Lab.- Advanced OpenMP Vectorization

TACC OpenMP Team

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These slides & Labs: tinyurl.com/tacc-openmp

Getting started

- Log on to Lonestar 5 with your account

```
ssh <your_tacc_login>@ls5.tacc.utexas.edu
```

- Access a node for 60 minutes, for your lab work

```
idev -m 60 -A TRAINING-HPC
```

- Untar lab_simd.tar.gz file in ~train00

```
tar -xvf ~train00/lab_simd.tar.gz
cd simd
```

Examples of no vectorization

- Go to the no_vect folder
- For each one of the examples:
  - `icc exampleX.cpp -o exampleX -vec-report=6`
- Look at the vectorization report (exampleX.optrpt)
- Does the loop vectorize?

Examples of vectorization

- Go to the vect folder
- Compile **1_vectorize.cpp**

```
icc 1_vectorize.cpp -o 1_vectorize -vec-report=6
```

- Read the vectorizationreport
- Change **aligned_function** so that the loop (line 68) can be efficiently vectorized:
  - Remember the _mm_malloc/_mm_free instructions
  - Use the OpenMP SIMD construct to inform the compiler about the alignment
  - Add the **-openmp** flag to the compiler

Examples of vectorization

- `2_simd_declaration.cpp` is similar to `1_vectorize.cpp`, but the main kernel has been moved into a function
- Using OpenMP SIMD declaration, properly decorate the kernel function
  - Each variable should be described (linear, uniform)
  - Is the kernel function invoked from within a branch?