

Princeton GPU Hackathon

EcoSLIM

Members

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Mentors

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Progress and Goals

- **What have you accomplished since June 2?**
 - Scan part was finished by writing a wrapper calling `inclusive_scan` in Thrust.
 - Carl figured out an in-place compaction/scatter to deal with the huge number of particles on GPU which is memory limited. (100-million*20 double precision)
 - We wrote the kernel and preliminarily tested it.
- **What are your goals for the day?**
 - To fix the race condition issue and update test.
 - Working with Troy for long-term maintenance of the code by using cmake.

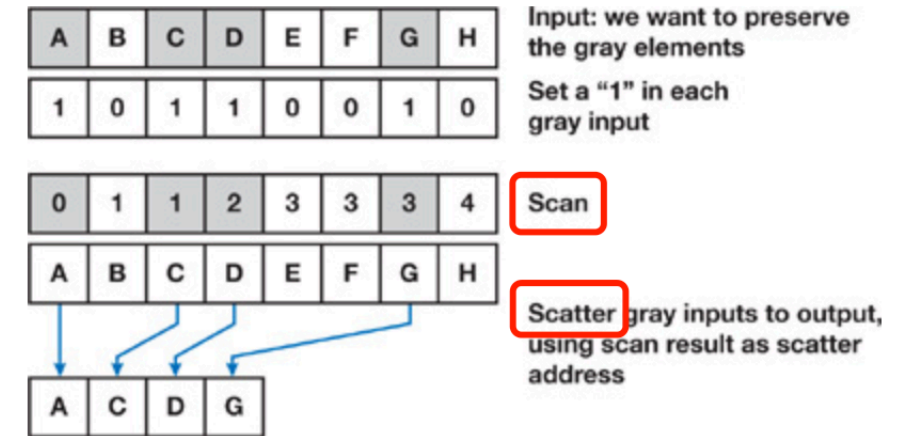
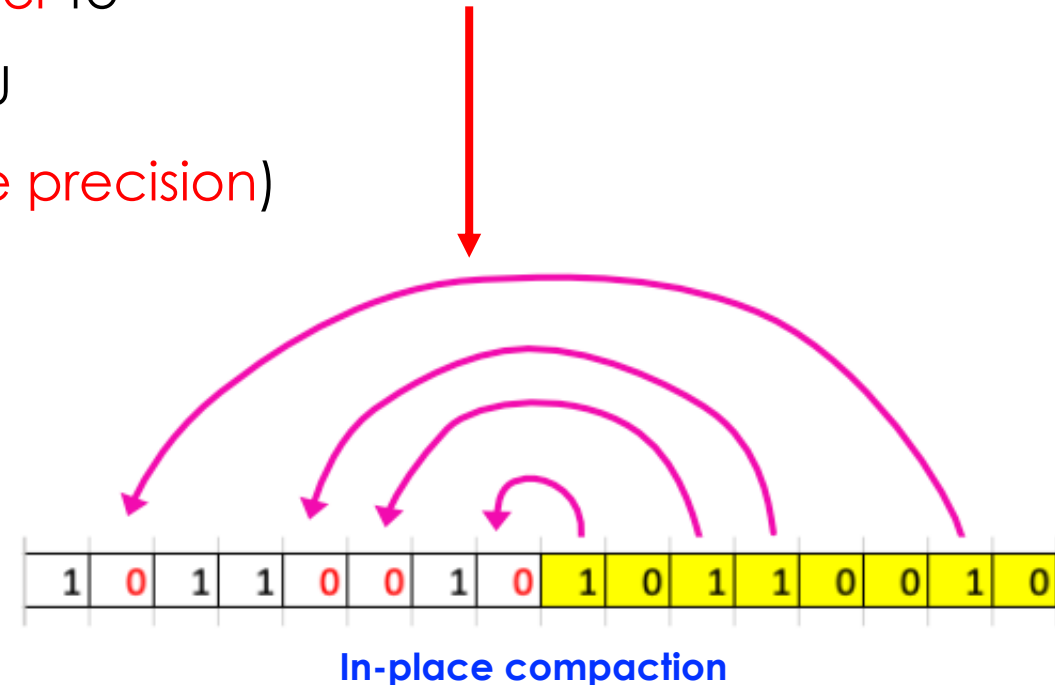


Figure 39-10 Scan and Scatter



1s*8760*40/3600/24=4days saved

Profiler Output

The test results using an array of size 80,000,000*10 for serial and parallel codes:

Environment (Della-GPU cluster): AMD EPYC 7H12 64-Core Processor, NVIDIA A100 GPU, nvhpc/21.1, cudatoolkit/11.1

a. the parallel code used 10.685 ms, the serial code used 1445.623 ms, so the speedup is **135-fold**(1445.623/10.685)

b. considering that it is not necessary to transfer data if using parallel code on GPU, it is **190-fold**((1445.623+344.304+244.287)/10.685)

Currently, just timing; Try to use profilers such as Nsight in the following days.

```
istat = cudaEventRecord(startEvent, 0)
```

```
gpuData = cpuData
```

```
istat = cudaEventRecord(stopEvent, 0)
```

```
istat = cudaEventSynchronize(stopEvent)
```

```
istat = cudaEventElapsedTime(time1, startEvent, stopEvent)
```

Problems and Solutions

- What problems are you currently facing?

Race condition

separate it to two kernels

- Have you resolved any problems (or found bugs) that others might find useful?

Multi-GPU with MPI code can run on Della-GPU with help of Jon, Gabe, and Troy.

Currently Loaded Modulefiles:

1) nvhpc/21.1 2) openmpi/nvhpc-21.1/4.1.0 3) cudatoolkit/11.1

srun: error: della-i14g10: tasks 0-1: Illegal instruction (core dumped)

srun: launch/slurm: _step_signal: Terminating StepId=34784447.0

srun: error: della-i14g11: tasks 2-3: Illegal instruction (core dumped)

```
ii = (blockIdx%x - 1) * blockDim%x + threadIdx%x
if(ii <= numElements .and. idnint(d_isValid(ii)) == 0) then
  holes(ii - idnint(d_indices(ii))) = ii
end if

!ii = numElements - ii + 1
ii2 = idnint(d_indices(numElements)) - idnint(d_indices(ii)) + 1

if(ii <= numElements .and. idnint(d_isValid(ii)) > 0 .and. &
  holes(ii2) <= idnint(d_indices(numElements)) .and. &
  holes(ii2) >= 1) then
  do j = 1, n_attri-2
    d_in(holes(ii2),j) = d_in(ii,j)
  enddo
end if
```

can't guarantee work all the time