

ASSESSMENT COVER SHEET

Unit Code and Title:	6G6Z0037 Cloud Computing
Assessment Set By:	Dr Mohammed Kaleem
Assessment ID:	1CWK100
Assessment Weighting:	100%
Assessment Title:	Provisioning and Configuring Cloud Services for Application Deployment
Type:	Individual
Hand-In Deadline:	See Moodle
Hand-In Format and Mechanism:	PDF/DOCX document with screenshot evidence of cloud deployment uploaded to Moodle. OneDrive link to code file shared in report/evidence document.

Learning outcomes being assessed:

- LO1** Contrast different virtualization processes, platforms and architectures for the creation of scalable and resilient systems.
- LO2** Create software capable of running on commercial cloud computing platforms, using the platform's required APIs and tools.
- LO3** Use application or system virtualisation technologies to run servers in a cloud-based environment.

Note: it is your responsibility to make sure that your work is complete and available for marking by the deadline. Make sure that you have followed the submission instructions carefully, and your work is submitted in the correct format, using the correct hand-in mechanism (e.g., Moodle upload). If submitting via Moodle, you are advised to check your work after upload, to make sure it has uploaded properly. If submitting via OneDrive, ensure that your tutors have access to the work. Do not alter your work after the deadline. You should make at least one full backup copy of your work.

Penalties for late submission

The timeliness of submissions is strictly monitored and enforced.

All coursework has a late submission window of 7 calendar days, but any work submitted within the late window will be capped at 40%, unless you have an agreed extension. Work submitted after the 7-day late window will be capped at zero unless you have an agreed extension. See 'Assessment Mitigation' below for further information on extensions.

Please note that individual tutors are unable to grant any extensions to assessments.

Assessment Mitigation

If there is a valid reason why you are unable to submit your assessment by the deadline you may apply for Assessment Mitigation. There are two types of mitigation you can apply for via the unit area on Moodle (in

the 'Assessments' block on the right-hand side of the page):

- **Non-evidenced extension:** does **not** require you to submit evidence. It allows you to add a **short** extension to a deadline. This is not available for event-based assessments such as in-class tests, presentations, interviews, etc. You can apply for this extension during the assessment weeks, and the request must be made **before** the submission deadline. For this assessment, the self-certification extension is 2 days.
- **Evidenced extension:** requires you to provide independent evidence of a situation which has impacted you. Allows you to apply for a longer extension and is available for event-based assessment such as in-class test, presentations, interviews, etc. For event-based assessments, the normal outcome is that the assessment will be deferred to the summer reassessment period.

Further information about Assessment Mitigation is available on the dedicated [Assessments page](#).

Plagiarism

Plagiarism is the unacknowledged representation of another person's work, or use of their ideas, as one's own. Manchester Metropolitan University takes care to detect plagiarism, employs plagiarism detection software, and imposes severe penalties, as outlined in the [Student Code of Conduct](#) and [Academic Misconduct Policy](#). Poor referencing or submitting the wrong assignment may still be treated as plagiarism. If in doubt, seek advice from your tutor.

As part of a plagiarism check, you may be asked to attend a meeting with the Unit Leader, or another member of the unit delivery team, where you will be asked to explain your work (e.g. explain the code in a programming assignment). If you are called to one of these meetings, it is very important that you attend.

Use of generative AI



The use of generative AI is permitted in this assessment, but please make sure you follow these specific instructions:

As directed on moodle, you can use AI to check your own code, to help solve bugs or errors, to explain short sections of code you may have found within the course notes or elsewhere and to give suggestions for design.

You may not use it to generate large sections of code and pass that work off as your own. You must be able to fully explain ALL your solution and have a complete and detailed understanding of the solution you submit (see Plagiarism above).

For any other uses of generative AI, you should also follow the instructions in the 'Are you allowed to use AI in assessments?' section of the [AI Literacy Rise Study Pack](#) or speak to your tutor. All submitted work must be your own original content.

