UNIVERSITY OF ALBERTA
AUGUSTANA CAMPUS

AUCSC 450 - Fall 2019
Parallel & Distributed Computing
Assignment - I

Due: Wednesday, October 23 – start of class

Task: Matrix Multiplication using MPI
Objectives: parallel program design, collective communication, speedup and efficiency
Instructions

- Solutions must be your own work
- Solutions must be neat, easy to follow, and in order
- Source code must be readable and fully commented
- Hand in a printout of your report and source code
- Name the source file mmm.c and submit it to eClass

Use Foster's methodology to design and implement MPI program to compute matrix-matrix multiplication

$$C_{m\times n} = A_{m\times k} \times B_{k\times n},$$

Assume that,

- m, k and n are command line inputs
- Populate both A and B with randomly generated double precision numbers.
- Number of processes (communication size) divides m, k and n.
- P_0 read in m, k and n, allocates $A, B, and\ C$, and prints $C_{m\times n}$

Illustrate how did you implement each of the following phases in your program?

1. Partitioning scheme of tasks and data required to compute C
2. Communication required to partition A and B
3. Aggregation of tasks into larger tasks
4. Mapping of larger tasks to processes

Experiments:
Run your program on berio.augustana.ualberta.ca using the configurations below to fill in the following tables

Table 1-Run Time

	Matrix Size			
Comm_sz	32x32	64x64	128x128	256x256
1				
2				
4				
8				

Table 2 - Speedup

	Matrix Size			
Comm_sz	32x32	64x64	128x128	256x256
1				
2				
4				
8				

Table 3-Efficiency

	Matrix Size			
Comm_sz	32x32	64x64	128x128	256x256
1				
2				

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4				
8				

Report
The report should include
1) the run times, speedup and efficiency results for the experiments you did
2) A discussion of how you parallelized the problem according to PCAM methodology
3) Interpretation of results (speed up and efficiency)

Deliverables
1) Report
2) printout of your source code
3) Source code file (submitted to eClass) name the file "mmm.c"