Kokkos Training
Welcome

Helen He, Rahul Gayatri, NERSC
April 25, 2024
Kokkos Training

- C++-based programming model for writing performance portable applications
- Part of the NERSC/OLCF/ALCF Performance Portability Series

**Session** | **Date**
--- | ---
Advanced SYCL Techniques and Best Practices | May 30, 2023
HIP Training Series | August - October 2023
OpenMP Offload 2023 training, Part 1: Basics of Offload | September 29, 2023
OpenMP Offload 2023 training, Part 2: Optimization and Data Movement | October 6, 2023
Raja | October 10, 2023
Performance Portability for Next-Generation Heterogeneous Systems | February 26, 2024
AMReX | March 14, 2024
Kokkos | April 25-26, 2024
OpenMP Training Series | May - October, 2024
Other solutions | TBD

SYCL: TBD
HPX: TBD
A few Upcoming Trainings

- **Kokkos 4.3 Release Briefing, April 29**
- **ALCF AI Testbed Training Workshops, May - June**
  - 2 more sessions, registration due May 1
- **OpenMP Training Series, May 6 - October 28**
  - Also part of the NERSC/OLCF/ALCF Performance Portability Series
  - Monthly training sessions. First session starts May 6
- **Debugging Challenging Memory and GPU Problems with TotalView, May 13**
- **NERSC GPU Hackathon, August 13-22**
  - Application deadline May 8
Some Logistics

- Users are muted upon joining Zoom due to large number of attendees
- Please change your name in Zoom session as “first_name last_name (nersc_user_name)”, such as “Helen He (yunhe)”
  - Click “Participants”, then “More” next to your name to rename.
- You can click the CC button to toggle captions and view full transcript
- Slides will be uploaded soon. Recording to be available in a few days
  - https://www.nersc.gov/portability-series-kokkos-apr2024/
- Please ask your questions in GDoc (preferred over Zoom chat)
  - https://tinyurl.com/99k548je
- Please help us improve by answering the survey
  - https://tinyurl.com/57e3c6vy
- Slack channel for Q&A after this training
Agenda (Day 1)

**New Users** (Main Zoom room)
- Kokkos Introduction and simple parallel patterns  
  - Rahul Gayatri (NERSC)
- Kokkos Data abstractions + Execution and Memory Spaces  
  - Bruno Turcksin (OLCF)

**Advanced Users** (Breakout 1)
- Hierarchical Parallelism  
  - DongHun Lee (Sandia National Lab)
- Scratch Memory  
  - Conrad Clevenger (Sandia National Lab)
- Reductions  
  - Daniel Arndt (OLCF)
Agenda (Day 2)

**New Users** (Main Zoom room)
- Multi-dimensional Range parallelism
  - Rahul Gayatri (NERSC)
- Hierarchical Parallelism
  - Bruno Turcksin (OLCF)

**Advanced Users** (Breakout 1)
- Kokkos Tools
  - Vivek Kale (Sandia National Lab)
  - John Mellor-Crummey (Rice Univ)
  - Kevin Huck (Univ of Oregon)
  - Sameer Shende (Univ of Oregon)
  - Daniel Arndt (OLCF)
Kokkos Materials

● Primary GitHub repo [https://github.com/kokkos](https://github.com/kokkos)
● Documentation: [https://kokkos.github.io/kokkos-core-wiki](https://kokkos.github.io/kokkos-core-wiki)
● **Kokkos Lecture Series**
● **Hands-on exercises**
● Join the Kokkos slack [https://kokkosteam.slack.com](https://kokkosteam.slack.com)
  ○ #doe-portability-training channel
Access to Perlmutter and Use Kokkos Module

- NERSC users have been added to ntrain9 project
- Non-users were sent the instruction to get a training account
  - Account valid through May 2
- Login to Perlmutter: ssh username@perlmutter.nersc.gov
- Kokkos modules:
  - % module use /global/common/software/nersc/pe/modulefiles/latest
  - % module load kokkos-cpu/4.3.00 (CPU module)
  - % module load kokkos-gpu/4.3.00 (GPU module)
- Running Jobs examples:
  - https://docs.nersc.gov/jobs/
Compute Node Reservations

- **GPU node reservation**: 10 am -1 pm Pacific, Fri Apr 26
  - To use 1 GPU only (sample flags for sbatch or salloc):
    - `-A ntrain9 --reservation=kokkos -C gpu -N 1 -c 32 -G 1 -t 30:00 -q shared`
  - To use multiple nodes (sample flags for sbatch or salloc):
    - `-A ntrain9 --reservation=kokkos -C gpu -N 2 -t 30:00 -q regular`

- **Outside of reservation, use**:
  - To use 1 GPU only (sample flags for sbatch or salloc):
    - `-A <project> -C gpu -N 1 -c 32 -G 1 -t 30:00 -q shared`
  - To use multiple nodes (sample flags for sbatch or salloc):
    - `-A <project> -C gpu -N 2 -t 30:00 -q regular` (or `-q interactive` for salloc)