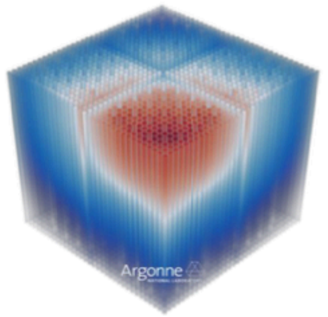
# Showcase

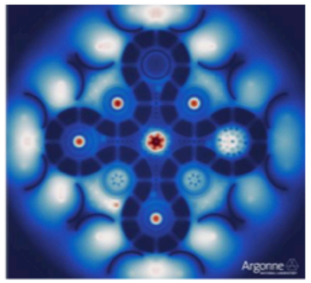
## ExaSMR: OpenMC Performance on Ponte Vecchio

Monte Carlo particle transport code for exascale computations

**Ponte Vecchio with OpenMP Target offload**

**2x performance lead**

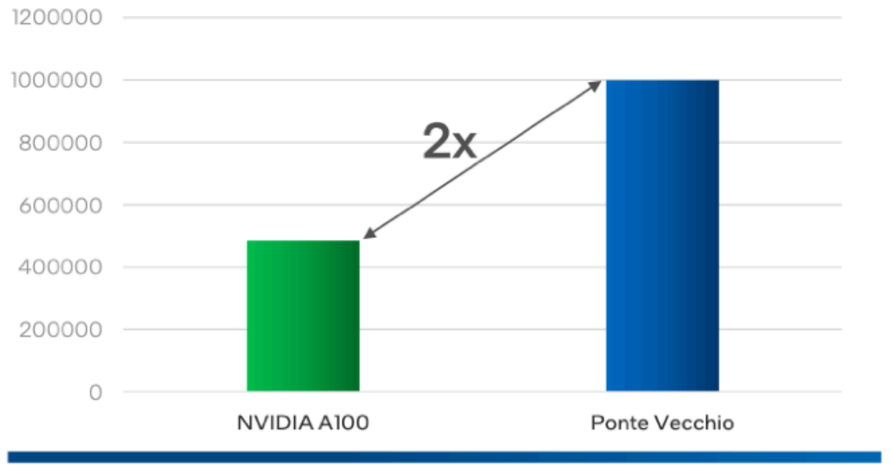



**Exascale Compute Project Annual Meeting 2022 presentation:**
https://www.alcf.anl.gov/events/2022-ecp-annual-meeting
**International Conference on Physics of Reactors 2022 presentation:**
https://www.ans.org/meetings/physor2022/session/view-976/

https://docs.openmc.org

OpenMC Depleted Fuel Inactive Batch Performance on HM-Large Reactor with 40M particles (particles/second, Higher is better)




**Application Summary:** OpenMC is a Monte Carlo particle transport application that has recently been ported to the OpenMP target offloading programming model for use on GPU-based systems. The Monte Carlo method employed by OpenMC is considered the "gold standard" for high-fidelity simulation while also having the advantage of being a general-purpose method able to simulate nearly any geometry or material without the need for domain-specific assumptions. However, despite the extreme advantages in ease of use and accuracy, Monte Carlo methods like those in OpenMC often suffer from a very high computational cost. The extreme performance gains OpenMC has achieved on GPUs, as compared to traditional CPU architectures, is finally bringing within reach a much larger class of problems that historically were deemed too expensive to simulate using Monte Carlo methods. The leap in performance that GPUs are now offering carries with it the potential to disrupt a number of engineering technology stacks that have traditionally been dominated by non-general deterministic methods. For instance, faster MC applications may greatly expand the design space and simplify the regulation process for new nuclear reactor designs -- potentially improving the economics of nuclear energy and therefore helping to solve the world's climate crisis.

HOT CHIPS

- See backup for workloads and configurations. Results may vary.
- Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.



intel.

H. Jiang, "Intel's Ponte Vecchio GPU : Architecture, Systems & Software," *2022 IEEE Hot Chips 34 Symposium (HCS)*, 2022, pp. 1-29, doi: 10.1109/HCS55958.2022.9895631.

# Student Opportunities

- DOE's: **Science Undergraduate Laboratory Internship (SULI)**
  - **Application**:
    - How to Apply
    - open **NOW**
    - **due January 9, 2024**

- Argonne's: **Student Research Participation Program (SRP)**
  - Applications for Spring 2024 **NOW OPEN !!**
  - Deadline: **Friday, October 27, 2023**

- **Reach out!**

**APPLY NOW!!**