

CSC3065 Cloud Computing

Assessment 1: Containerisation vs Traditional Deployment Critical Analysis

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Weighting: 40%
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<https://www.qub.ac.uk/directorates/AcademicStudentAffairs/AcademicAffairs/ExaminationandAssessment/MarkSchemesandClassifications/>

If you have any questions about the assignment, please see the module organiser Esha Barlaskar in the first instance or use any of the support options listed in this document.

1. Assessment Details

For this assessment you will be required to produce a technical report with a detailed comparison between two applications (which are provided), using graphs and visualisations to highlight the differences in resource utilisation, scalability, performance, cost, and futureproofing.

In this context a technical report is:

- a textual piece of work containing technical details and facts about the topic in question
- suitable for reading by someone with knowledge of computer science and basic knowledge of containerisation, regardless of deployment concept familiarity.

For example, you may consider this report to be the result of a Chief Technology Officer or IT Manager asking you to carry out "A Comparative Study on Two Dockerised Applications" and report back:

- **Application 1:** PHP Prime Number Application (Web Service), you can access this application here:
https://repository.hal.davecutting.uk/root/php_prime_number_application/
- **Application 2:** Python Fibonacci Application (not a Web Service), you can access this application here:
https://repository.hal.davecutting.uk/root/python_fibonacci_application

Both the applications are dockerised.

The word limit for this report is 2,000 words though this should be seen as a limit only and generally reports of between 1,500 and 2,000 words should be acceptable. It's likely that a very short report won't be able to cover the topic to sufficient detail to score highly but won't be penalised specifically for length. However, including graphs, diagrams is an important part of the analysis and will be penalised if not provided. Therefore, the inclusion of empirical data and visual representations will help you to score highly.

Although due to the nature of this assignment there will be variations across different reports, the following key areas should be included in your report (some example questions are provided as guidance and they're just there as possible examples of minimum questions, you could include more questions if you wish to):

1. **Application Complexity and Resource Demand** – specifically for the provided applications in question. For example:
 - Could you provide resource utilisation graphs comparing CPU and memory usage (during application execution) between the two applications?
 - Does the category of application (Application 1 being a web service application and Application 2 being a non-webservice application) contribute to the difference in resource utilisation and computational complexity between the two applications? If it does, please highlight the reasons specific to the applications in question.

- Generate graphs depicting the relationship between input parameters (e.g., prime number range or Fibonacci sequence length) and resource usage.
 - Make suggestions on how the resource utilisation can be optimised for the two applications using modern technologies/services.
2. **Scalability and Elasticity** – specifically for the two applications in question, provide a comprehensive comparative analysis, which may include graphs and empirical data, to address the following:
- What strategies and resource allocation policies would you consider for dynamic workload management for both the applications. Analyse how would Application 1 adapt to varying workloads compared to Application 2? Are there specific strengths or weaknesses in their abilities to handle fluctuations in workloads?
 - Could you create and present graphical representations that visually depict the scalability of both applications? These graphs should serve as a means to showcase the respective efficiencies of Application 1 and Application 2 in handling increased workloads, particularly during periods of high demand or extensive workloads.
3. **Containerisation Strategies vs. Traditional Deployment** – specifically for the two applications provide a comprehensive analysis on the following:
- When comparing containerisation strategies to traditional deployment, what are the notable architectural and performance differences? How do containerisation platforms address advanced deployment needs compared to non-containerised environments?
 - Utilise architecture diagrams to visually represent the distinctions between containerised and non-containerised deployments of the two applications in question. For example, use diagrams illustrate the resource isolation within containerised deployments, emphasising how containers separate processes and dependencies, and also visualise how resources are shared among containers in the containerised deployment, contrasting it with how resources are managed in the non-containerised setup.
4. **Isolation and Compatibility Challenges in Containers** – specifically for the two applications provide a comprehensive analysis on the following:
- What specific isolation benefits and compatibility challenges does containerisation offer when contrasted with non-containerised deployments in multi-tenant host environments? How do containers address conflicts and dependencies?
 - Use diagrams to represent multi-cloud or hybrid cloud deployments and demonstrate redundancy strategies.

Please make sure you include these four sections in your report clearly marked (this is a technical report not an essay!). Failure to clearly structure your report may result in problems marking (leading to a loss of marks).

For a more detailed explanation of how each report will be marked please see the Assessment Criteria section of this document.

You will also need to prepare a brief (2 minute absolute max) video overview of the topic (as if you'd been asked to give a brief presentation to the board on the back of your report).

Format

Report can be generated in any word processor (such as Word or LaTeX) but must be submitted as a .pdf file. The top of the file should clearly state (a) the topic, (b) your student number, (c) your name, and (d) the word count of the document.

