Parallelizing Stock Buy and Sell

CSE 708 Parallel Algorithms Seminar

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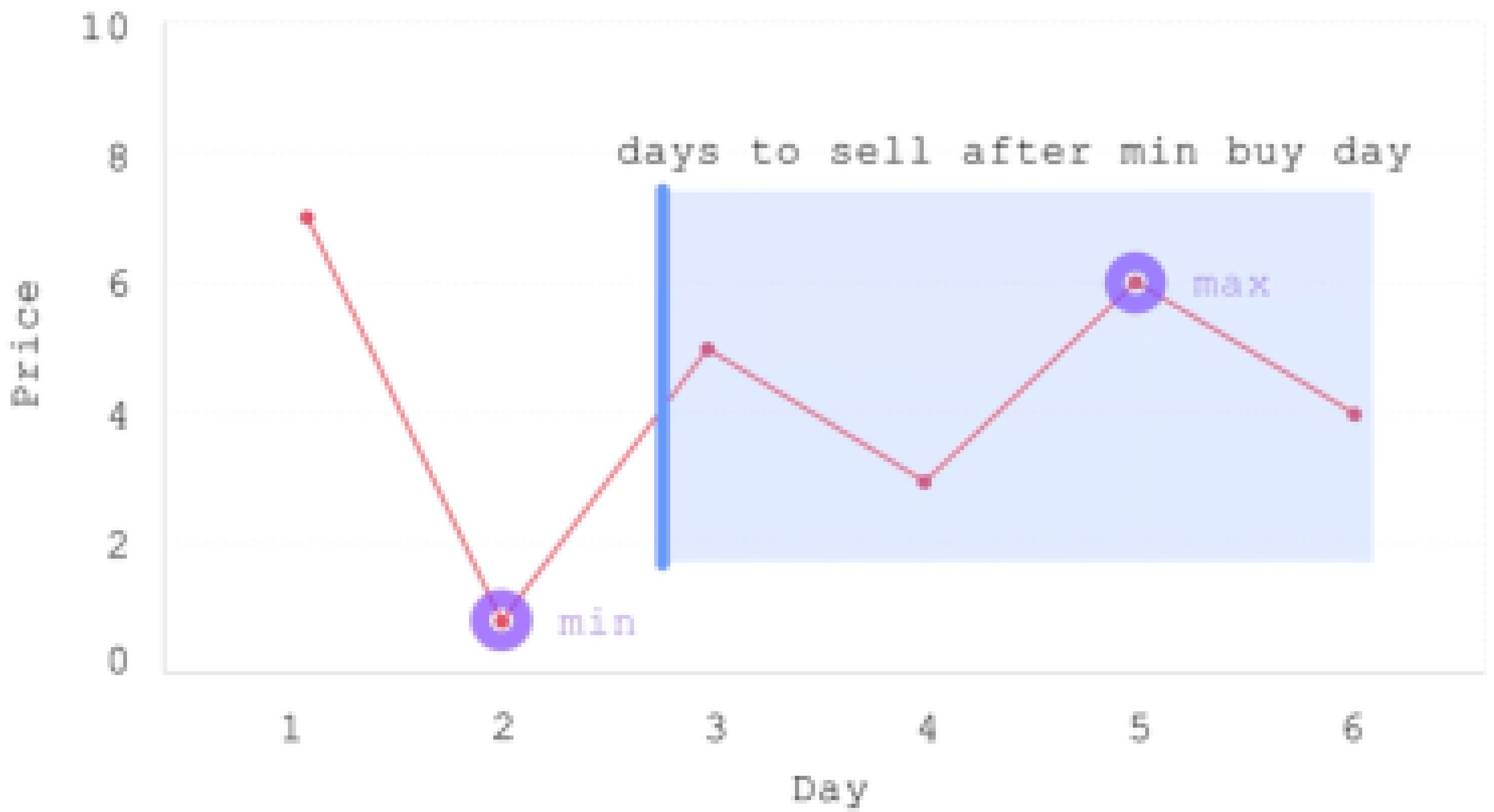
Problem Statement Overview

Buy low, sell high – the fundamental principle of stock trading.

Find the maximum profit by determining the best buying and selling points for a given stock over time.