If you are unable to upload your work to Moodle

If you have problems submitting your work through Moodle, you can send your work to the Assessment Management Team using the [Contingency Submission Form](#). Assessment Management will then forward your work to the appropriate person for marking. If you use this submission method, your work must be sent **before the published deadline**, or it will be logged as a late submission. Alternatively, you can save your work into a single zip folder then upload the zip folder to your university OneDrive and submit a Word

document to Moodle which includes a link to the folder. **It is your responsibility to make sure you share the OneDrive folder with the Unit Leader, or it will not be possible to mark your work.**

Assessment Regulations

For further information see the [Assessments and Results information pages](#)

Assignment Task Overview

You are tasked with the deployment of a database driven web application to the cloud. You must select appropriate cloud services from any of the popular cloud service providers, then setup and configure a virtual machine instance and cloud database to deploy the provided web application to the cloud. As well as this there you will write a cloud function that

All work attempted/completed should be evidenced through screenshots in a report that you will write detailing the cloud deployment process as well as demonstrating your understanding with regards to the key concepts involved in cloud computing. *More detailed instructions can be found below.*

Assignment Details and Instructions

Deploy Java Web Application to the Cloud (20%)

You will be provided with a WAR file of a simple java web application. The web app is a database of contacts (names and email addresses). Once deployed (and properly connected to the database) it allows user to browse the database of contacts. If the user is logged in with the admin username and password (i.e. kaleem, pa55word) they can also perform CRUD operations on the database (see figure 1)

You can find the WAR file as well as a SQL file to generate the database along with some dummy data on Moodle. You are free to select the cloud service provider of your choice to complete this part of the assignment. All the major cloud platforms (AWS, Google and Microsoft Azure) have services for provisioning and maintaining virtual machine (VM) instances.

