PARALLEL PROCESSING CUDA/CELL

The task is to implement an application that calculates a given problem. The application must be performed in CUDA or OpenCL technology. The programming language used is free. For the task you can in total get 50 points distributed over three consecutive stages. Penalty for late return stage is 25% for each subsequent meeting. The project can be performed by one or two people. In the case of two people, it is required that the calculations be made in the environment distributed (e.g. MPI, PVM, JMS).

Stage I (4h, 5 pts):
• problem analysis and solution design (5 pts).

Stage II (4h, 15 pk):
• presentation of the solution on one selected device (5 pk) (1 person),
• presentation of the solution in a distributed environment composed of nodes with the same GPU models (5 pk) (2 people),
• presentation of the operation on various input data (5 pk),
• code quality, use of good programming practices (5 pk).

Stage III (5h, 20 pk):
• the presentation:
◦ demonstrating scalable operation with different sizes of available resources (5 pk),
◦ demonstration of operation on various devices (various GPU models available in laboratory) (5 pk) (1 person),
◦ demonstration of operation on various devices (distributed system nodes equipped with various GPU models) (5 pk) (2 people),
◦ presentation of a scalable operation with introduced optimizations (5 pk);
• code quality, use of good programming practices (5 pk).

Stage IV (2h, 10 pts):
• report:
◦ comparison of the execution time depending on the size of the input data (1 pk),
◦ comparison of the execution time depending on the available resources (1 pk),
◦ comparison of the execution time depending on the device (1 pk),
◦ comparison of the execution time depending on the optimizations used (1 pk),
◦ Comparing the execution time depending on the size of the input and available dat resources (3 pk) - includes items 1 and 2 above
◦ Comparing execution time depending on the size of the input data available resources and introduced optimizations (5 pk) - includes cases 1-5 above,
◦ Runtime comparison depending on the size of the input data available Resource and Equipment (5 pk) - Includes cases 1-5 above.

Available resources are understood as:
• 1 person: e.g. the number of CUDA threads,
• 2 pers: eg number of CUDA threads and number of distributed system nodes.

Details are agreed with the tutors at the solution design stage.