Real time Application

Day Trading

Day traders buy and sell stocks within a single trading day to take advantage of intraday price fluctuations. Solving the stock buy and sell problem helps them make profitable trading decisions.

Investment Research

Investment analysts and researchers use similar concepts to analyze historical stock data and make predictions about future stock price movements.

Financial Planning

Financial planners and advisors can use these algorithms to optimize their clients' investment portfolios, helping them achieve their financial goals.

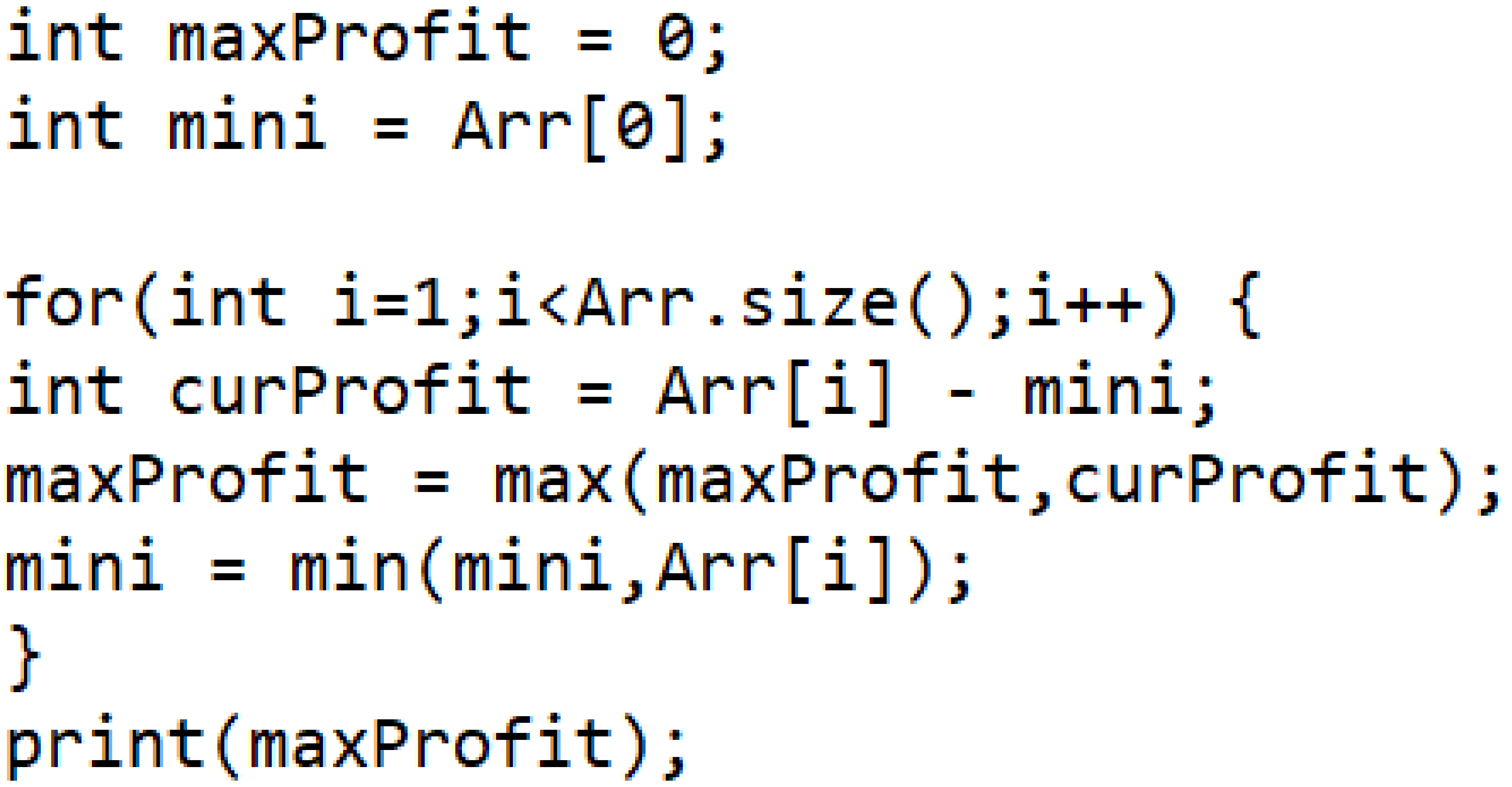
Sequential 1d DP Aproach

Time Complexcity :