Font size should be around 12 point.

Acknowledgement

In the report you need to provide some information as appropriate in the Appendix on how you came to certain answers or found information. This would include your use of AI tools but also other third-party sources of information all of which are available to be used and acknowledged in your work. Some examples would include answering questions like “what enhancements and modifications did you implement in your analysis report beyond the suggestions and guidance provided by ChatGPT/ any other third party sources? Could you share specific examples for each of the tasks of how your creative input and expertise were integrated to improve the overall analysis?”

References

References are expected for all the facts and elements covered in the report. You can choose a referencing format that you like (and use this consistently) but Author/Name (Harvard-style) is strongly recommended.

When citing sources, you must be clear to differentiate reliable source from opinion or fact. You should also, ideally, aim to have a mixture of sources both peer-reviewed academic and public/corporate information in your report.

Some examples:

Saying: “X has the option to turn red (X Creator, 2020)” is fine, here we have a fact supported by a verifiable source (the manual or documentation for X).

Saying: “X is the best thing since the wheel (X Creator, 2020)” is not fine, here we have an opinion from a questionable source. “The creator of X says it’s the best thing since the wheel (X Creator, 2020)” would be fine, as would referencing an independent academic study: “In a systematic analysis of things-versus-wheels by the University of ThingWheel it was identified that X was the best thing since the wheel (McWheelface et al., 2019)”.

This is a semantic difference but an important one.

Another example perhaps Bobby Scienceman writes on his blog that the Earth is flat. We couldn't cite that and say "the Earth is flat" but we could cite it as evidence that "some people say the Earth is flat".

Presentation

Should be a recording in any suitable video format. This can just be a video recording to a phone, a screen recording of powerpoint with commentary, or whatever you feel is the most appropriate method.

2. Assessment Criteria

The following are the criteria against which your submission will be marked and their conceptual marking equivalents.

The assessment of the quality of the individual elements will be made, where applicable, in combination of both the written report and video presentation.

Marking Criteria

Criteria	Outstanding 85% +	Excellent 70%-85%	Very Good 60%-70%	Good 50%-60%	Acceptable 40%-50%	Nearly Acceptable 30%-40%	Clearly Unacceptable 0%-30%
Application Complexity and Resource Demand Analysis 25%	High quality analysis with a detailed discussion on the comparative study including a very good number of graphs showcasing the comparison. All the comparative points are valid, relevant, and well explored.	Good quality analysis with a detailed discussion on the comparative study including a very good number of graphs showcasing the comparison. All the comparative points are valid, relevant, and well explored.	Good quality analysis with a good discussion on the comparative study including a good number of graphs showcasing the comparison. However, more discussion and graphs could have been added. All the comparative points are valid, and relevant, but could have been explored more.	Good quality analysis with a good discussion on the comparative study including a few graphs highlighting the comparison. However, more discussion and graphs could have been added. Most of the comparative points are valid, and relevant, but could have been explored more.	The analysis covers the comparative study with some gaps not including any graphs to showcase the comparison. Most of the comparative points are valid, and relevant, but could have been explored more.	The analysis is incomplete, it doesn't cover much on the comparison. The comparative points are irrelevant or significantly lacking.	Little to no relevance to the topic, fails to identify and cover key comparative points.

Scalability and Elasticity 15%	Excellent understanding shown regarding the dynamic workload management and scalability. Excellent comparison made on scalability using graphs.	Strong understanding shown regarding the dynamic workload management and scalability. A good comparison made on scalability using graphs.	Very good understanding shown regarding the dynamic workload management and scalability. A very good comparison made on scalability using graphs.	Comprehensive understanding shown regarding the dynamic workload management and scalability. A good comparison made on scalability using graphs.	A weak understanding shown regarding the dynamic workload management and scalability. Very weak comparison made on scalability.	Dynamic workload management and scalability are discussed, but not so relevant to the applications in question.	Dynamic workload management and scalability are discussed, but there is no relevance to the applications in question.
Containerisation Strategies vs. Traditional Deployment 10%	Excellent understanding shown regarding the containerisation and traditional deployments specific to the	Strong understanding shown regarding the containerisation and traditional deployments specific to the	Very good understanding shown regarding the containerisation and traditional deployments specific to the	Comprehensive understanding shown regarding the containerisation and traditional deployments. Includes	A weak understanding shown regarding the containerisation and traditional deployments. Includes	There are a lot of gaps in the discussion around containerisation and traditional deployments. There is no	Containerisation and traditional deployments are discussed, but they are not relevant. There is no

