Usage

```
make clean
make
mpiexec -np [np] ./jacobi [-nl] [-max_iteration]
mpiexec -np [np] ./ssort [-N]

## or use bash script in slurm_scripts
cd slurm_scripts
bash runsort.sh # submit sort jobs to slurm
bash runweak.sh  # submit weak scaling jobs to slurm
bash runstrong.sh  # submit strong scaling jobs to slurm
```

Jacobi reports

For scaling experiments, we must specify partition. And the result (running time) is extremely unstable, sometimes

incredibly fast.

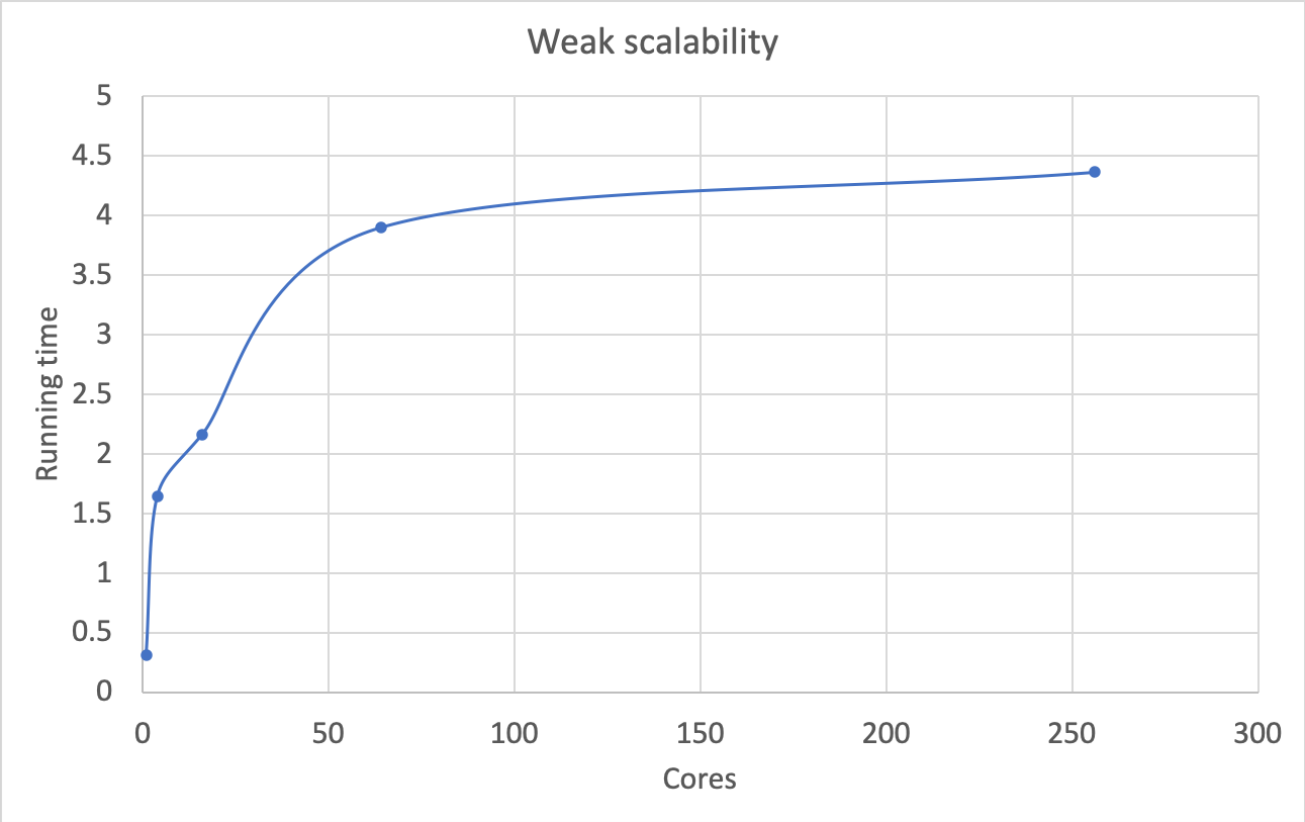
All the result below is run on partition (c01_17, at least is specified as so)

Weak scaling

Max Iteration = 20000

N	p	N_l	Time	Residual
100	1	100	0.314247	0.00513211
200	4	100	1.645168	14.1556
400	16	100	2.161828	176.08
800	64	100	3.901601	575.316
1600	256	100	4.366603	1375.32

