INFS3208 - Cloud Computing
Individual Project Proposal

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1.Introduction

- **About the project**

  This is an online learning application developed on the Google Cloud platform. It enables users to register as educators or learners and engage in teaching and learning activities.

- **Motivation**

  Since 2020, the increasing demand for remote teaching has highlighted a significant market need. My online learning system is a valuable tool that meets this demand.

- **The features**

General Features	Educator Features	Learner Features
User registration	Release new courses	Add courses to collection
Log in and log out	Upload files (eg: images, pdf, txt files)	Download files (eg: images, pdf, txt files)
User profile		Pay for courses
User profile updating		
Comment under a course page		
Search for/ filter a course		

- **The limitations of traditional computing solutions**

  The traditional solution needs much cost on new infrastructure and its ongoing ownership, which is a heavy investment for small businesses. In addition, adding more storage capacity to traditional hardware can be also expensive.

- **The benefits brought by cloud computing**

  The core benefits include scalability, flexibility, and cost-efficiency. Computational infrastructures can be adjusted based on demand, and cloud computing offers a more cost-effective solution.

2.Technical Solutions

▸ **TECHNOLOGIES**

- **Google Compute Engine** is used in this project, serving as the Infrastructure as a Service (IaaS) component of the Google Cloud Platform (GCP). Google Compute Engine VMs host my application, allowing for dynamic adjustments in both the number and size of VMs to efficiently meet demand.

- **Docker** technologies are used to containerise my web application with multiple containers (Nginx, PHPMyAdmin, MariaDB, PHP-FPM) running in a micro-service architecture. It helps to migrate the application to the cloud efficiently.

- **Docker Swarm** is the orchestration tool that manages multiple containers across hosts for your application. It offers built-in features like load balancing, scalability, reliability, and rollback.

- **NGINX** is the web server with load balancing to respond to client requests
- **PHP-FPM** is a PHP FastCGI Process Manager that handles PHP requests.
- **CodeIgniter** is a PHP framework using MVC architecture that runs on top of the PHP-FPM.
- **MariaDB** is the back-end data storage that stores all the data for the website
- **PHPMyAdmin** is a PHP-based MySQL administration tool, which allows the administration to manage the database via a graphical user interface.
- **HTML5 and CSS3** are used for the front-end pages of this application. HTML5 is used for structuring, CSS3 for styling, and the front-end framework used is Bootstrap.

▸ **MONTHLY COST ESTIMATION**
- The estimated monthly cost is US$334.38, which includes two VM instances. Here are the details:

Monthly estimate

US$167.19

That's about US$0.23 hourly

Pay for what you use: No upfront costs and per-second billing

Item	Monthly estimate
6 vCPU + 10 GB memory	US$165.84
10 GB balanced persistent disk	US$1.35
Total	US$167.19

Figure 1: Estimated monthly cost for each Google Cloud Engine VM.
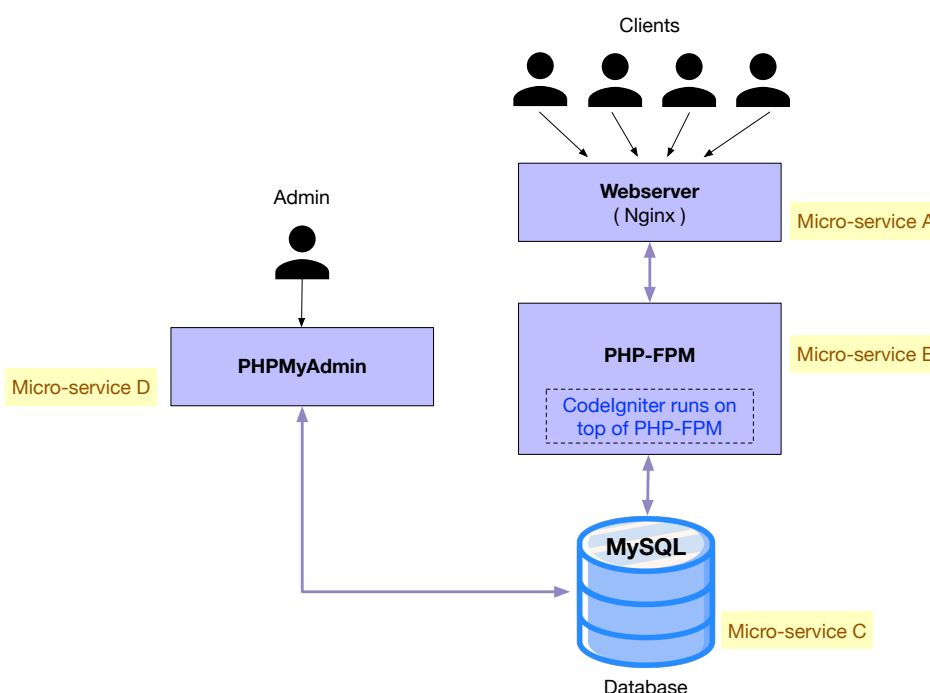
3.Architecture Design
- The micro-service framework is depicted below:

Figure 2: Micro-service architecture.