Lincoln School of Computer Science

Assessment Item Briefing Document

Title: CMP3110M Parallel Computing, Assessment Item One, Coursework	**Indicative Weighting: 30%**

Learning Outcomes:

On successful completion of this assessment item a student will have demonstrated competence in the following areas:

- [LO1] demonstrate practical skills in applying parallel algorithms for solving computational problems;

- [LO3] analyse parallel architectures as a means to provide solutions to complex computational problems.

Requirements

Your task is to develop a simple statistical tool for analysing historical weather records from Lincolnshire. The provided data files include records of air temperature collected over a period of more than 80 years from five weather stations in Lincolnshire: Barkston Heath, Scampton, Waddington, Cranwell and Coningsby. Your tool should be able to load the provided dataset and perform statistical summaries of temperature including the min, max and average values, and standard deviation. The provided summaries should be performed on the entire dataset regardless their acquisition time and location. For additional credit, you can also consider the median statistic and its 1st and 3rd quartiles (i.e. 25th and 75th percentiles) which will require a development of a suitable sorting algorithm.

Due to the large amount of data (i.e. 1.8 million records), all statistical calculations shall be performed on parallel hardware and implemented by a parallel software component written in OpenCL. Your tool should also report memory transfer, kernel execution and total program execution times for performance assessment. Further credit will be given for additional optimisation strategies which target the parallel performance of the tool. In such a case, your program should run and display execution times for different variants of your algorithm. Your basic implementation can assume temperature values expressed as integers and skip all parts after a decimal point. For additional credit, you should also consider the exact temperature values and their corresponding statistics.

You can base your code on the material provided during workshop sessions, but you are not allowed to use any existing parallel libraries (e.g. Boost.Compute). To help you with code development, a shorter dataset is also provided which is 100 times smaller. The original file is called "weather_lincolnshire.txt" and the short dataset is "weather_lincolnshire_short.txt". More details about the file format are included in the "readme.txt" file. The data files are provided on Blackboard together with this description document in a file "temp_lincolnshire_datasets.zip". The output results and performance measures should be reported in a console window in a clear and readable format. All reading and displaying operations should be provided by the host code.

The main assessment criteria for this task are related to the correctness of the developed algorithms and effectiveness of optimisation strategies. The code should be well commented and clearly

structured into functional blocks.

Useful Information

This assessment is an individually assessed component. You will be required to demonstrate your developed code during a dedicated workshop session in the computing labs. Only the submitted code will be considered during demonstrations so further developments occurring after the deadline will not be taken into account. Non-attendance at the scheduled demonstration session will automatically result in zero mark for this assessment item. The demonstration date and further details will be provided during lectures. Please make sure you have a clear understanding of the grading principles for this component as detailed in the accompanying Criterion Reference Grid. If you are unsure about any aspect of this assessment component, please seek the advice of a member of the delivery team.

Submission Instructions

The deadline for submission of this work is included in the School Submission dates on Blackboard.

You must make an electronic submission of your work by using the assessment link on Blackboard for this component. All developed code should be submitted as a single ZIP file. It is important that you check that your .ZIP file decompresses to a Visual Studio project that can be directly built and executed on the computers in the computing labs. This will be required during the final demonstration of your work. There is no written report required for this submission.

DO NOT include this briefing document with your submission.