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Task1

single host thread + CUDA (assume 1 GPU/host)

compile command: nvcc MonteCarlo.cu -o MonteCarlo

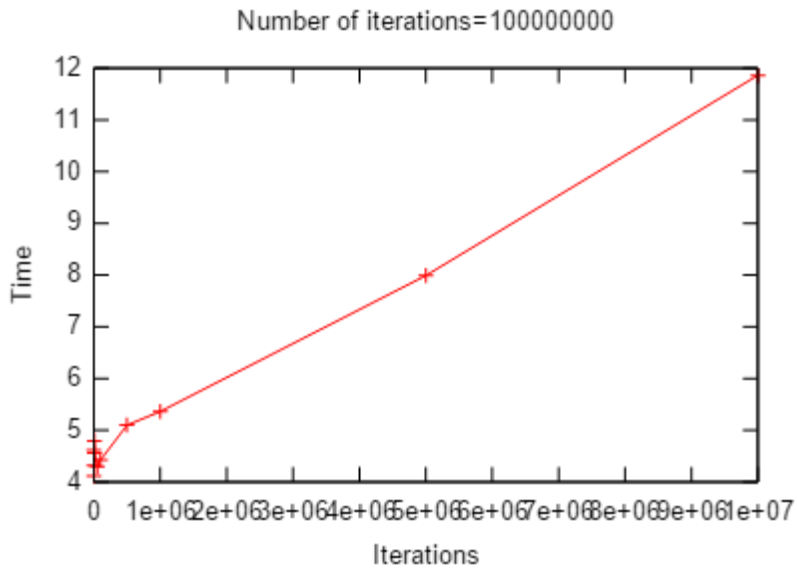
run command: ./MonteCarlo

File MonteCarlo.cu contains the program code.

File plot_data.txt contains the measurements of tests.

Result

```
access-gaia.uni.lu - PuTTY
Calculated PI is = 3.165000.
4000 4.120000
0 [09:53:00] oborysov@gaia-179(gaia-cluster) ~> ./MonteCarlo
Type number of steps
6000
Calculated PI is = 3.152667.
6000 4.790000
0 [09:55:01] oborysov@gaia-179(gaia-cluster) ~> ./MonteCarlo
Type number of steps
10000
Calculated PI is = 3.127200.
10000 4.560000
0 [09:55:33] oborysov@gaia-179(gaia-cluster) ~> ./MonteCarlo
Type number of steps
50000
Calculated PI is = 3.132880.
50000 4.300000
0 [09:56:03] oborysov@gaia-179(gaia-cluster) ~> ./MonteCarlo
Type number of steps
100000
Calculated PI is = 3.134440.
100000 4.420000
```



Task2

with MPI+CUDA (1 MPI process/host, assume 1 GPU/host)

Reservation of job: oarsub -I -l "{gputype='K80'}/nodes=1/core=1"

Loading MPI module: module load mpi/OpenMPI/1.8.4-GCC-4.9.2

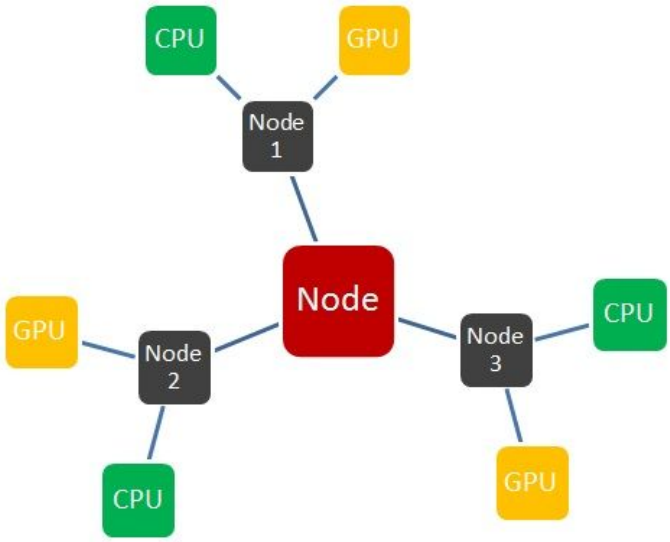
Compilation command: nvcc -I/usr/mpi/gcc/openmpi-1.4.6/include -L/usr/mpi/gcc/openmpi-1.4.6/lib64 -lmpi MonteCarlo2.cu -o MonteCarlo2

Run command: mpirun -np 4 ./MonteCarlo2 -machinefile $PBS_NODEFILE

File MonteCarlo2.cu contains the program code.