O(n)

Space Complexcity :

O(1)



```
int maxProfit = 0;
int mini = Arr[0];

for(int i=1;i<Arr.size();i++) {
int curProfit = Arr[i] - mini;
maxProfit = max(maxProfit,curProfit);
mini = min(mini,Arr[i]);
}
print(maxProfit);
```

Sequential 1d DP Aproach

10	13	12	100	8	14
0	1	2	3	4	5

Sell on day 1 $ 3

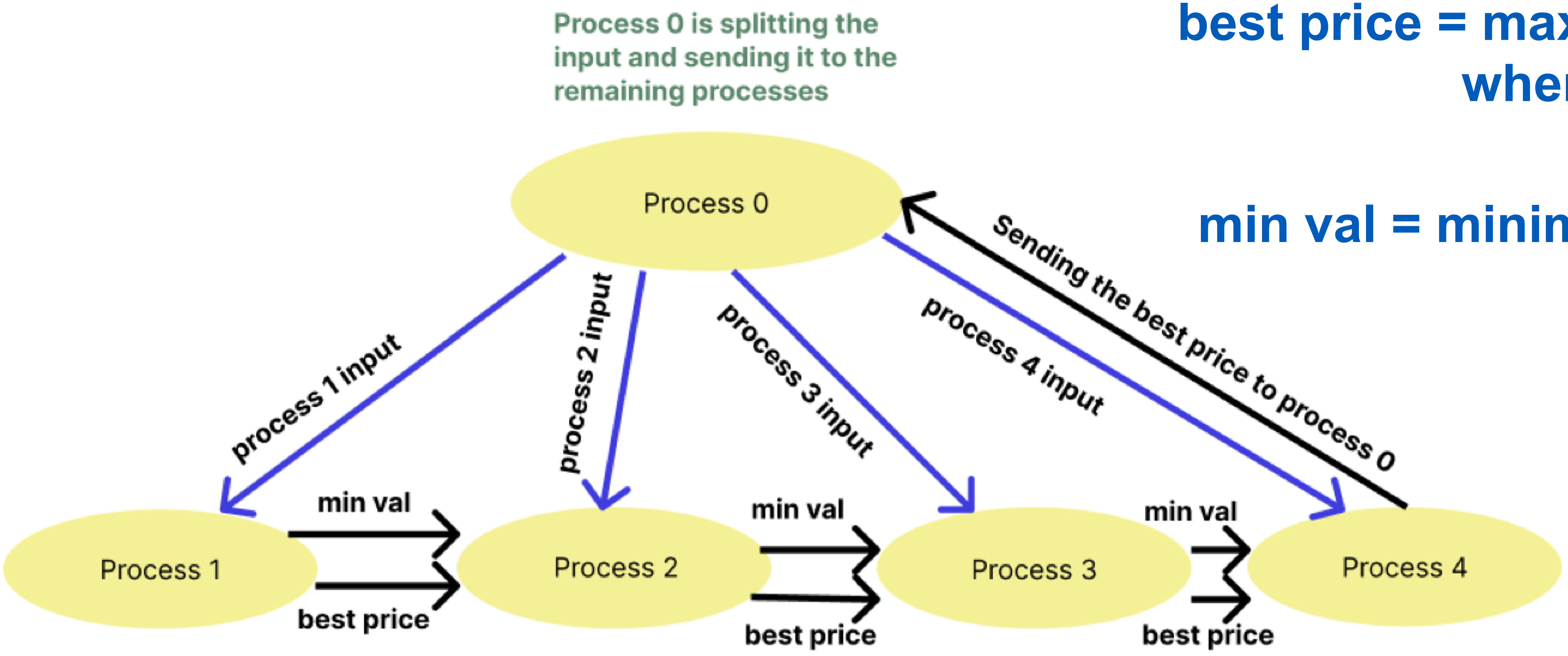
Sell on day 2 $ 2

Sell on day 3 $ 90

Sell on day 4 loss $ 2

Sell on day 5 $ 6

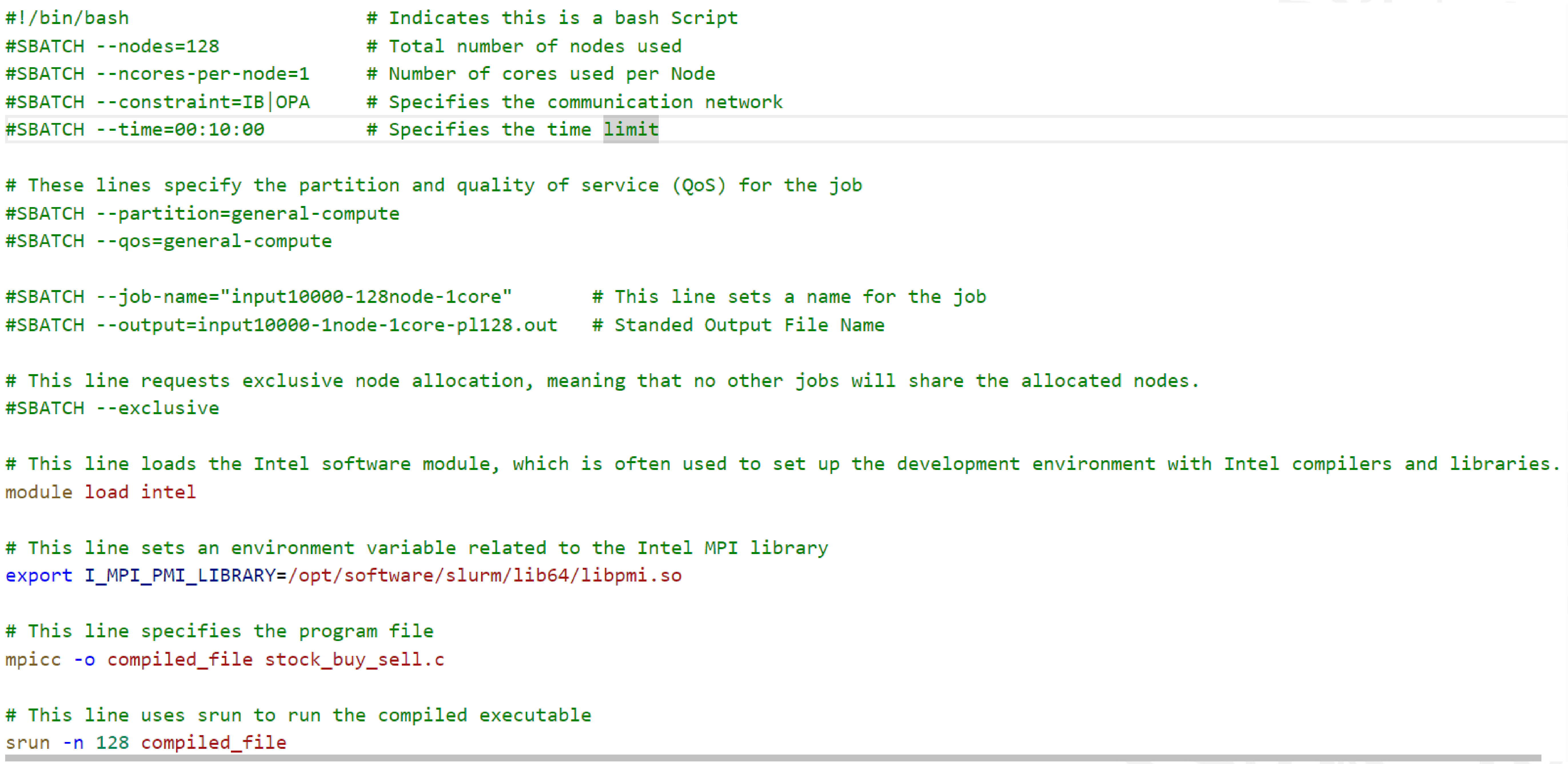
Parallel Approach Architecture



best price = max(price[i] - price[j])
where i > j

min val = minimum value of the array

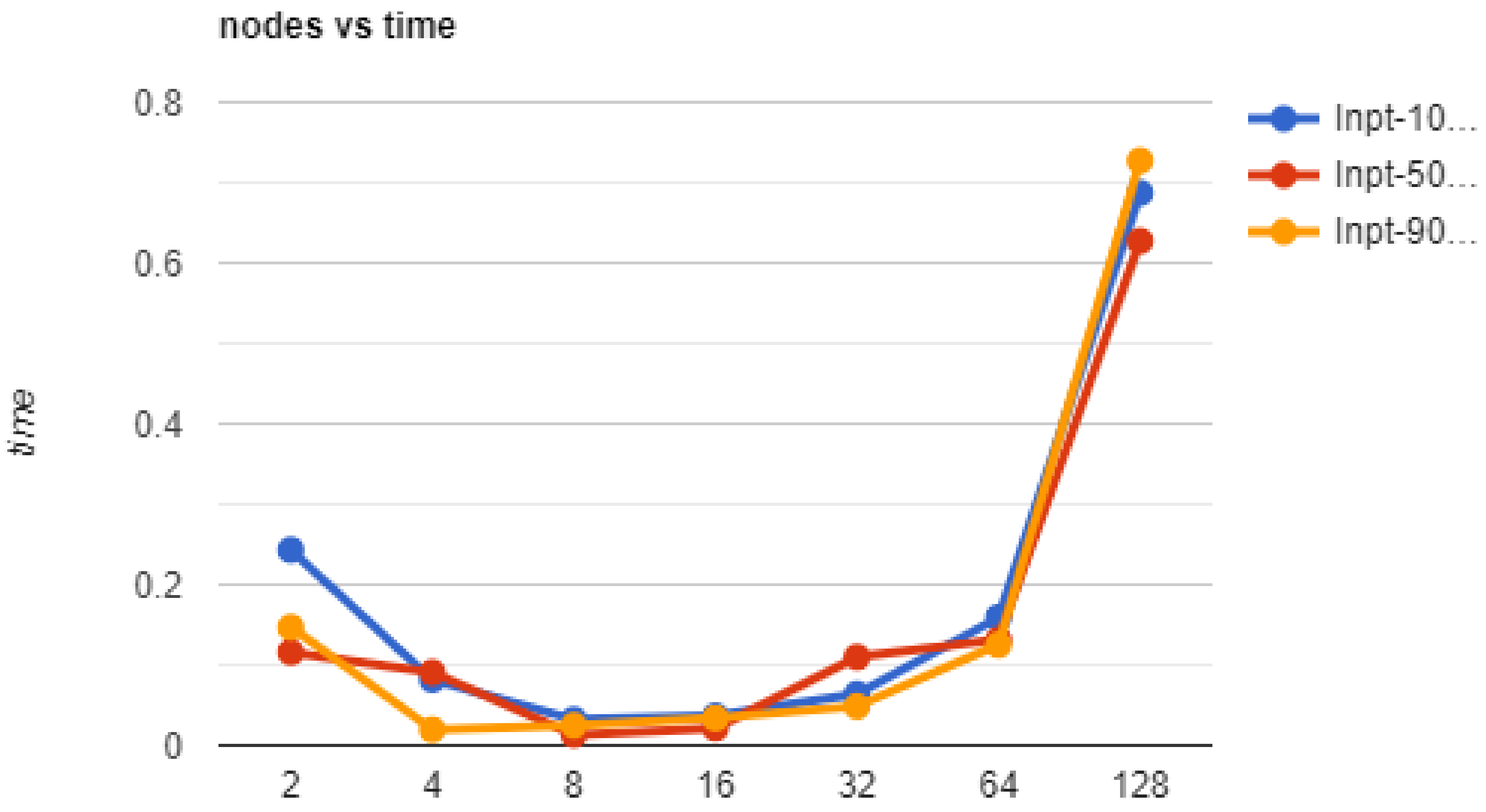
Bash Script Used



```
#!/bin/bash                     # Indicates this is a bash Script
#SBATCH --nodes=128             # Total number of nodes used
#SBATCH --ncores-per-node=1     # Number of cores used per Node
#SBATCH --constraint=IB|OPA     # Specifies the communication network
#SBATCH --time=00:10:00         # Specifies the time limit

# These lines specify the partition and quality of service (QoS) for the job
#SBATCH --partition=general-compute
#SBATCH --qos=general-compute

#SBATCH --job-name="input10000-128node-1core"       # This line sets a name for the job
#SBATCH --output=input10000-1node-1core-pl128.out   # Standed Output File Name

# This line requests exclusive node allocation, meaning that no other jobs will share the allocated nodes.
#SBATCH --exclusive

# This line loads the Intel software module, which is often used to set up the development environment with Intel compilers and libraries.
module load intel

# This line sets an environment variable related to the Intel MPI library
export I_MPI_PMI_LIBRARY=/opt/software/slurm/lib64/libpmi.so

# This line specifies the program file
mpicc -o compiled_file stock_buy_sell.c

# This line uses srun to run the compiled executable
srun -n 128 compiled_file
```