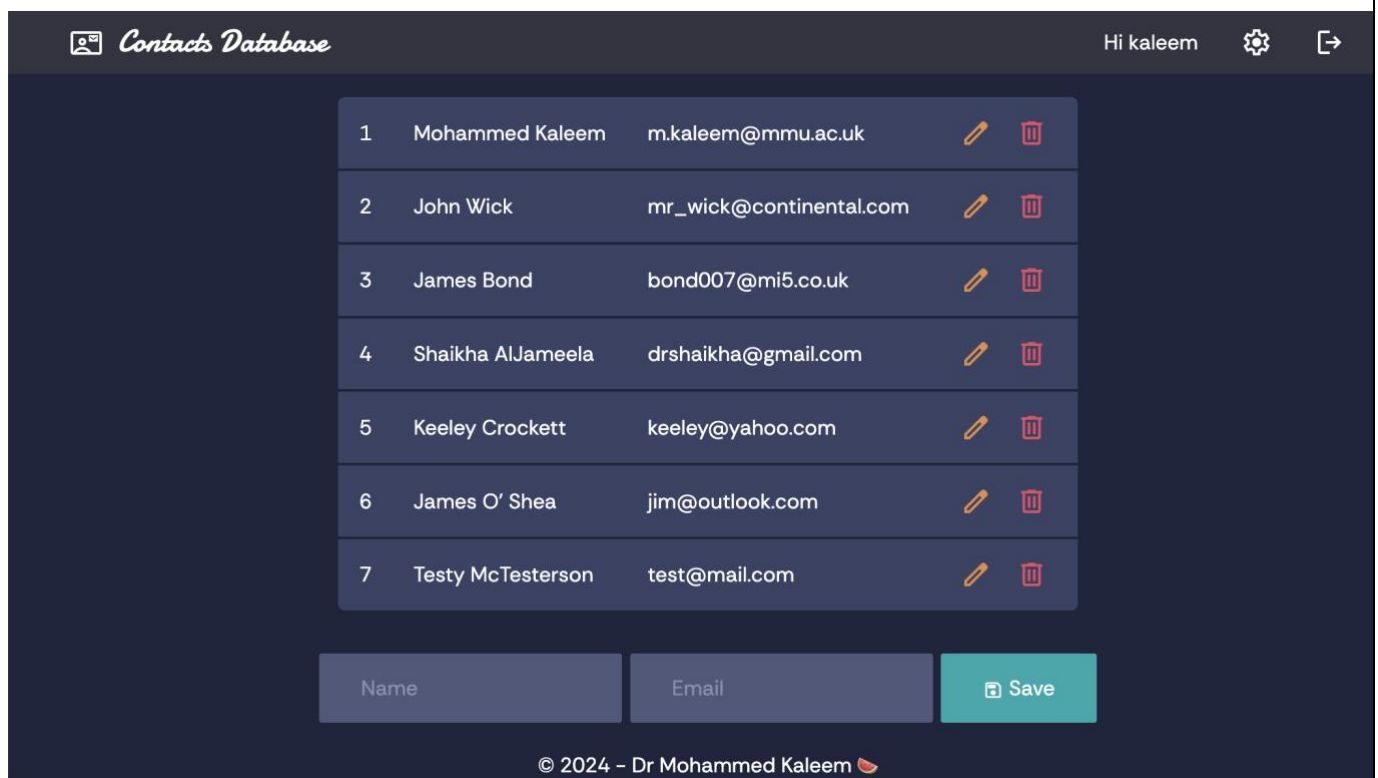


Figure 1 – Contacts Web Application (logged in)

The specification for the **VM can stay at the very basic level** (one CPU, minimum amount of RAM and storage) as this web application is not intended to receive heavy user traffic (it is just for the purpose of demonstrating your cloud computing skills).

You will need to configure the VM to be able to host java web applications, therefore your server instance will require the following specifications:

- Ubuntu 24.04 LTS (operating system)
- Java Development Kit (JDK)
- Tomcat 9 (the WAR file is developed for tomcat 9 it will not work on tomcat 10)
- MySQL 8 *if you are planning to host the database locally on the same VM instance*

Configuring the Database Settings:

Once you have deployed the web application through tomcat and deployed a database you can configure the database connection information and database user credentials at the following url: `[domain:port]/contacts-db-app/dbconfig` (see Figure 2 below).

From this page you can select the **database type**, enter the **database endpoint** (if you are using a cloud service this will be the IP of the database server or the automatically generated endpoint URL depending on the cloud service provider), enter the **database name**, the **username** and **password** and **save** the new settings. *If you are using a **Google Cloud SQL** database, then you will also have to enter the instance name which can be found on the instance overview page.*

Remember to delete all cloud resources once you have gathered screenshot evidence for the report, you do NOT need to keep the cloud VM and database running for the purpose of marking.

The screenshot shows a web application titled 'Contacts Database' with a 'Database Configuration' page. The page has a dark blue background. At the top, there's a header with the application name and a settings icon. Below the header, there's a section for selecting the database type: 'localhost' (selected), 'AWS RDS', 'Google Cloud SQL', and 'Azure'. To the right, there's a box titled 'Currently stored DB settings:' showing the current configuration: DB Type: localhost, IP: localhost, DB Name: contact, DB Instance Name: N/A, DB Username: root, and DB Password: (empty). Below the type selection, there are four input fields: 'Database IP/End point' (with placeholder 'Eg. 123.45.567.89'), 'Database Name' (with placeholder 'Eg. MyDB'), 'Database Username' (with placeholder 'Eg. root'), and 'Database Password' (with placeholder 'Eg. StrongPa55word'). At the bottom left, there's a green 'Save' button. At the bottom right, there's a copyright notice: '© 2024 - Dr Mohammed Kaleem'.

Figure 2 - Database Configuration/Settings Page (localhost example)

Database (10%)

The data for the contacts web application is stored in a MySQL database. You have a choice of either installing a MySQL database locally on the same VM instance or for the higher marks, you can utilise a cloud database service such as amazon RDS, Google Cloud SQL or Azure Database for MySQL.

Cloud Function (Serverless) (20%)

You will develop a string processing and transformation cloud function in **Java**. You are free to develop the function on any cloud platform that support java functions (e.g., AWS, GCP). The function should accept **POST** requests and allow users to send a string contained in JSON object in the body of the request.

