TMA4280 Super Computers

Jakob Hovland
Jørgen Grimnes
Assignment 4

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1   Introduction

This report presents a solution to homework project number four in TMA4280 Super Computers, spring 2015, at Norwegian University of Science and Technology. The assignment is a introduction to implementing efficient and parallel programs.

2   C++ program

Please see the file *summation.cpp*

3   OpenMP

Do the necessary changes to utilize shared memory parallelization through OpenMP

Please see the file *summation openmp.cpp*

4   MPI program

Write a program to compute the sum S_n using P processors where P is a power of 2, and a distributed memory model (MPI)

Please see the file *summation mpi.cpp*.
Report the difference $S - S_n$ in double precision for different values of n.

5   OpenMP and MPI

Confirm that your program also works when you are using OpenMP and MPI in combination

Please see the file *summation combined.cpp* for confirmation.

6   Which MPI calls are convenient/necessary to use?

Call	Description
MPI::Init	Initializes the MPI execution environment
MPI::COMM_WORLD.Get_size	Returns the size of the group associated with COMM_WORLD.
MPI::COMM_WORLD.Get_rank	Determines the rank of the calling process in COMM_WORLD.
MPI::COMM_WORLD.Bcast	Broadcasts a message from the process with rank root to all other processes of the group.
MPI::COMM_WORLD.Reduce	Reduces values on all processes within COMM_WORLD
MPI::Finalize	Terminates MPI execution environment.

Table 1: Non-Functional Requirements