Performance Update
E3SM 2019 March Madness Edition

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• Prepare for new architectures
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  – A21 (newly announced Intel Xeon SP with Xe GPU, Shasta/slingshot, memory innov)
  – Trend?
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- Monitor/measure performance
  - Standard benchmarks
  - Performance tools
Performance Analytics for Climate Experiments

Infrastructure to provide executive summary of experiments performance.

- Harvest/collect performance of all sims
  - Also collateral data to sell
- Central hub of performance data
- Interactively deep-dive as desired
- Facilitate performance research
- User input, existing scripts

Summary Performance Graphs

https://pace.ornl.gov

Atmosphere model time distribution

Load Balance: MPI Task Mapping
Status

• Phase 2 Baseline Benchmarks
  – E3SM metric to track over time
  – How best to present/utilize this data?

• Ongoing work high-res
  – MPAS, RRTMG
  – Threading (MPAS)

• Initial profiles/optimization of BGC configuration
  – I/O bound

• I/O
  – PIO2, ADIOS
  – Substantially better performance

• KNL dead to us
  – Well, maybe some vector/thread improvements still needed
GPU Strategy

• Short term: 737-MAX model
  – Not a different model
    • No need for additional training
    • Porting exercise
  – Software to hide details
    • Kokkos
    • OpenACC/OpenMP
  – Issues
    • How much to port (eg v1 physics)

• Longer term
  – Utilize GPU differently
  – Subgrid models (SAM, ocean ML)
  – Task parallelism to split work across devices
Related sessions

- Performance breakouts (3p today, 10a tomorrow)
  - Input on how to best use/present perf data
  - Input on v1 physics
- Discussions in SCREAM, Algorithm NGD
- Remember Deep Dives 4:30 tomorrow