OOKAMI PROJECT APPLICATION

Date:

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Project Title:

Climate and weather models on A64FX

Usage:

- Testbed

Principal Investigator: V. Balaji

- University/Company/Institute: Cooperative Institute for Modeling the Earth System (CIMES)
- Mailing address including country: Sayre Hall, 300 Forrestal Road, Princeton University, Princeton NJ 08544.
- Phone number: +1 609-258-1311
- Email: `balaji@princeton.edu`

Names & Email of initial project users:

- PI: V. Balaji, `balaji@princeton.edu`
- Co-Investigators: Robert Knight, `knight@princeton.edu`, Rusty Benson, `rusty.benson@noaa.gov`, Tom Robinson, `thomas.robinson@noaa.gov`, Niki Zadeh, `niki,zadeh@noaa.gov`

Usage Description:

Princeton University's Cooperative Institute for Modeling the Earth System (CIMES), in conjunction with NOAA's Geophysical Fluid Dynamics Laboratory (NOAA/GFDL) builds some of the world's leading models for simulation of weather and climate. GFDL dynamical cores for the atmosphere FV3, and MOM6 for the ocean, are considered the state of the art, and have been adopted as operational model components by the US National Weather Service. These

models also form the basis for GFDL-CM4 and GFDL-ESM4, which are considered among the best (the best in fact on several measures of skill) in the world in the current model comparison exercise CMIP6. The models routinely run on some of the world's largest computers, including NOAA's Gaea system in Oak Ridge National Labs (currently Intel Broadwell), and the newly installed Stellar system at Princeton University (AMD Rome). The codes are built on a common parallel infrastructure, the Flexible Modeling System (FMS), and are routinely used in acquisition benchmarks. FMS is built on a platform of MPI and OpenMP and contain vector loops well suited to the A64FX long vector instructions.

We propose to use some standard configurations of GFDL FMS models for an exploration of comparative performance of these models in relation to current processors such as AMD Rome and Intel Cascade Lake, on which the models have already been benchmarked. A typical benchmark run of these models will use the GFDL-FV3 dynamical core Perturbed Baroclinic test configuration covering the Earth using a cubed-sphere mesh at 50 km resolution. The test will study strong scaling of this configuration and others on single or multi-node systems, at single or double-precision floating point. Typical test configurations will test scaling and integrity under checkpoint/restart (native capability, no additional software requirement). Tests can scale from 1 to 10s of nodes.

Computational Resources:

- Total node hours per year: 960
- Size (nodes) and duration (hours) for a typical batch job: 1-2 nodes, 1 hour wallclock for a 1-month simulation.
- Disk space (home, project, scratch): 1.5 TB.

Personnel Resources:

No additional personnel will be needed from Ookami beyond standard system administration and helpdesk services.

Required software:

- Compilers: GNU, CCE (Cray), Nvidia, Fujitsu
- I/O libraries: netCDF, HDF5
- System software: MPI, ddt, Singularity/docker (if available)

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