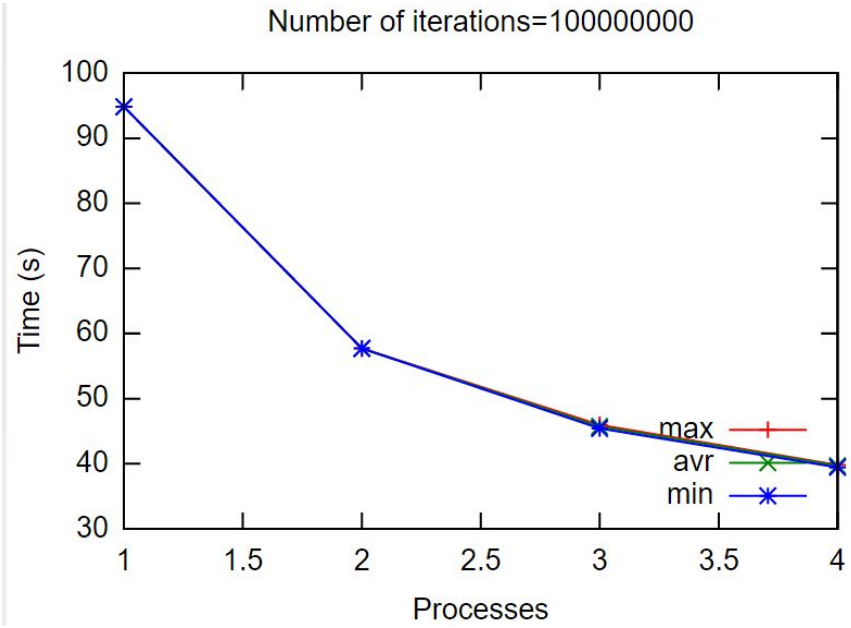
File plot_data2.txt contains the measurements of tests.

I used next architecture for task 2:



```
access-gaia.uni.lu - PuTTY
      gaia-179*1
      gaia-180*1
      gaia-181*1
      gaia-182*1

Linux gaia-179 3.2.0-4-amd64 unknown
 16:21:44 up 75 days, 17:53,  1 user,  load average: 0.00, 0.00, 0.00
0 [16:21:44] oborysov@gaia-179(gaia-cluster) ~> module load mpi/OpenMPI/1.8.4-GC
C-4.9.2
0 [16:21:50] oborysov@gaia-179(gaia-cluster) ~> mpirun -np 4 ./MonteCarlo2 -mach
inefile $PBS_NODEFILE
Type number of steps
100000000
myid = 2: device used = 2
myid = 1: device used = 1
myid = 3: device used = 3
myid = 0: device used = 0
Calculated PI is = 3.141096.
 Time= 39.825703
0 [16:22:49] oborysov@gaia-179(gaia-cluster) ~> mpirun -np 3 ./MonteCarlo2 -mach
inefile $PBS_NODEFILE
Type number of steps
100000000
myid = 1: device used = 1
myid = 2: device used = 2
myid = 0: device used = 0
Calculated PI is = 3.141509.
 Time= 45.962257
```



Task3

single host thread + CUDA (multiple GPUs/host)

compile command: nvcc MonteCarlo3.cu -o MonteCarlo3

run command: ./MonteCarlo3

File MonteCarlo3.cu contains the program code.

File plot_data3.txt contains the measurements of tests.