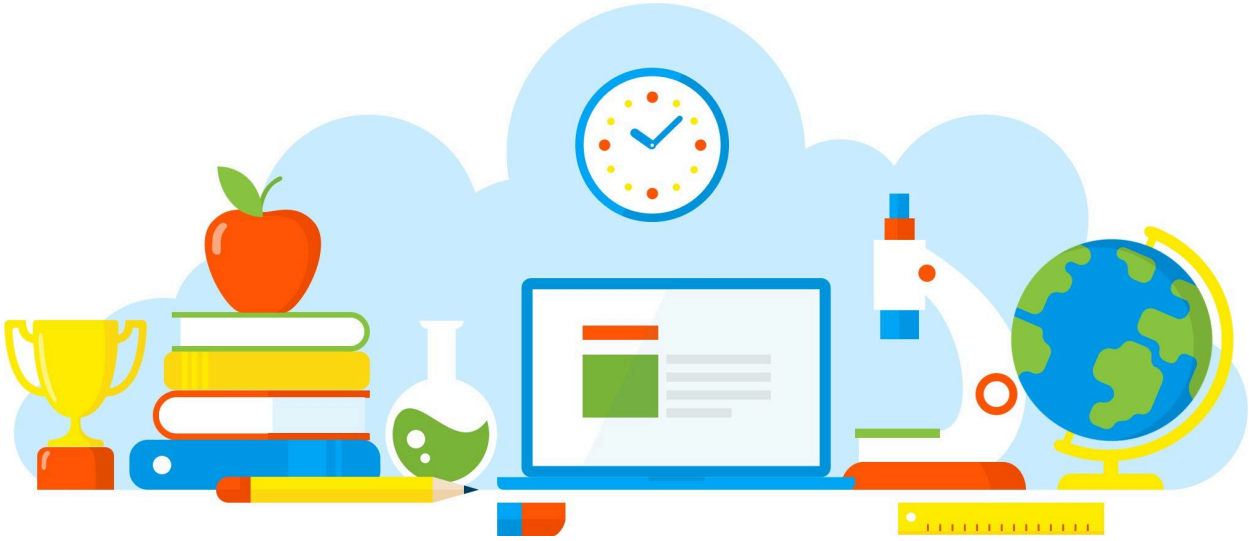

TP4 : MPI P2P & Collective communications

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16/4/2025

Exercice 1 .

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex1.exe
Hello World
Hello World
Hello World
Hello World
```

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex1.exe
Process 1 of 4: Hello World
Process 0 of 4: Hello World
Process 2 of 4: Hello World
Process 3 of 4: Hello World
```

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex1.exe
Hello World from the master process (rank 0). Total processes: 4
```

Exercice 2 .

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex2.exe
10
-1
Process 0 got 10
Process 3 got 10
Process 2 got 10
Process 1 got 10
```

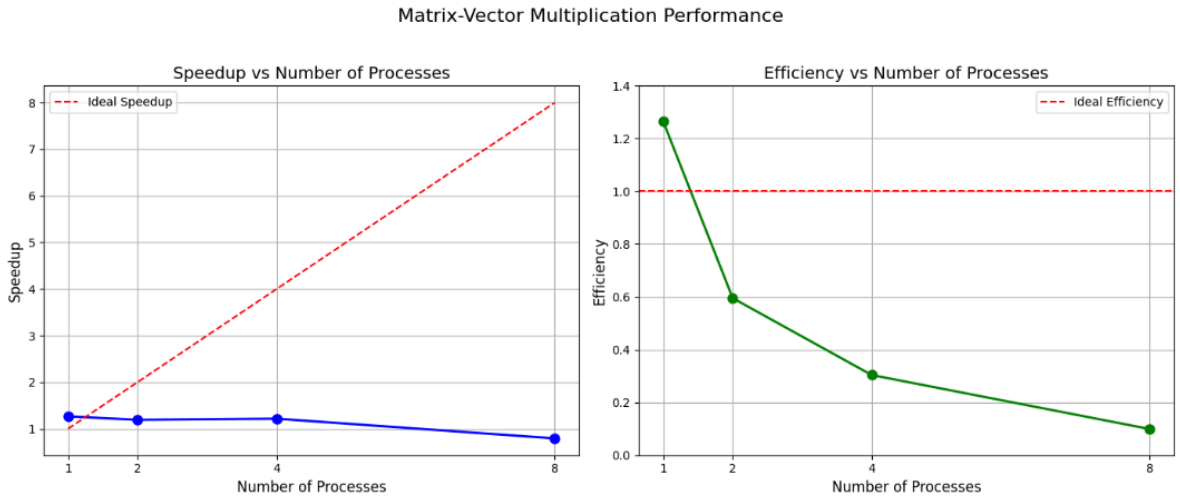
Exercice 3 .

