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|  | **SCHOOL OF ENGINEERING, TECHNOLOGY & DESIGN**  **ASSIGNMENT GUIDELINES** | |
| **TITLE OF MODULE**:  MCOMD3HPC – High Performance Computing | | **MODULE COMPONENT:**  **50% of Module** |
| **MODULE TEAM**: Dr Vijay Sahota | | **ASSIGNMENT CONTACT**: Dr Vijay Sahota  [Vijay.Sahota@canterbury.ac.uk](mailto:Vijay.Sahota@canterbury.ac.uk) |
| **ASSIGNMENT DEADLINE**:  TBC | | **EXPECTED FEEDBACK DATE:**  TBA  **Location of Feedback:** VIA TURNITIN ON BLACKBOARD |
| **ASSESSMENT TYPE** | | Report |
| **Where to Submit:** BLACKBOARD TURNITIN SUBMISSION TOOL  If you experience any problems with this system then please contact the Computing Administration Team ([computing@canterbury.ac.uk](mailto:computing@canterbury.ac.uk))  **What to Submit:**  **A 2000 (Max) word report of high professional standard & Source code+ data.** | | |
| **TITLE OF ASSIGNMENT**: HPC, HPC, HPC? | | |

**ASSIGNMENT INSTRUCTIONS**

This is an individual submission and must be your own work.

There are ***three tasks***. You must complete ***all three tasks***.

**General advice**

* You are required to back up your work regularly onto your N: drive and on removable storage devices. Always check the date-stamp on your files before submission.
* You **must** submit your work using the software versions we currently have on the University’s network.

**Scenario:**

You have been employed by a Silicon Valley start-up, there is no sense of direction here, and all they know is that they want to do something big and make lots of money! All they know is that HPC is the way forward, but have no real world knowledge or examples to emulate.

The company already has existing links and expertise in many field, but still does not want to be constrained by them – blue sky!

What they want is some in-depth knowledge of what HPC is, its implication, and its cost – such that they can apply it as a proof of concept (for business application) to one of the following narrowed down fields.

1. Profiling/ Behavioural Analysis
2. AI
3. Medical data processing
4. Stock Market Analysis
5. Simulation/ modelling

You have been offered complete freedom here to pick anything within these domains, perform research and provide a plausible use of HPC.

**Please note, that this is an open ended assessment, but must be kept within the realms of this 20 credit module.**

**It is expected that you discuss with your tutor what you intend to do, such that they can validate it appropriateness (doesn’t exceed 50% of 20 credits).**

**TASK 1: HPC?**

For this section you must research and answer the question, what is HPC? Given your chosen domain, you are to present the implications and impact HPC has provided to it. You are also to further project possible future use for this technology and plausible benefits it may/ will bring.

This is effectively a sales pitch with an informal business plan.

*(~500 Words)* [25 Marks]

**TASK 2: R&D:**

One constraint the start-up has introduced is that in terms of solutions, they are either looking to use a traditional cloud compute environment or implement an in-house HPC compute solution.

For this section you are research both types of technologies, and provide an in-depth analysis of the pros and cons of each technology – aspects such as scalability, overall costings and compute ability as a few factors to consider.

*(~800 Words)*[40 Marks]

**TASK 3: Selection:**

Following on from your R&D, you are to select one of the technologies for your selected domain problem and provide justification/ limitations.

In this section you will provide a brief on your selected domain problem, outlining its needs/ requirements and intricacies of this given problem and what to look out for when providing a solution.

Once this outline has been provided, a technology must be selected and for the most part justification should be apparent (and stated) but marks are also available for indirect implications a company may face, had it selected the other technology.

*(~300 Words)*[25 Marks]

**Quality** of report presentation, assumptions, proper referencing, etc.

[10 Marks]

**Mark Distribution:**

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| **Task** | **Detail** | **Marks** |
| **1** |  | **25** |
|  | Simple outline of HPC, with little-none application of chosen domain | **0-10** |
|  | As above but in greater depth/ proof, a good attempt of implication of HPC to chosen domain. | **10-15** |
|  | As above, but with justification as to the impact this work will have financially/ socially/ to the domain – and future extrapolations. | **15-25** |
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| **2** |  | **40** |
|  | A simple outline of each technology with little to no technical depth. Most of the details provided are at a high level and server minimal technical guidance. | **0-20** |
|  | A complete investigation represented, such that it can be used for technical guidance and cover many factors such as ability, cost and scalability | **20-40** |
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| **3** |  | **25** |
|  | Incomplete/ semi section made with minimal justification | **0-10** |
|  | Complete, justification based on the review of the domain problem, along with outlines of benefits and limitation, for either technology. | **10-25** |
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|  | **Quality** of report presentation, assumptions, proper referencing, etc. | **0-10** |
|  | **MAX TOTAL** | **100** |