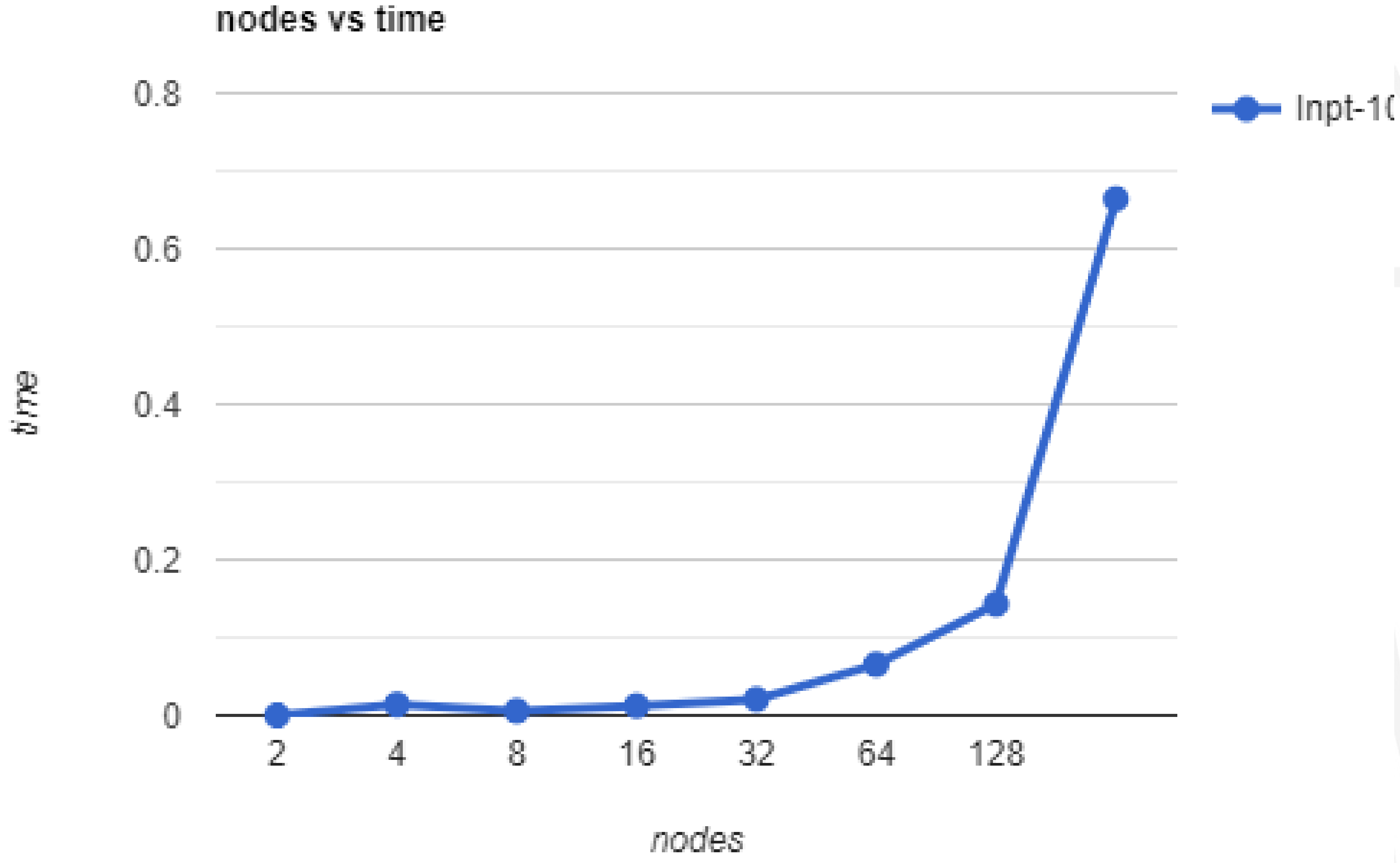
Results for Large Inputs 1*10^6, 5*10^6, 9*10^6

