Course Description

This is the last course out of the four courses under GCCF. It included 2 course modules.

- Module 09: You Have the Data, but What Are You Doing with it?
 - Discuss big data managed services in the cloud
 - Describe using Cloud Dataproc to run Spark, Hive, Pig, and MapReduce as a managed service in the cloud
 - Explain building ETL pipelines as a managed service using Cloud Dataflow
- Module 10: Let Machines Do the Work
 - Discuss machine learning in the cloud
 - Explore building bespoke machine learning models using AI Platform
 - Leverage Cloud AutoML to create custom machine learning models
 - Apply a range of pre-trained machine learning models using Google's machine learning APIs

4.4.2. Badges

- Google Cloud Computing Foundations: Data, ML and AI in Google Cloud is awarded after completion of both modules
- Perform Foundational Data, ML and AI Tasks in Google Cloud Skill Badge is awarded after completion of Perform Foundational Data, ML and AI Tasks in Google Cloud Challenge Lab

5. CURRICULUM QUESTS

5.1. Quest Description

Quest is a group of hands-on labs on Qwiklabs that covers a particular Google Cloud topic or concept by taking you through multiple hands-on labs and Google Cloud platform features.

5.2. Google Cloud Essentials

5.2.1. Quest Outline

This is an introductory level quest with 5 hands-on lab sessions to be completed:

- A Tour of Qwiklabs and Google Cloud
- Creating a Virtual Machine
- Getting Started with Cloud Shell and gcloud
- Kubernetes Engine: Qwik Start
- Set Up Network and HTTP Load Balancers

5.2.2. Badges

- Google Cloud Essentials Quest Badge is awarded after completion of all five labs

5.3. Baseline: Infrastructure

5.3.1. Quest Outline

This is an introductory level quest with 5 hands-on lab sessions to be completed:

- Cloud Storage: Qwik Start - Cloud Console
- Cloud IAM: Qwik Start
- Cloud Monitoring: Qwik Start
- Cloud Functions: Qwik Start- Console
- Google Cloud Pub/Sub: Qwik Start- Console

5.3.2. Badges

- Baseline: Infrastructure Quest Badge is awarded after completion of all lab sessions

5.4. Networking in Google Cloud

5.4.1. Quest Outline

This is a fundamental level quest with 6 hands-on lab sessions to be completed:

- User Authentication: Identity Aware Proxy
- Multiple VPC Network
- VPC Networks- Controlling Access
- HTTP Load Balancer with Cloud Armor
- Create an Internal Load Balancer
- Google Cloud Packet Mirroring with Opensource IDS

5.4.2. Badges

- Networking in Google Cloud Quest Badge is awarded after completion of all labs

5.5. Baseline: Data, ML and AI

5.5.1. Quest Outline

This is an introductory level quest with 6 hands-on lab sessions to be completed:

- AI Platform: Qwik Start
- Dataprep: Qwik Start
- Dataflow: Qwik Start
- Dataproc: Qwik Start – Console
- Cloud Natural Language API: Qwik Start
- Reinforcement Learning: Qwik Start

5.5.2. Badges

- Baseline: Data, ML and AI Quest Badge is awarded after completion of this Quest.

5.6. Kubernetes in Google Cloud

5.6.1. Quest Outline

This is an advanced quest with 5 lab sessions:

- Introduction to Docker
- Kubernetes Engine: Qwik Start
- Orchestrating the Cloud with Kubernetes
- Managing Deployments Using Kubernetes Engine
- Continuous Delivery with Jenkins in Kubernetes Engine

5.6.2. Badges

- Kubernetes in Google Cloud Quest Badge is awarded after completion.

6. QUEST AND SKILL BADGES

Complete list of Quest & Skill Badges earned are as follows:

- Create and Manage Cloud Resources Skill Badge
- Build and Secure Networks Skill Badge
- Perform Foundational Infrastructure Tasks Skill Badge
- Perform Foundational Data, ML and AI Tasks Skill Badge
- Google Cloud Essentials Quest Badge
- Baseline: Infrastructure Quest Badge
- Baseline: Data, ML and AI Quest Badge
- Networking in the Google Cloud Quest Badge
- Kubernetes in Google Cloud Quest Badge

7. CONCLUSION

We have a long history of how technological advancements have influenced the way society thinks and strives. Needless to say, technology has created and destroyed livelihoods. Cloud computing is the next frontier of digital transformation.

The Cloud has changed the way we view and interpret data. AI-based predictions powered by cloud resources are now the prevalent solutions in dealing with critical business decisions and goals. Cloud Computing has become the backbone of many IT solutions and operations for the past decade. And according to research, it will continue to do so for the coming years.

It appears that the demand for skills in Cloud computing has been on the rise with no signs of slowing down. Whether you are an IT professional, a student, or even an average Joe who's interested in tech, investing your time and resources in learning cloud computing skills is going to be worth your while, and with GCP at your help, learning cloud computing had never been easier. Curriculums like GCCF focus at interactive and comprehensive approaches for better learner experience.

7.1. Future Scope

Recent studies claim that of the 9 SaaS platforms with over a billion users, Google provided at least 7 of them. Google indeed is a big player with Gmail, Sheets, Docs, YouTube, Ads, etc.

Even some of the hotshot organizations such as Planet Labs, Lush Cosmetics, Spotify and Apple have opted for Google Cloud, making it very clear that it won't be long before Google Cloud becomes the de-facto Cloud solution. If all of these facts are any indications, then Google Cloud Platform definitely has a bright future.

8. RESULTS AND OUTCOMES

The complete procedure of learning and knowing GCP via the means of GCCF was an inexplicable experience. A learner might able to bring about the following constructive and productive learning outcomes from the curriculum:

- Being able to access Qwiklabs and GCP console and basic GCP services such as Kubernetes.
- How to set up virtual machines, load balancers, and other compute servers, that too via web and knowing about zones and regions
- Being able to restrict unwanted access to projects and monitor the progress timely using automated services.
- Setting up alerts and monitoring signals and create a privatized storage block with utmost security.
- Setting up and deploying AI models for prediction and analysis and using Natural Language API as an aid.

9. REFERENCES

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