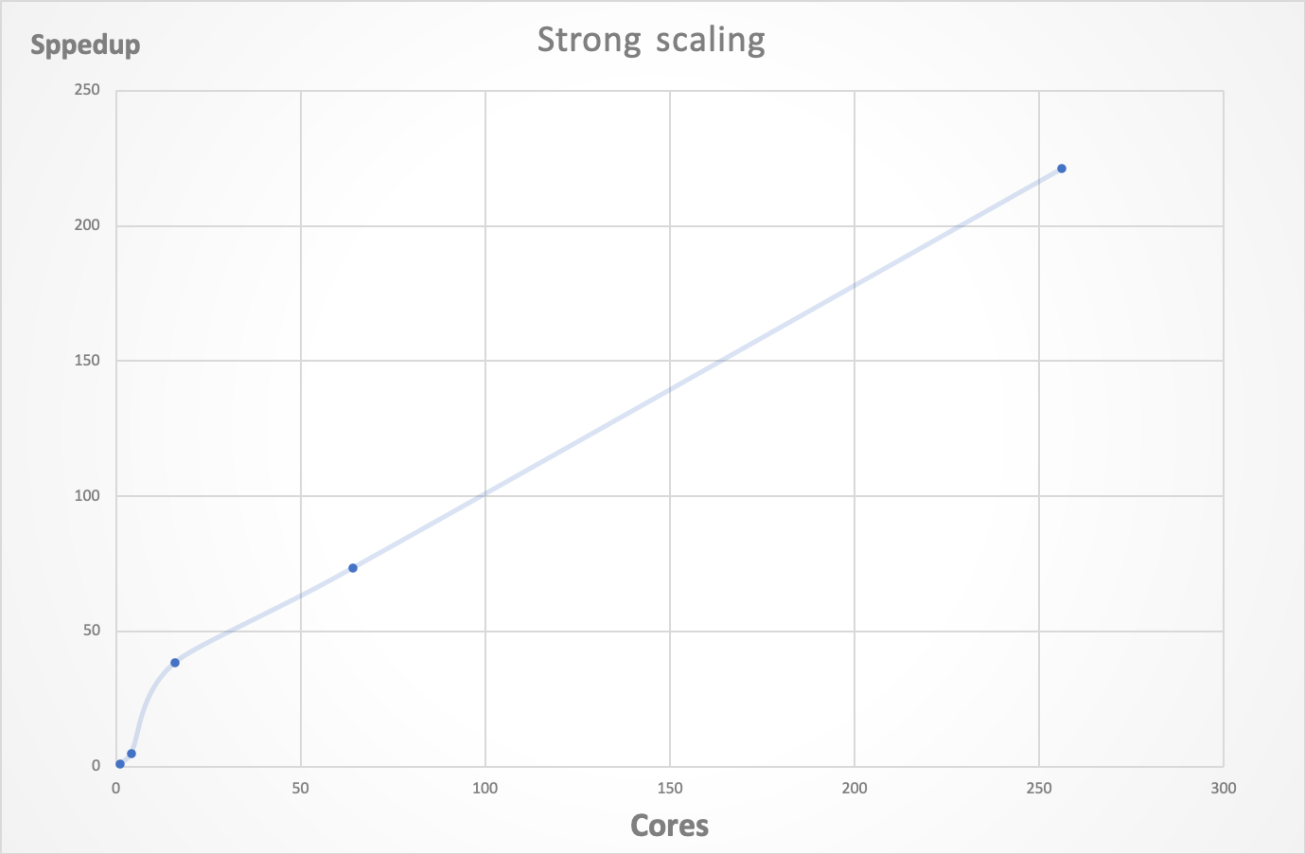
Our result shows weak scalability to a certain extent except when p=1. I guess this is because N is small and the single-thread program saves communication costs. (I tried dozens of times and the the result stays similar)



Strong scaling

Max Iteration = 20000

N	p	N_l	Time	Residual	Speed up
1600	1	1600	557.565293	1375.32	1
1600	4	800	120.552866	1375.32	4.62506875
1600	16	400	14.503465	1375.32	38.4435921
1600	64	200	7.600227	1375.32	73.3616631
1600	256	100	2.520968	1375.32	221.171111



We can see that the line is basically straight which means it has perfect strong scalability. When cores number is relatively small, it performs even better than ideal model. I speculate this is because in our case N is quite large and it runs extremely slow for single thread, so the speed-up greater than the ideal one. But when cores grows larger, the real speed-up slows down. Because of the cores limit of the prince cluster, I cannot test 1024 cores. However, I guess it will not show linear growth.

Ssort reports

Cores: 64

N	Time
1e4	0.074081
1e5	0.069223
1e6	0.188538