# COMPARATIVE ANALYSIS OF OPENMPI ALGORITHMS FOR COLLECTIVE OPERATIONS USING THE OSU BENCHMARK

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# INTRODUCTION

- HPC

- OPENMPI

- OSU Micro-Benchmarks

# COLLECTIVE OPERATIONS

- B_cast
- Reduce
- Gather
- Scatter
- Barrier

# BENCHMARKING

- OpenMPI
- MPI_Bcast
- MPI-Barrier
- SLURM
- THIN Partition

# ALGORITHMS FOR B_CAST

- **Default Algorithm (0)**
- **Basic Linear Algorithm (1)**
- **Chain Algorithm (2)**
- **Binary Tree Algorithm (5)**

# BATCH FOR BCAST

```bash
#!/bin/bash

#SBATCH --nodes=2
#SBATCH --time=120
#SBATCH --account=dssc
#SBATCH --partition=THIN
#SBATCH --exclusive
#SBATCH --job-name=bcast_benchmark
#SBATCH --output=bcast_benchmark.out
module load openMPI/4.1.5/gnu

for np in $(seq 2 2 48) # 2 4 6 ... 48
do
    for alg in 0 1 2 5 # default, basic linear, chain, binary tree
    do
        mpirun -np $np --map-by core --mca coll_tuned_use_dynamic_rules true --mca coll_tuned_bcast_algorithm $alg ./osu/osu_bcast
        --full --iterations 10000 --warmup 1000 --message-size 1:1048576 -f csv >> ./output/bcast-np$np-a$alg.csv
    done
done
```

