CSCI596_HW8
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OpenMP Target Offload Computation of p
Code of omp_teams_pi.c

```c
#include <omp.h>
#include <stdio.h>
#define NTMS 12
#define NBIN 1000000
#define NTRD 96

int main() {
    float step,sum=0.0,pi;
    step = 1.0/(float)NBIN;
    float sum_teams[NTMS];
    for (int j=0; j<NTMS; j++) sum_teams[j] = 0.0;

    // #pragma omp target map(step,sum)
    #pragma omp target teams map(step,sum_teams) num_teams(NTMS)
    {
        #pragma omp distribute
        for (int j=0; j<NTMS; j++) {
            long long ibgn = NBIN/NTMS*j;
            long long iend = NBIN/NTMS*(j+1);
            if (j == NTMS-1) iend = NBIN;
            // # pragma omp parallel for reduction(+:sum) num_threads(NTRD)
            # pragma omp parallel for reduction(+:sum_teams[j]) num_threads(NTRD)
            // for (long long i=0; i<NBIN; i++) {
            for (long long i=ibgn; i<iend; i++) {
                float x = (i+0.5)*step;
                // sum += 4.0/(1.0+x*x);
                sum_teams[j] += 4.0/(1.0+x*x);
            }
        } // End omp Distribute
    } // End omp Target

    for (int j=0; j<NTMS; j++) sum += sum_teams[j];

    pi = sum*step;
    printf("PI = %f\n",pi);
    return 0;
}
```

Result:

```
[cancan@discovery2 as08]$ clang -fopenmp -fopenmp-targets=nvptx64-nvidia-cuda -X
openmp-target -march=sm_70 -X -gcc-toolchain=/spack/apps/gcc/8.3.0 omp_teams_pi.c
-o omp_teams_pi
ptxas /tmp/omp_teams_pi-94027a.s, line 1772; warning : Instruction 'vote' withou
t '.sync' may produce unpredictable results on sm_70 and later architectures
ptxas /tmp/omp_teams_pi-94027a.s, line 1772; warning : Instruction 'vote' withou
t '.sync' is deprecated since PTX ISA version 6.0 and will be discontinued in a
future PTX ISA version
[cancan@discovery2 as08]$ ls
omp_teams_pi  omp_teams_pi.c
[cancan@discovery2 as08]$ salloc --partition=gpu --gres=gpu:v100:1 --time=00:30:
00
salloc: Pending job allocation 6681207
salloc: job 6681207 queued and waiting for resources
salloc: job 6681207 has been allocated resources
salloc: Granted job allocation 6681207
salloc: Waiting for resource configuration
salloc: Nodes d13-02 are ready for job
[cancan@d13-02 as08]$ ./omp_teams_pi
PI = 3.141593
[cancan@d13-02 as08]$
```

(Optional) DPC++ Computation of p

```
u115660@login-2:~$ ls
as08  cs596  tmp
u115660@login-2:~$ cd cs596
u115660@login-2:~/cs596$ ls
pi.cpp
u115660@login-2:~/cs596$ dpcpp -o pi pi.cpp
u115660@login-2:~/cs596$ qsub -I -l nodes=1:gpu:ppn=2
qsub: waiting for job 1019479.v-qsvr-1.aidevcloud to start
qsub: job 1019479.v-qsvr-1.aidevcloud ready

########################################################################
#      Date:              Mon 15 Nov 2021 11:27:14 PM PST
#      Job ID:            1019479.v-qsvr-1.aidevcloud
#      User:              u115660
# Resources:             neednodes=1:gpu:ppn=2,nodes=1:gpu:ppn=2,walltime=06:00:
00
########################################################################

u115660@s001-n160:~$ ./pi
-bash: ./pi: No such file or directory
u115660@s001-n160:~$ ls
as08  cs596  tmp
u115660@s001-n160:~$ cd cs596
u115660@s001-n160:~/cs596$ ls
pi  pi.cpp
u115660@s001-n160:~/cs596$ ./pi
Running on: Intel(R) UHD Graphics P630 [0x3e96]
Pi = 3.14159
u115660@s001-n160:~/cs596$
```