Exercise 6

Programming SS 2019 - Problem Set 4

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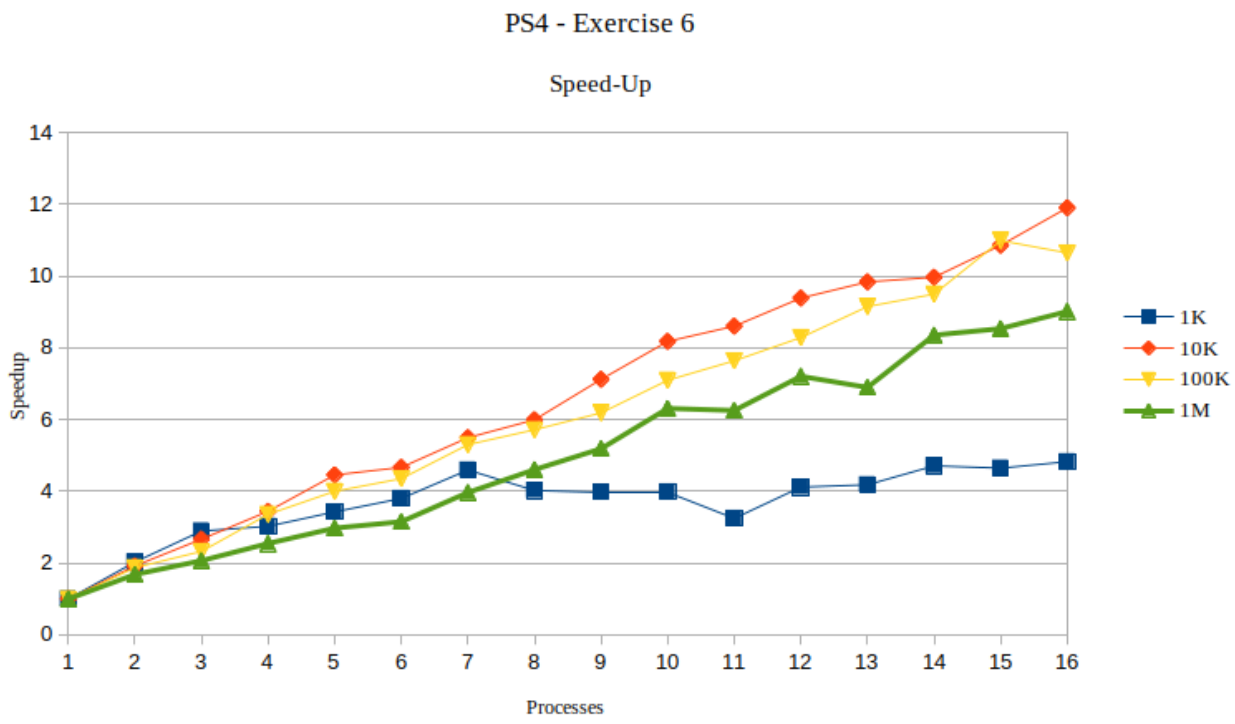
We are asked to check the speed-up for combinations of MPI processes and sample points using one node on *Alphacruncher*.

Speed-up in latency is calculated as follow:

$$S = \frac{t_{old}}{t_{new}}$$

In our case, t_{old} is the runtime with **one** thread.



Note1 : The exercise asks to try combination of MPI processes between 1 & 20. However, we noticed that jobs submitted with more that 16 threads would not start;

- The job status *PD* (pending) would not change, the reason being *Ressources*.

We noticed that the session used (`intq`), features only 16 CPUs, it means that only 16 tasks can be ran in parallel.

```
PartitionName=intq
   AllowGroups=compute_partitions_all,compute_partitions_intq AllowAccounts=ALL AllowQos=ALL
   AllocNodes=ALL Default=NO QoS=N/A
   DefaultTime=NONE DisableRootJobs=NO ExclusiveUser=NO GraceTime=0 Hidden=NO
   MaxNodes=UNLIMITED MaxTime=04:00:00 MinNodes=1 LLN=NO MaxCPUsPerNode=UNLIMITED
   Nodes=gpu01
   PriorityJobFactor=1 PriorityTier=1 RootOnly=NO ReqResv=NO OverSubscribe=NO
   OverTimeLimit=0 PreemptMode=OFF
   State=UP TotalCPUs=16 TotalNodes=1 SelectTypeParameters=NONE
   JobDefaults=(null)
   DefMemPerNode=UNLIMITED MaxMemPerNode=UNLIMITED
```

Additionally, looking at the `node` parameters, we could see that no only the session features only 16 CPUs, but each core is limited to **one** thread only.

```
(base) [pfefferlee@lgn01 Exercise6]$ scontrol show node
NodeName=gpu01 Arch=x86_64 CoresPerSocket=8
   CPUAlloc=0 CPUTot=16 CPULoad=0.01
   AvailableFeatures=(null)
   ActiveFeatures=(null)
   Gres=(null)
   NodeAddr=gpu01 NodeHostName=gpu01 Version=18.08
   OS=Linux 3.10.0-957.12.1.el7.x86_64 #1 SMP Mon Apr 29 14:59:59 UTC 2019
   RealMemory=1 AllocMem=0 FreeMem=255184 Sockets=2 Boards=1
   State=IDLE ThreadsPerCore=1 TmpDisk=0 Weight=1 Owner=N/A MCS_label=N/A
   Partitions=intq
   BootTime=2019-05-16T10:44:13 SlurmdStartTime=2019-05-16T10:47:01
   CfgTRES=cpu=16,mem=1M,billing=16
   AllocTRES=
   CapWatts=n/a
   CurrentWatts=0 LowestJoules=0 ConsumedJoules=0
   ExtSensorsJoules=n/s ExtSensorsWatts=0 ExtSensorsTemp=n/s
```

With two sockets, 8 cores per sockets and 1 thread per core, we are only allowed to run 16 tasks (`ntasks`) in parallel.

Note2: Execution outputs are stored in *Exercise6/output/*.