The cloud function should then process the input string, perform transformations, and returns the modified strings and analysis in JSON and XML format. The processing and transformations required are as follows:

- Number of characters
- Number of words
- String reversed
- Words reversed
- Uppercase
- Lowercase
- Crazy case
- Camel case
- Kebab case
- Snake case
- String with vowels all removed
- Count the occurrence of every character in the String (returned as JSON object/array)

Test string: **The quick brown fox jumped over the lazy dog**

Provide screenshot evidence of the deployed cloud function and the results of the function tested using the string above in Postman. Upload the code of the cloud function to OneDrive and provide a link in your evidence document/report.

Report (50%)

You are required to produce a short report (1500-2000 words). The report should demonstrate your understanding of cloud computing. In addition to this the report should detail the tools and technologies you used to deploy the contacts web application. ***Use relevant references/case studies wherever possible.***

The general structure of the report should be as follows (words counts are only a guide):

Background (500-800):

- What is cloud computing?
- Comparison of Cloud Service Models: SaaS vs. PaaS vs. IaaS
- Pros and cons of Cloud Computing?

- Critical comparison of the different cloud providers that you have interacted with.

Analysing Security Challenges in Cloud Computing: Best Practices and Mitigations (500 words)

- What are the pertinent security issues related to cloud computing?
- How can these issues be mitigated?

Cloud Infrastructure Vs Physical Infrastructure (500 words)

Consider the following scenario: There is a start-up company hoping to launch a new social media platform. This new social media website/app is **expected** to receive a very high volume of traffic and have a large and ever-growing user base that generates more and more data (images, short videos etc.) that needs to be persisted. Initially the company has limited capital and are still in the early phases of developing a prototype.

The company must decide between two options:

1. Buy their own physical server infrastructure for hosting and data storage.
2. Utilise Cloud Services for hosting and data storage.

Acting as the chief technical officer (CTO) for the company, what advice would you give to the project stakeholders on this matter? Which option would you recommend? Provide justifications for your answers.

Your implementation (500 words)

- In depth description of the tools and technologies you utilised to deploy the web application.
- Which cloud services you utilised and why.
- Detailed screenshots of the deployment process (Cloud VM instance settings, database tables/implementation, Contacts app working in browser, database configuration page etc.).

Discuss (200-300):

If you were not given the web application you deployed (i.e., the Contacts Web App), what alternative cloud services could you have used to develop and deploy a similar application?

Assignment Marking Criteria

Component	0 – 49%	50 – 59%	60 – 69%	70 – 84%	85-100%
Web Application Deployment (20 marks)	No meaningful attempt at task, or some attempt made but not functioning correctly.	Web App has been deployed through AWS Elastic Beanstalk.	Cloud VM instance fully implemented (i.e. with tomcat and all other requirements) with all required dependencies to deploy java web apps. CONTACTS web app WAR has been deployed through tomcat and dbconfig page is loading correctly.	All previous criteria met, and the database has been configured meaning the app is fully functional and the functionality has been clearly evidenced in the report.	
Database (10 Marks)	No meaningful attempt at task.	MySQL database instance has been attempted but is not functioning correctly.	MySQL instance is fully functional locally on same VM instance as the web app. The CONTACTS database and tables have been created.	A cloud database solution has been utilised to host the database. The Contacts database and tables have been created and clearly evidenced in the report.	
Cloud Function (20 Marks)	No real attempt made at implementing the cloud function.	Cloud function attempted, but no progress past the starter/template code.	Good attempt made on the cloud function, some of the specified functionality has been implemented.	Cloud function has been fully implemented, functions as specified and thoroughly evidenced. Function has been coded using best practice and responses to HTTP requests are returned in an appropriate data format.	

<p>Report (50 Marks)</p>	<p>No real attempt made at the report, just listing what was done along with screenshots.</p>	<p>Some background research with little to no referencing. A more detailed discussion of what was done.</p>	<p>Good report which covers the topics well, along with a good walkthrough of the cloud deployment process.</p>	<p>Appropriate references from reputable sources used throughout and suitable justifications provided for all answers and implementation choices made. As well as an in-depth explanation of the implementation and alternatives cloud services that can be utilised to achieve similar functionality to the Contacts Web app.</p>	<p>The report contains appropriate references and draws from real world case studies to justify/support the points made.</p>
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If you have any questions about this assignment, please contact Dr Mohammed Kaleem (m.kaleem@mmu.ac.uk)