

OOKAMI PROJECT APPLICATION

Date: May 17, 2021

Project Title: Next-generation Models for the Event Horizon Telescope

Usage: Testbed

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Usage Description:

The project aims to create a library of high-resolution global simulations of the accretion of matter onto spinning black holes. This will involve optimizing a new GPU-based code for General-Relativistic Magnetohydrodynamics (GRMHD) called KHARMA for present upcoming system architectures.

KHARMA is an implementation of HARM (Gammie et al 2003): a simple, fast method of solving the GRMHD equations on Eulerian regular meshes, established in, with tweaks applied over years of use in different contexts. KHARMA is written in C++, using the Kokkos performance portability framework to generate efficient code for CPUs or GPUs.

Ookami presents a unique opportunity to test and improve performance of KHARMA on a new and intriguing architecture with the potential for widespread use in the future. It is beneficial to be able to do such tests now, early in KHARMA's development, while it is relatively easier to make changes and measure the effects of optimizations.

Computational Resources:

- Total node hours per year: 10k
- Size (nodes) and duration (hours) for a typical batch job: Usually 1-4 nodes, for development and per-node performance measurements. Very occasional scaling tests up to 64 nodes.
- Disk space (home, project, scratch): no home/project requirements beyond defaults. May use up to 10TB scratch space temporarily for simulation output.

Personnel Resources:

None required.

Required software:

C++14-capable compilers, MPI library. Kokkos, Parthenon, and Parallel HDF5 are traditionally compiled along with the software, but if system versions prove more performant they can be used.

If your research is supported by US federal agencies:

- Agency: NSF
 - Grant number(s): OISE 17-43747
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