# ALGORITHMS FOR BARRIER

- **Default Algorithm (0)**
- **Linear Algorithm (1)**
- **Tree Algorithm (6)**

# BATCH FOR BARRIER

```bash
#!/bin/bash

#SBATCH --nodes=2
#SBATCH --time=120
#SBATCH --account=dssc
#SBATCH --partition=THIN
#SBATCH --exclusive
#SBATCH --job-name=barrier_benchmark
#SBATCH --output=barrier_benchmark.out
module load openMPI/4.1.5/gnu


for np in $(seq 2 2 48) # 2 4 6 ... 48
do
    for alg in 0 1 6 # default, linear, tree
    do
        mpirun -np $np --map-by core --mca coll_tuned_use_dynamic_rules true --mca coll_tuned_barrier_algorithm $alg
        ./osu/osu_barrier --full --iterations 10000 --warmup 1000 --message-size 1:1048576 -f csv >> ./output/barrier-np$np-a$alg.csv
    done
done
```
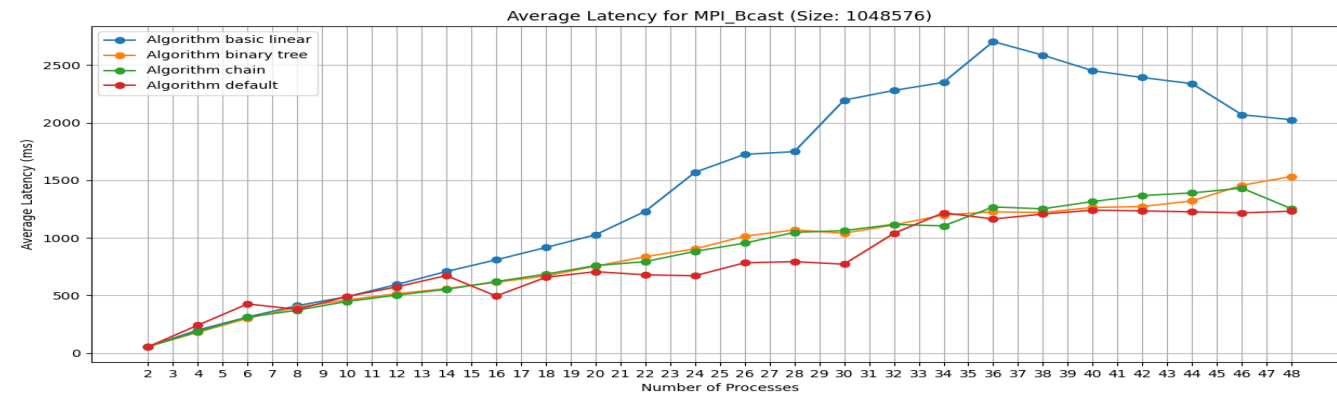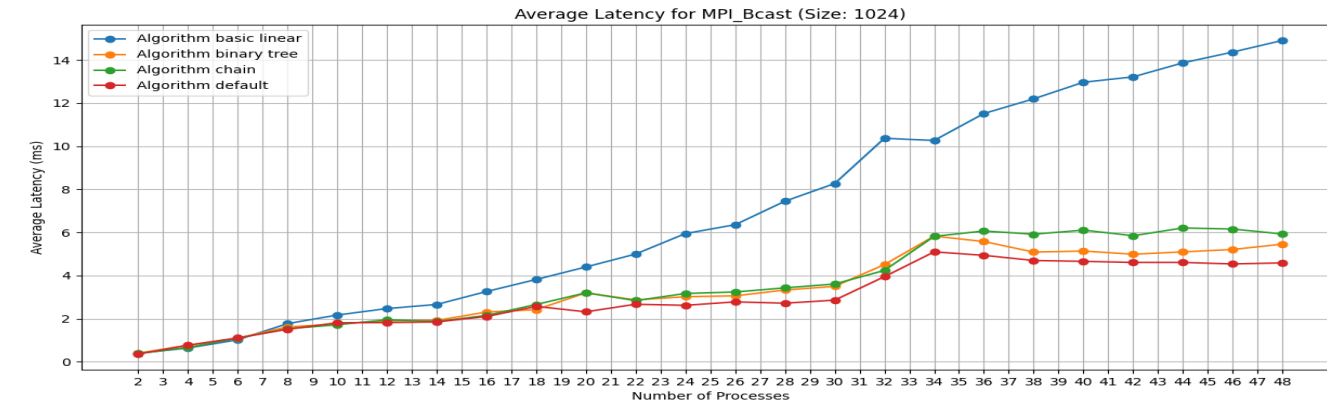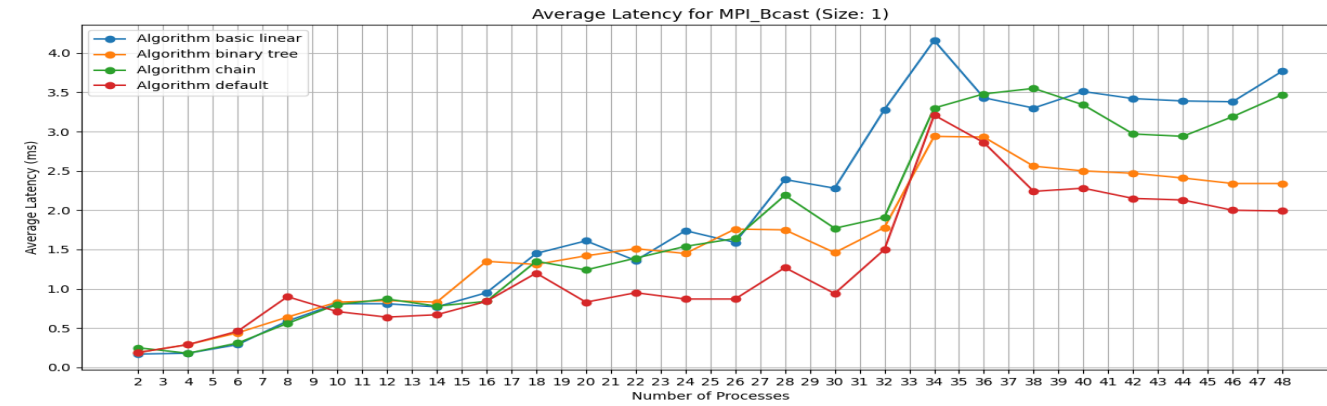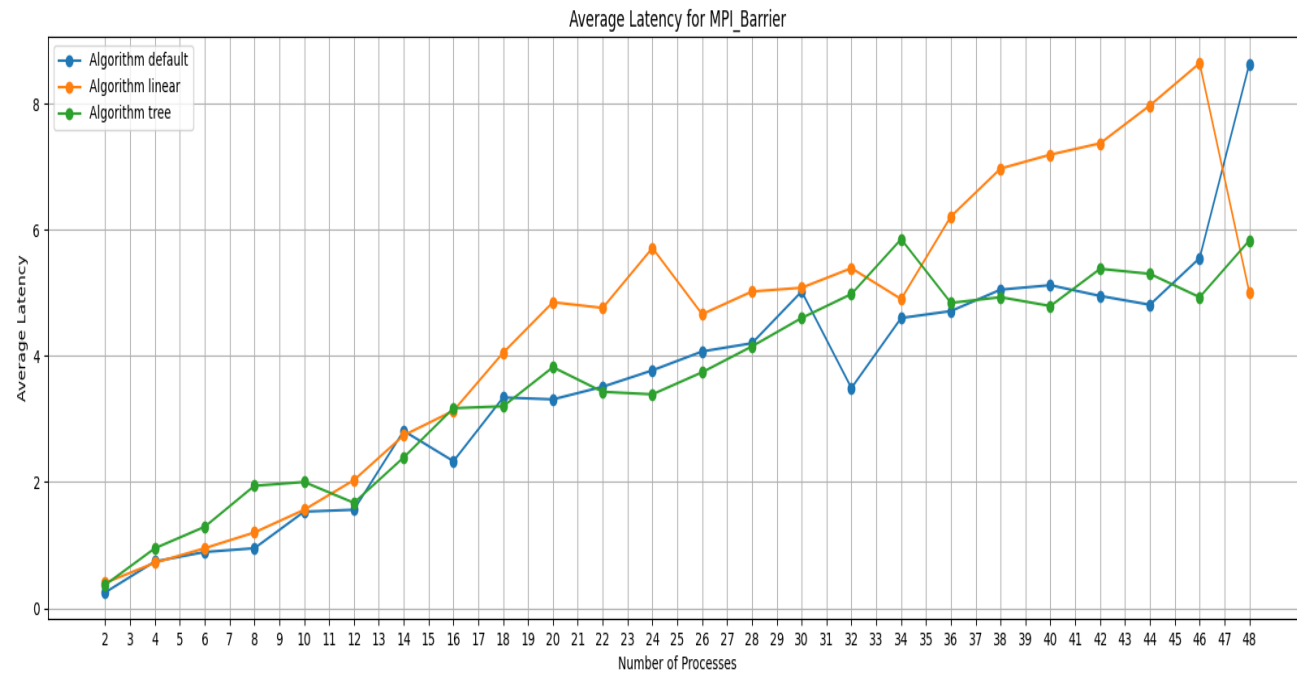
# RESULTS FOR BCAST



Average Latency for MPI_Bcast (Size: 1)



Average Latency for MPI_Bcast (Size: 1024)



Average Latency for MPI_Bcast (Size: 1048576)

# RESULTS FOR BARRIER



Average Latency for MPI_Barrier

THANK YOU