Amdahla Law

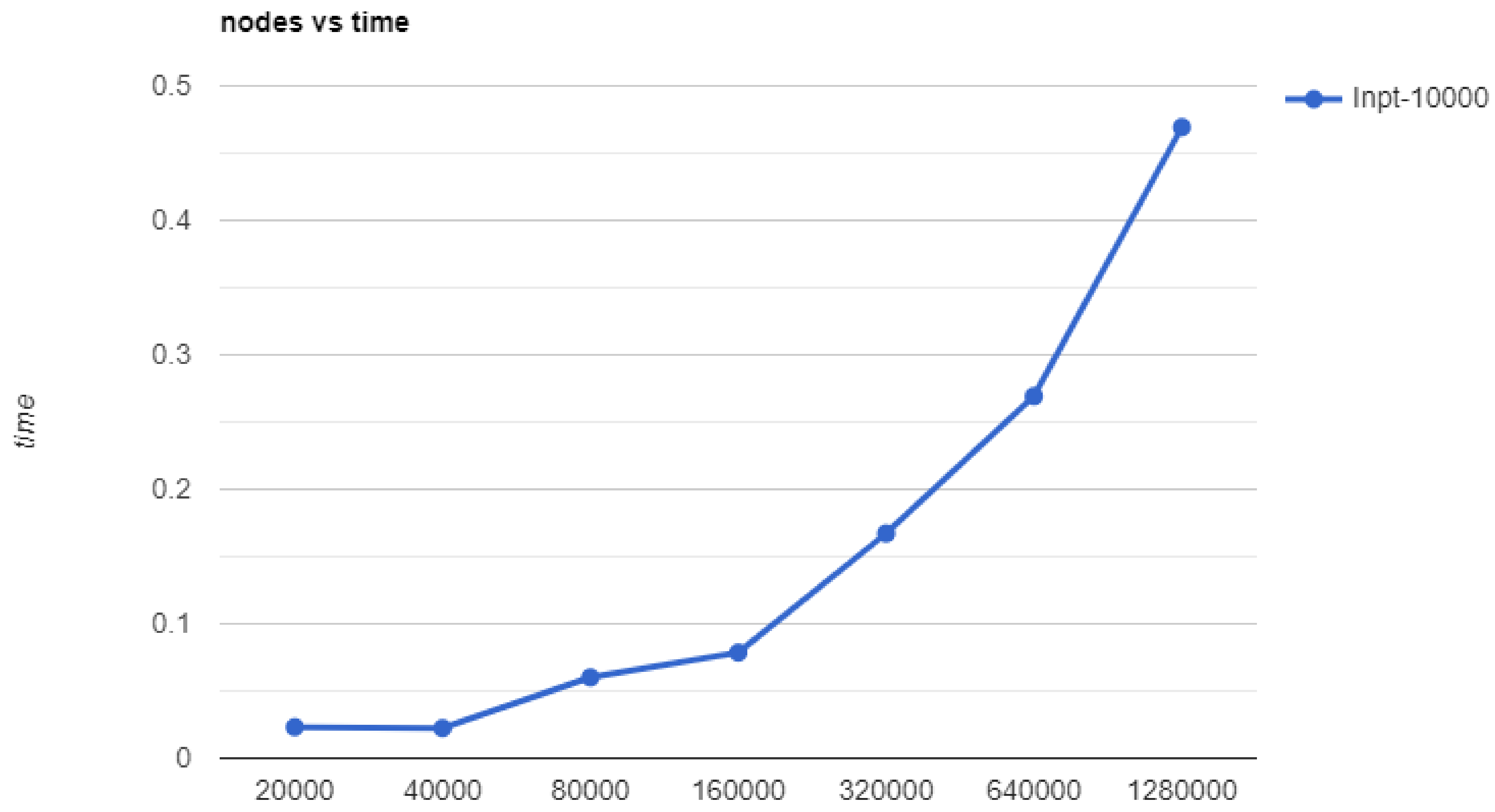


Results for scaled constant. data per node 1e5

Gustafson’s Law



Results for Sequential Approach



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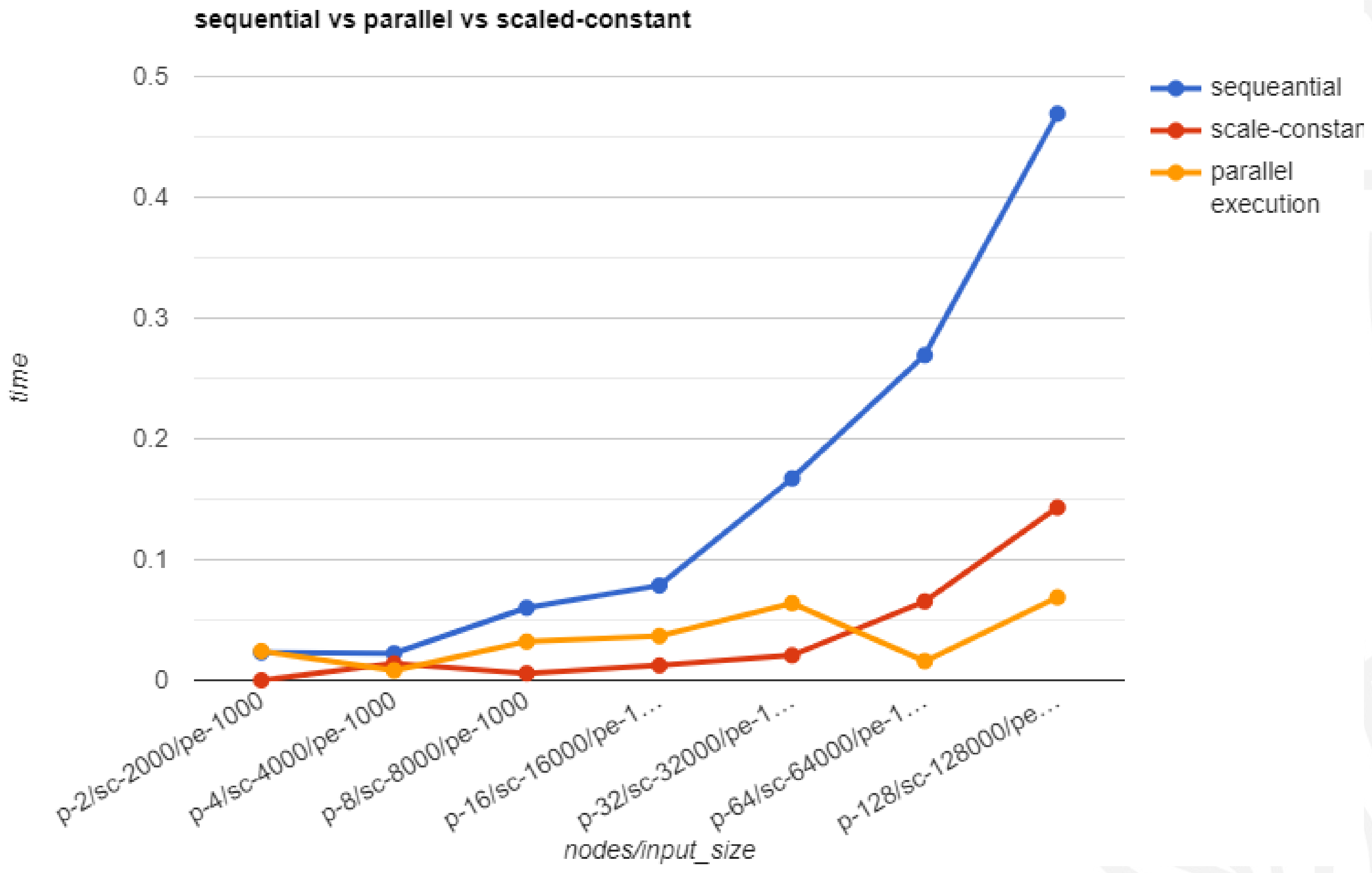
Comparasion of Sequential vs parallel vs scaled constant



References

- **Dr. Jones Lectures on MPI**
- **https://carleton.ca/rcs/rcdc/introduction-to-mpi/**
- **https://www.geeksforgeeks.org/stock-buy-sell/**

Thank You