Open MPI for Exascale (OMPI-X), David E. Bernholdt (ORNL) 1.3.1

Description and Scope

Project Description:

This project focuses on preparing the MPI standard and its implementation in Open MPI for exascale through improvements in scalability, capability, and resilience.

ECP Scope

Our work will address a broad spectrum of issues in both the standard and the implementation: (1) runtime interoperability for MPI+X and beyond, (2) extending the MPI standard to better support coming exascale architectures, (3) improvements to Open MPI scalability and performance, (4) support for more dynamic execution environments, (5) resilience in MPI and Open MPI, (6) MPI tools interfaces, and (7) quality assurance.

Maturity Level and Accessibility

Maturity Indicators and Metrics

- *Open MPI is a widely used, high-quality, comprehensive, community-based open source implementation of the MPI standard.*
- *Open MPI was created in 2003 based on ideas from four earlier institutionally-based MPI implementations*

Accessibility

- *Releases: https://www.open-mpi.org/software/*
- *Repository: https://github.com/open-mpi/ompi*
- *Releases under a modified BSD license*

Current users

- *Also the basis for commercial MPI offerings from Mellanox, Cisco, Fujitsu, Bull, and IBM (transition in progress)*

Collaborators

Potential or likely ties to other ECP Projects

- *Use of MPI is nearly ubiquitous in ECP projects in the AD, CD, and ST areas*
- *We expect to obtain input from a broad cross-section of ECP projects using MPI*
- *We seek to partner more closely with a smaller number of projects that can help motivate and validate our work on the MPI standard and the Open MPI implementation of it. (see ECP Scope, at left)*

Synergistic projects

- *Exascale MPI (focuses on MPICH implementation of MPI)*
- *SOLLVE, Enhancing Qthreads, and other projects (MPI+X interoperability)*
- *Memory hierarchiy management (multiple projects)*
- *Resilience, including checkpoint/restart (multiple projects)*

First Year Development Plan

- *Requirements gathering from AD, CD, ST, and NNSA ATDM projects*
- *Identify and implement variables to be reported through MPI_T interface*
- *Identify and obtain/implement tooling needed for internal performance/scalability studies*
- *Initial design of MPI+X interoperability interface(s)*
- *Implement and evaluate MPI Finepoints prototype*
- *Integrate ULFM impl. into Open MPI dev. tree, build scalable resilience primitives*
- *Identify/implement metrics/data to support intelligent process placement strategies*
- *Implement and evaluate more scalable startup (PMIx + SCON)*