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex3.exe
10
Process 2: Received 11, added 2, result is 13
Process 1: Received 10, added 1, result is 11
Process 3: Received 13, added 3, result is 16
```

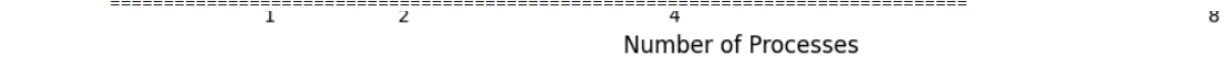
Exercice 4 .

Matrix-Vector Multiplication .

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 2 ex4.exe 300
CPU time of serial multiplication: 0.000341 seconds
CPU time of parallel multiplication using 2 processes is 0.000318 seconds
Speedup: 1.071384
Efficiency: 0.535692
Maximum difference between Parallel and serial result: 0.000000e+00
```




```
SUMMARY OF RESULTS:
================================================================================
Processes Serial Time (s)     Parallel Time (s)   Speedup        Efficiency
--------------------------------------------------------------------------------
1         0.000238            0.000188            1.265143       1.265143
2         0.000368            0.000309            1.190353       0.595176
4         0.000321            0.000264            1.215123       0.303781
8         0.000499            0.000629            0.792150       0.099019
================================================================================
```

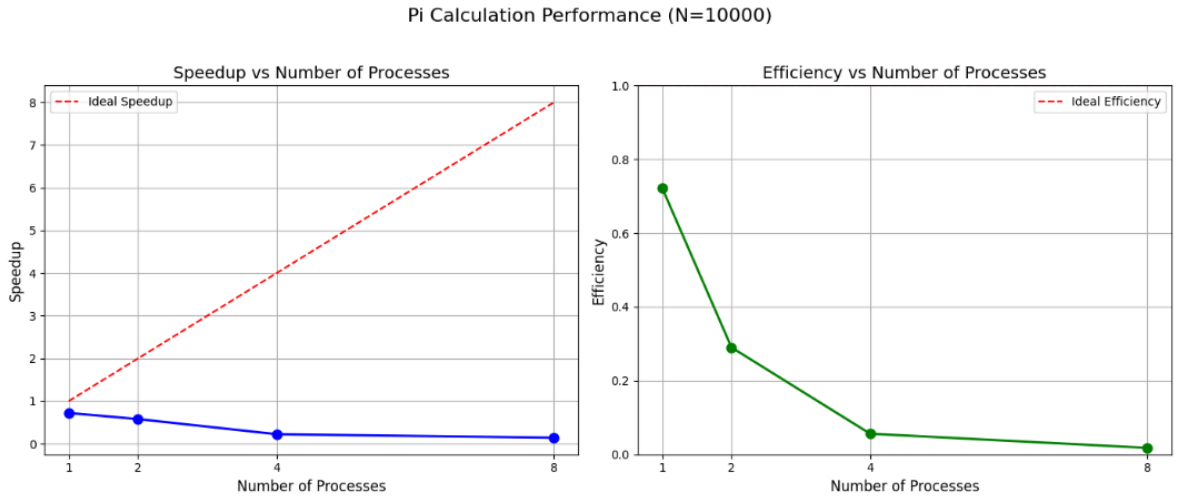


Splitting the Matrix .

```
Process 3 (i=5 to 9, j=5 to 9):
 505.0  506.0  507.0  508.0  509.0
 605.0  606.0  607.0  608.0  609.0
 705.0  706.0  707.0  708.0  709.0
 805.0  806.0  807.0  808.0  809.0
 905.0  906.0  907.0  908.0  909.0

Process 2 (i=5 to 9, j=0 to 4):
 500.0  501.0  502.0  503.0  504.0
 600.0  601.0  602.0  603.0  604.0
 700.0  701.0  702.0  703.0  704.0
 800.0  801.0  802.0  803.0  804.0
 900.0  901.0  902.0  903.0  904.0

Original 10x10 Matrix A:
   0.0    1.0    2.0    3.0    4.0    5.0    6.0    7.0    8.0    9.0
 100.0  101.0  102.0  103.0  104.0  105.0  106.0  107.0  108.0  109.0
 200.0  201.0  202.0  203.0  204.0  205.0  206.0  207.0  208.0  209.0
 300.0  301.0  302.0  303.0  304.0  305.0  306.0  307.0  308.0  309.0
 400.0  401.0  402.0  403.0  404.0  405.0  406.0  407.0  408.0  409.0
 500.0  501.0  502.0  503.0  504.0  505.0  506.0  507.0  508.0  509.0
 600.0  601.0  602.0  603.0  604.0  605.0  606.0  607.0  608.0  609.0
 700.0  701.0  702.0  703.0  704.0  705.0  706.0  707.0  708.0  709.0
 800.0  801.0  802.0  803.0  804.0  805.0  806.0  807.0  808.0  809.0
 900.0  901.0  902.0  903.0  904.0  905.0  906.0  907.0  908.0  909.0

Process 0 (i=0 to 4, j=0 to 4):
   0.0    1.0    2.0    3.0    4.0
 100.0  101.0  102.0  103.0  104.0
 200.0  201.0  202.0  203.0  204.0
 300.0  301.0  302.0  303.0  304.0
 400.0  401.0  402.0  403.0  404.0
```

Exercice 6 .

```
PS C:\Users\soufiane\OneDrive\Bureau\TP4_PL> & "C:\Program Files\Microsoft MPI\Bin\mpiexec.exe" -n 4 ex6.exe 10000
Calculating Pi with 10000 intervals
Pi approximation (parallel): 3.1415926544231239
Pi approximation (serial): 3.1415926544231336
Error between parallel and serial: -9.7699626167013776e-15
Serial execution time: 0.000036 seconds
Parallel execution time with 4 processes: 0.000566 seconds
Speedup: 0.064368
Efficiency: 0.016092
```



SUMMARY OF RESULTS:

Processes	Serial Time (s)	Parallel Time (s)	Speedup	Efficiency
1	0.000028	0.000039	0.722646	0.722646
2	0.000029	0.000050	0.580198	0.290099
4	0.000028	0.000122	0.225225	0.056306
8	0.000035	0.000241	0.143154	0.017894