	two applications. Includes excellent architecture diagram, and performance comparison graphs.	two applications. Includes a very good architecture diagram, and performance comparison graphs.	two applications. Includes a good architecture diagram.	decent architecture diagram.	architecture diagram, but they are not very relevant to the topic.	architecture diagram.	architecture diagram.
Isolation and Compatibility Challenges in Containers 10%	Excellent identification and analysis of isolation benefits and compatibility challenges specific to the two applications. An excellent diagram included to represent multi-cloud or hybrid cloud deployments.	Very good identification and analysis of isolation benefits and compatibility challenges specific to the two applications. A very good diagram included to represent multi-cloud or hybrid cloud deployments.	Very good identification and analysis of isolation benefits and compatibility challenges specific to the two applications. However, there are scopes to add more to the discussions. A very good diagram included to	Good identification and analysis of isolation benefits and compatibility challenges. However, there are scopes to add more to the discussions. A good diagram included to represent multi-cloud or hybrid cloud deployments.	Some identification and analysis of isolation benefits and compatibility challenges. A decent diagram included to represent multi-cloud or hybrid cloud deployments.	There are gaps in identification and analysis of isolation benefits and compatibility challenges. No diagram included.	There is no relevant identification and analysis of isolation benefits and compatibility challenges. No diagram included.

			represent multi-cloud or hybrid cloud deployments.				
Overall Quality 10%	Excellent report very well written throughout with clear logical structure suitable for the topic.	Very good report well written with very good structure.	Good report generally well structured but with some limitations.	Report well structured and written for the most part but with notable limitations.	Report structure and writing makes sense but with areas for significant improvement.	Report structure sometimes illogical and report not well written in parts.	Illogical structure and/or large sections of the report very poorly written or hard to follow.
Range, Suitability, Use of References and Acknowledgement 20%	Excellent range of appropriate references from different suitable sources. Referencing used and styled consistently throughout.	Very good range of references showing good reading around the topic. Referencing used consistently throughout.	Good range of references used from multiple suitable sources. Some minor issues with referencing used and style.	References used in most sections to an acceptable level but with room for improvement in range and/or coverage and/or style.	References used but significant room for improvement in range and/or coverage and/or style.	References lacking in coverage or depth. Some inappropriate referencing and sources used.	A lack of references or inappropriate references used throughout. Acknowledgement is not provided or

	Acknowledgement is excellent with detailed examples covering all aspects.	Acknowledgement is very good with thorough examples.	Acknowledgement is good with some good examples.	Acknowledgement is acceptable but lacks a good number of examples.	Acknowledgement is provided but with a few examples but not detailed examples.	Acknowledgement is provided with a very few examples but not explained anything.	just a line saying what is being used with no details or examples at all.
Clarity of Message and Content Quality of Video Presentation 10%	Excellent presentation, well thought out and presented with all key messages covered.	Very good presentation with strong coverage of key issues but areas which could be improved.	Good presentation covering most items to some depth but suffering from some issues with structure and/or content.	Good presentation covering most items to some depth but suffering from issues in both structure and content.	Fair presentation but with some obvious gaps in coverage and/or presentational issues.	A presentation with significant clear weaknesses for example major topics absent or very unclear descriptions.	A poor presentation which is very hard to follow and/or does not cover issues to any suitable depth.

3. Feedback

Feedback in the form of marks will be provided as soon as practicable after submission with the expectation that marking will be complete (and marks provided) within two working weeks.

Individual feedback will take the form of a numeric score against each of the assessment criteria (there may be brief comments for these criteria if appropriate), a total made from these scores weighted by section, and an overall textual comment on the totality of the report.

Generalised feedback will be provided to the class as a whole including overall trends and areas of particular concern.

Anyone wishing to discuss their marks in more detail are welcome to do so using any of the support arrangements outlined in this document.

4. Submission

Submission instructions will be provided on Canvas.

Submission of the report will be a single file in PDF (.pdf) format.

Submission of the video will be a single file in a suitable video format (please do not upload massive video files, use sensible resolution!).

5. Support Available

A number of support avenues are available throughout this assignment. It's suggested you try them in this order, but this is your choice and you should feel free to avail yourself of one or all.

Canvas Discussion – you can ask any questions (in general please, don't include your work as everyone can see!) on the Canvas Discussion Forum. This is very useful as everyone can see (the question and the answer!) and its possible students can help each other out.

Module “Drop-in” – CSC3065 offers a virtual drop-in session every Monday 12-2pm. Our module teaching members (who will be involved in the marking) will be guaranteed to be available and the module lecturer will be most often as well. Just say “hello” on your teams drop-in channel.

Office Hours – Esha Barlaskar has office hours available every week. Appointments can be booked via the Office Hours link on Canvas.

Open Door/Other Appointments – Esha Barlaskar operates an “open door” policy when she is available. She is happy to make ad-hoc meetings for individuals or groups as needed outside of the office hours above. Drop her an email or message via teams.