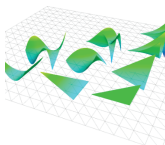
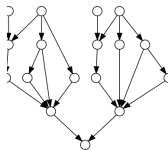


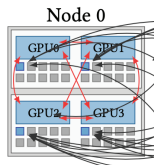
# NUWEST: NNSA-University Workshop on Exascale Simulation Technologies



```
comm = comm1.COMM_WORLD
bufs = ...
requests = [comm.Irecv(
    for i, n in
)]
# do other work
...
for i, r in enumerate(r
    r.wait()
    processP(bufs[i])
```

$$\partial_r f \approx \sum_{\ell=1}^n D_{i\ell} f_{\ell j}$$

$$\partial_s f \approx \sum_{\ell=1}^n D_{j\ell} f_{i\ell}$$



January 18, 2024

Luke Olson

University of Illinois Urbana-Champaign

# NUWEST's Goal

To share ideas on tools for exascale predictive science

- ▶ Showcase and characterize available technologies
- ▶ Identify challenges and limitations
- ▶ Provide opportunities to initiate collaboration
- ▶ Focus on **hands-on experience** — technologies to look at in detail

# Schedule

<https://illinois-ceeds.github.io/nuwest/>

- ▶ **Keynote 1** [Christian Trott, Sandia]
- ▶ **Keynote 2** [Bill Gropp, Illinois]
- ▶ **Conceptual Overview** (4× 10–12 min, morning/afternoon) **Ballroom**
- ▶ Small group interactions: **hands-on** (2h window) **In parallel**

## Morning:

- Scalable and portable HPC in Python using Parla and PyKokkos George Biros, University of Texas at Austin
  - Parsl - Python based workflow management Daniel S. Katz, Doug Friedel, University of Illinois Urbana-Champaign
  - Pragmatic performance-portable solids and fluids  
with Ratel, libCEED, and PETSc Jed Brown, University of Colorado Boulder
  - CUnumeric and Legion Charlelie Laurent, Stanford University
- ▶ View as 1 hour + 1 hour: try another session at the 1 hour mark!

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## Afternoon:

- **OpenCilk: A Modular and Extensible Software Infrastructure for Fast Task-Parallel Code** Tao Schardl, Massachusetts Institute of Technology
  - **MIRGE – A lazy evaluation framework in Python** Andreas Kloeckner, University of Illinois Urbana-Champaign
  - **MPI Advance - Optimizations and Extensions to MPI** Purushotham V. Bangalore, University of Alabama
  - **Acceleration and Abstraction of Python based Monte Carlo Compute Kernels for Heterogeneous machines via Numba** Joanna Piper Morgan, Oregon State University
- ▶ View as 1 hour + 1 hour: try another session at the 1 hour mark!

# Logistics

- ▶ <https://illinois-ceeds.github.io/nuwest>
- ▶ Contact Luke Olson ([lukeo@illinois.edu](mailto:lukeo@illinois.edu)) or Courtney McLearn ([cmcleari@illinois.edu](mailto:cmcleari@illinois.edu)).
- ▶ See Slack for announcements
- ▶ 0800-0900 Keynotes
- ▶ 0900-1200 Morning session
- ▶ 1200-1300 Lunch (on site)
- ▶ 1300-1600 Afternoon session
- ▶ 1600-1700 Closing + collaboration time
- ▶ 1700-1900 Optional social @ Bow & Arrow Brewing Co.

# Some questions to think about...

- ▶ What ideas are working for actual simulations?
- ▶ Any pivots needed?
- ▶ What are lab needs?
- ▶ What are barriers for adoption on conceivable hardware?
- ▶ How do tools improve with end-to-end simulation workflows?

# Questions?

This material is based in part upon work supported by the Department of Energy, National Nuclear Security Administration, under Award Number DE-NA0003963.