Why MPI is the best communication library?

Made by Anna Polova

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top most popular communication libraries in hpc

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AI Overview

The top and most popular communication libraries in High-Performance Computing (HPC) are implementations of the Message Passing Interface (MPI), such as Open MPI, Intel MPI, and MVAPICH2, which provide a standard for distributed memory parallel programming. For GPU-accelerated workloads, specialized libraries like NVIDIA Collective Communications Library (NCCL) and ROCm Communication Collectives Library (RCCL) are crucial for efficient collective operations, while the Unified Collective Communication (UCC) library and Libfabric offer more generic and versatile options for various fabrics and GPUs.

HiCCL: A Hierarchical Collective Communication Library - arXiv

Aug 12, 2024 — Communication libraries in high-performance computing (HPC) for…

arXiv

Set up Message Passing Interface (MPI) for HPC …

Sep 17, 2024 — The Message Passing Interface (MPI) is a…

What is MPI?

Message Passing Interface (MPI) is a standard for communication in high-performance computing, defining a common set of operations that every MPI library must implement to ensure compatibility.

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MPI_Send/MPI_Recv

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MPI_Bsend

MPI_Ssend

MPI_Isend/MPI_Irecv

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MPI_Gather

MPI_Reduce

MPI_Scatter

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MPI_Put/MPI_Get

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MPI_Reduce

MPI_Barrier

AND MUCH, MUCH MORE…

MPI_Scatter

MPI_Put/MPI_Get

MPI is a standard – not a library!

What makes it so great?

- Scales from laptops to the world’s largest supercomputers
- Optimized by all major hardware vendors
- Supports GPU Direct and hybrid models (MPI + OpenMP, CUDA, SYCL)
- Rich communication features: collectives, one-sided, persistent ops
- Portable: same code runs on many systems and networks
- Actively developed and future-proof
- Proven stability: 30+ years powering scientific breakthroughs

Molecular Dynamics

Astrophysics

Climate modeling

Engineering Simulations

MPI has widespread application in fields which require massive computation resources

Particle Physics

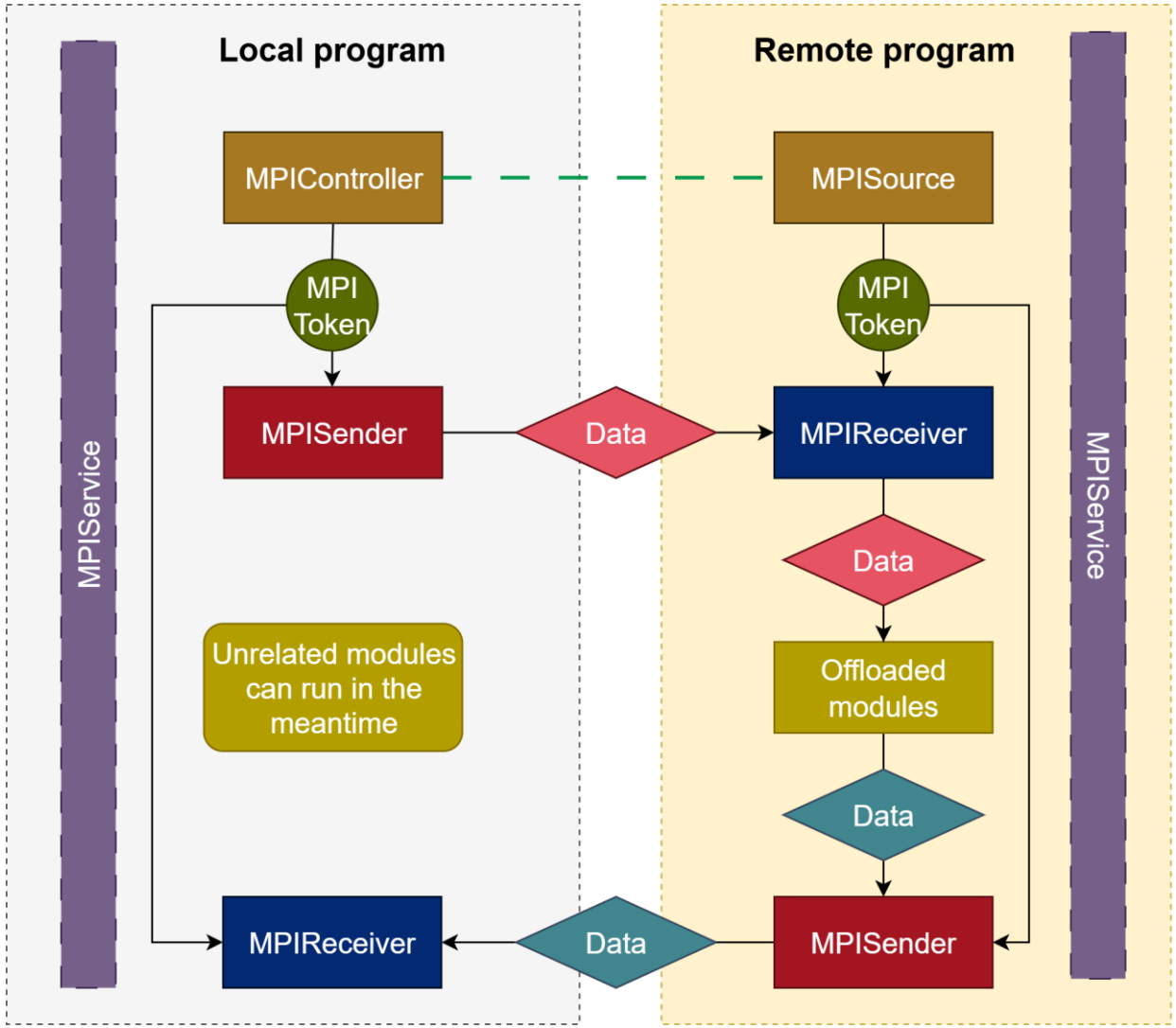
Seismology

Fluid Dynamics

Bioinformatics

Our work for CMSSW

We are now integrating MPI into event processing pipelines as part of NGT project to leverage remote accelerators when local GPU resources are insufficient



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