מחשוב מקבילי ומבוזר

תרגיל כיתה #1

The purpose of this exercise is to familiarize with MPI environment

VLAB user: **linuxu / Linux1212 / Academic**

to compile the program

mpicc myProgram.c -o myProgram

to run it with 7 processes

mpiexec -np 7 ./myProgram

Scientific Eclipse:

New / Project / C Project / MPI Hello World
Build Project
Run As / Run Configuration
Resources:
Target System Configuration / Generic MPIH2
Local / Number of Processes
Application:
Application Program

1. Write simple programs with point-to-point communications between processes:

   a) Start a number of processes. The only job of each process is to display its rank. Run few times and notice the order of the printed ranks.

   b) Start two processes. The first process sends some number to the second, which multiplies it by some random number and sends the result to the first process. Each process displays its rank and all relevant information – the data sent and received.

   c) Write a program that measures a time to transform the message between processes. Do it once and in a loop. Notice a difference.

   d) Write a program based on the previous one (c). The modification is that **N** processes are started now. One of them (master, not obligatory that its rank is 0) defines some **N-1** integers and sends them to other processes (slaves) – one integer to each process. There may be positive and negative integers in this set. Each slave compares the value it received with zero and sends the result back to the master. You have to decide what type of information a slave sends to the master. After all slaves finished their work the master displays the amount of positive and negative numbers in the set. Measure the execution time. Be aware not to insert the print commands into part of the code where you want to evaluate the run time.

	Number of slaves	Execution time
1	4	
2	8	
3	20	
4	60	
5	100	
6	1000	

e) Modify the program from (d) so that a number of integers the master creates are significantly larger than the number of slaves.

2. Write a program where master creates two vectors of huge size and uses slaves to calculate the product of these vectors. Create a chart where you compare calculation time of sequential and parallel programs from e) and explain the results.

	Vector size	The number of slaves	Execution time
1	100	4	
2	100	8	
3	10000	4	
4	10000	8	
5	1000000	4	
6	1000000	8	
7	100000000	4	
8	100000000	8	

Example for time measurement:

```
int main( int argc, char *argv[] )
{
   double t1, t2;
   MPI_Init( 0, 0 );
   t1 = MPI_Wtime();
    // Perform some computation here
   t2 = MPI_Wtime();
   printf("MPI_Wtime measured a 1 second sleep to be: %1.2f\n",  t2-t1); fflush(stdout);
   MPI_Finalize( );
   return 0;
}
```