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| Task 1 | |
| **Percentage** | **Description** |
| 75-100 | Complete: Excellent coverage on HPC, its goals and limitations. Impact to chosen domain is covered well along with plentiful supporting examples/ applications and future implications. |
| 50-75 | Good: A good discussion on HPC and the impact it has made to your selected domain, but many valid proof/ indication for its usefulness. |
| 25-50 | Fair: A good discussion on HPC and the impact it has made to your selected domain, but with minimal proof. |
| 1-25 | Poor: A basic high level description of HPC, with little – none further details. |
| 0 | No Attempt |

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| Task 2 | |
| **Percentage** | **Description** |
| 75-100 | Complete: Excellent, a good and in-depth investigation of the technologies, whist covering many additional key aspects such as scalability and cost. |
| 50-75 | Good: A good and high level investigation of the technologies, whist covering many additional key aspects such as scalability and cost. |
| 25-50 | Fair: A good and high level investigation of the technologies, whist covering little to none of the additional key aspects such as scalability and cost. |
| 1-25 | Poor: A minimal level of investigation of the technologies, whist covering little to none of the additional key aspects such as scalability and cost. |
| 0 | No Attempt |

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| Task 3 | |
| **Percentage** | **Description** |
| 75-100 | Complete: Excellent, Complete problem review and a complete justification (+ future limitations) with documentation to clearly explains all key aspect of function and process. |
| 25-75 | Good: Complete overview of the problem which has led to valid selection with documentation to clearly explains most key aspect of function and process. |
| 1-25 | Poor: Incomplete no real justified selection with little documentation. |
| 0 | No Attempt |

**INDICATIVE TIME LINE FOR PLANNING:**

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| Time Line | |
| **Duration** | **Task/Tips** |
| 1.5-2 days | Time allocated to task 1; it would be helpful to see from a historical perspective the uptake & growth of HPC, outline limitations hardware/ technology has imposed.  Survey papers may prove help here.  Make liberal use of graphs, tables and figures to convey as much information possible whilst staying in the word count. |
| 2.5-3 days | Time allocated to task 2; you should use the most resent papers you can obtain, also use company white papers as a guide to speed up this process.  There will be many flavours of the given technology; it will be wise to provide a generic outline here whilst still taking note of unique aspects. |
| 1.5-2 days | Time allocated to task 3; you should be looking at the existing problem and if possible observe what other companies are doing with the same/ similar problem, again company website/ white papers are a good point to start with.  It would also be wise to see what solutions are provided by market leader of the technologies as they often list their prime users. |
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| \* | You should be adding to your write up as you go along so as to, at any point have material to submit. The suggested timeframes are indicative, you may want to revisits parts and tweak your work – keep this in mind when you plan for this assessment. |

**FORMATTING OF SUBMISSION:**

You are to upload your written report onto Bb (Turnitin), a bucket/ link will be provided in the same location where you downloaded this assignment.

Any **screen shots, tables, figures, charts, illustrations, etc. will not contribute towards the word count**.

Your work must be adequately referenced throughout, using Harvard referencing style. Pears & Shields (2016) give a complete guide to Harvard referencing. Guidelines on using the Harvard Referencing style are available at:

<https://www.canterbury.ac.uk/library/docs/harvard.pdf>

<https://www.canterbury.ac.uk/students/docs/study-skills/resource-1-Harvard-Referencing-Guide.pdf>

The report must be submitted using the dedicated Blackboard grade centre submission bucket on or before the submission deadline.

**Deliverables:**

You are expected to produce a report of a high professional standard adhering to the guidelines given at:

P:\COURSEWORK\IT\\_Departmental Standards for Students

**LEARNING OUTCOMES ASSESSED (Fully or Partially):**

**Learning Outcomes of this module:**

1. Critically evaluate the role played by HPC in Science, Technology, Engineering and Mathematics
2. Critically evaluate some commonly used HPC platforms and parallel programming models
3. ~~Create a high performance solution to a real world problem~~

**GRADUATE / EMPLOYABILITY SKILLS GAINED:**

This assessment is an opportunity to develop an understanding of the operation and impact of HPC.

In depth knowledge should be gained, providing insight into the cutting edge of technology to date.

All tasks build on skills and knowledge required in industry, namely researching a problem (analysis), developing/ pitching an idea (conception/ design/ communication) and documentation (though informal).

This assessment has been designed to exercise your abilities to work on your own and progress closer to becoming a proficient self-learner.

**PROGRAMMES OF STUDY:**

BSc (Hons) Computer Science