**44ASSESSMENT AND INTERNAL VERIFICATION FRONT SHEET (Individual Criteria)**

**(Note: This version is to be used for an assignment brief issued to students via Classter)**

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| Course  Title | | B.Sc. (Hons.) Software Development | | | Lecturer Name & Surname | Ryan AttardDavid Deguara | | |
| Unit Number & Title | | | [ITSFT-606-1620-Programming for the Cloud](https://moodle.mcast.edu.mt/course/view.php?id=506) | | | | | |
| Assignment Number, Title / Type | | | Principles of Programming for the cloud | | | | | |
| Date Set | | | 6/5/2025 | Deadline Date | 6/5/2025 | | | |
| Student Name | Lee Xerri | | | ID Number | 446203L | | Class / Group | SWD-6.3A |

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| Assessment Criteria | | Maximum Mark |
| **KU1.1** | Identify the benefits gained from using cloud services in a given scenario | 5 |
| **KU1.2** | Differentiate among a number of cloud services that could offer a solution to the same problem | 5 |
| **SE1.3** | Compare and Recommend other solutions (e.g. other cloud service providers) to the one you chose and justify your arguments | 10 |
| **KU2.2** | Defend your decision in choosing a specific data storage solution | 5 |
| **aa 3.2** | Inspect and examine how CDN can help with your application | 7 |
| **Aa3.3** | Use Cache Services or other related technologies to make more efficient use of the resources available | 7 |
| **KU 4.5** | Indicate what can be done in case of a data disaster | 5 |
| Total Mark |  | 44 |

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| **Notes to Students:** |
| * This assignment brief has been approved and released by the Internal Verifier through Classter. * Assessment marks and feedback by the lecturer will be available online via Classter (<Http://mcast.classter.com>) following release by the Internal Verifier * Students submitting their assignment on Moodle/Turnitin will be requested to confirm online the following statements:   **Student’s declaration prior to handing-in of assignment**   * I certify that the work submitted for this assignment is my own and that I have read and understood the respective Plagiarism Policy   **Student’s declaration on assessment special arrangements**   * I certify that adequate support was given to me during the assignment through the Institute and/or the Inclusive Education Unit. * I declare that I refused the special support offered by the Institute. |

**Assignment Guidelines**

Read the following instructions carefully before you start the assignment. If you do not understand any of them, ask your invigilator.

* This is an open-book TCA and students may use their own laptops. Ai Tools and PPTs may be used BUT NOT social media websites like Facebook, etc. Be careful about chatbots – do not rely heavily on them as the code provided will always require some amendment. Code which does not work or where you do not prove that it works won’t be given marks.
* Copying from other students is **Strictly Prohibited** and will be penalised according to disciplinary procedures.
* Duration: 2.5 hours, Duration for IEU: 3.25 hours
* Submission of this assignment is done by answering the questions here and re-upload the document again on vle.
* Most of the answers require you to take screenshots. Please do so and check your work also trying to maintain the clarity of screenshots to show evidence of the sought answer.

***KU1.1*** - Identify the benefits gained from using cloud services in a given scenario (5 minutes)

One of the benefits in using Cloud Buckets over any other file storage is that of being able to assign different permissions on different objects within the same bucket.

Your task is to use the cloud portal to give this email address *TCADemo2025@gmail.com* permission to download any file you place in a created bucket on your profile.

Paste the url (to a file) here together with a screenshot of the Access popup [2] where you specified the Reader access.

<https://storage.cloud.google.com/tcatask1/Kaufman.png>

A screenshot of a computer

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If the file is downloaded with the valid email address indicated above, then you get 3 marks. However an unauthorized email will be tried and if the file downloads as well you don’t get the 3 marks

***KU1.2*** - Differentiate among a number of cloud services that could offer a solution to the same problem (10 minutes)

You are tasked with comparing two different database solutions for cost efficiency based on the provided requirements. These requirements were calculated to come with a very similar resourceful database. Your job is to calculate and determine which option offers the best cost efficiency using the Google Cloud Pricing Calculator.

**Scenario**:  
You are building a system with **500,000 active users**. Each user performs an average of:

* **20 reads/day**
* **1 write/day**
* **0.1 delete/day**

Your task is to compare the price of Firestore with the following alternative solution:

**Cloud SQL (SQL Server) Cost Calculation**:

* + **CPU**: 2 vCPUs
  + **Memory**: 8 GB RAM
  + **Storage**: 500 GB SSD
  + **Backup Storage**: 500 GB

So which solution would you recommend in terms of costs [1]?

[1]Firestore

Justify your answer with screenshots of prices and workings [4]? Any other inputs must be same as much as possible (e.g. Region: South-Caroline (Us-East), Location, Storage and always go for the minimum requirements unless mentioned otherwise)

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KU2.2 - Defend your decision in choosing a specific data storage solution (10 minutes)

You are working for a **video streaming startup** that allows users to **upload, process, and stream** video content globally. The requirements are:

* Users upload videos from various locations worldwide.
* Videos must be stored in a cost-effective manner while remaining accessible for streaming.
* Frequently accessed videos should load quickly for viewers.
* Old videos (not accessed in the last year) should be stored in a cheaper storage class which will rarely be accessed, so do not calculate any traffic or any operations here.
* Total data transfer per month: 50TB egress to users mainly in Europe.
* Monthly API requests: 3 million reads, 1 million writes.
* Total storage required: 100TB.
* Storage Location: The company operates primarily in Europe, and data should be stored in the europe-west3 (Frankfurt) region.
* Storage Policy:
  + 40TB of frequently accessed videos should remain in Standard Storage.
  + 60TB of older videos should move to cheaper storage and assume they will remain there unaccessed.

Your task is to provide the cost estimates. You need to provide two estimates since files will be divided into different storage classes. Provide answers with screenshots here:

Screenshot 1 showing the estimate price for the 40TB [2.5]

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Screenshot 2 showing the estimate price for the 60TB [2.5]

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***KU4.5*** - Indicate what can be done in case of a data disaster [10 minutes]

Create a Cloud Storage Bucket in the us-central1 region to hold user data backups. Call it *YourName-Original-Bucket-1*

Create a Cloud Storage Bucket in the europe-west3 (Frankfurt) region to hold user data backups. Call it *YourName-Backup-Bucket-2*

Enable Cross-Region Replication to replicate the data from us-central1 to europe-west1.

Upload sample data files (e.g., JSON or CSV files) into the bucket.

Deliverable: Take a screenshot showing the *YourName-Original-Bucket-1* settings clearly showing that the **cross-bucket replication** is on. Paste here. [2.5]

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Deliverable 2: Take a screenshot of the metadata of the replicated file in *YourName-Backup-Bucket-2* and paste here. [2.5]

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AA3.3 - Use Cache Services or other related technologies to make more efficient use of the resources available [30 minutes]

1. Create a pubsub topic call it *yourname-topic-monitor*.
2. Create a pubsub triggered cloud run function which is triggered upon publishing something into the topic above.
3. Develop any necessary code inside it and apply it in such a way that if the sample data below is published inside the topic, you write some line containing the data in the logs as per screenshot below.

Sample data:

*{ "id": 1, "name": "ryan", "surname": "attard", "mobile": 79797979 }*

Screenshot: ****

**Deliverables:**

1. Change the sample data to show your name and surname
2. Paste a screenshot of the Function or copy-paste code – if it will have just a minor error you will still get the marks, however if the function’s code would not yield a correct result then you will also lose the marks for (d) [3]. Tip: just the HandleAsync method  
   A screenshot of a computer program

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3. A screenshot of the file containing package references e.g.csproj file or copy-paste code showing correct updated code [1]

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1. A screenshot of the Logs as above proving that it worked – to get these marks function must work and fully correct[3]

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***AA3.2 -*** Inspect and examine how CDN can help with your application [20 minutes]

Part 1:

Enable CDN on the bucket you should have created in KU1.1, while also creating a static ip address and a load balancer to help in retrieving the resource quicker. When you are ready paste the url here, which should include a static ip address and when clicked, it should show the original image file (<yourname>.jpg or png)you uploaded in your bucket

* url (to the image which have a static ip address – and it should open showing the image)[3]:

http://34.111.2.171/leexerri.png

Note: Once you create everything, it all takes a few seconds before actually starts working, so be patient.

Part 2:

Paste a screenshot of the Logs (from Logs Explorer) related to loading the *yourname.jpg* from the CDN clearly proving that loading from CDN takes much less time . The image filename must be your name! Prove that CDN is working [4]

Cdn:  
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Query:

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SE1.3 - Compare and Recommend other solutions (e.g. other cloud service providers) to the one you chose and justify your arguments [30 minutes]

Here’s a json file with a list of appointments <https://vle.mcast.edu.mt/mod/resource/view.php?id=60092>

1. Download it and implement a small application where you upload this list in Firestore. Paste the code here: (Code should not be larger than 15 lines of code -when pasting screenshot or code remove empty lines or lines which don’t contribute in any way to the goal of the task) [4]

using FirebaseAdmin;

using Google.Apis.Auth.OAuth2;

using Google.Cloud.Firestore;

using Newtonsoft.Json;

Environment.SetEnvironmentVariable("GOOGLE\_APPLICATION\_CREDENTIALS", @"E:\Repos\IT\_SWD\_63A\_PFC\_2025\PFTC\_THA\Lee\_Xerri\_PFC\_TCA\Lee\_Xerri\_PFC\_TCA\service-account.json");

FirestoreDb db = FirestoreDb.Create("pftcclass");

var json = File.ReadAllText("E:\\Repos\\IT\_SWD\_63A\_PFC\_2025\\PFTC\_THA\\Lee\_Xerri\_PFC\_TCA\\Lee\_Xerri\_PFC\_TCA\\appointments.json");

var data = JsonConvert.DeserializeObject<List<Dictionary<string, object>>>(json);

foreach (var item in data)

await db.Collection("appointments").AddAsync(item);

1. Paste a screenshot showing the imported appointments in Firestore (screenshot must include collection and documents)? [3]

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1. And then use the query builder to query the amount of “Pending” appointments. Specify number of pending appointments with a screenshot together with query inputs [3]

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