Overview

HPE Message Passing Interface (MPI)

The HPE Message Passing Interface (MPI) is an MPI development environment designed to enable the development and optimization of high performance computing (HPC) applications. The HPE Message Passing Interface (MPI) leverages a scalable MPI library and boosts performance of existing MPI applications on HPE HPC clusters without requiring recompilation.
The HPE Message Passing Interface (MPI) accelerates application performance by:

- Taking full advantage of the underlying server infrastructure.
- Tuning applications at runtime without requiring recompiling the code - including applications developed with other MPI implementations. Restricting the number of processor and memory resources used for a specific process, or set of processes, to avoid oversubscribing the system and possible interference between applications.
- Improve performance for I/O intensive applications without recompiling or retooling the software logic.
- Enable data placement to specific memory locations to limit communications overhead.
- Providing access to tools and libraries for application profiling and analysis helping to identify performance bottlenecks and load imbalances as well as guided placements for threads.
- HPE Message Passing Interface (MPI) v 1.9.4

What's New

- Support for RHEL 8.8 & 9.2, SLES 15 SP5 and Rocky Linux 8.8 & 9.2
- Support for HPE Compute Scale-up Servers 3200

Models

Licensing and Media Options

HPE Performance Message Passing Interface for 1 Socket 3yr Support LTU — Q2A48A

Notes:

- One license per socket.
- Includes three (3) years of HPE Services support.
- Please contact HPE Services for 4 and 5 year support options.

HPE Message Passing Interface (MPI) Media Kit — Q5U69A

Notes: One media kit per solution.

HPE Performance Message Passing Interface FIO — Q8K21A

Notes:

- For factory installation only; this SKU does not include the software license. Please order with PN Q2A48A.
- Order one PN per node.

Distribution Media and Software Documentation

Please select HPE Performance Message Passing Interface Media Kit (Part Number Q5U69A) to order the DVD.

HPE Message Passing Interface (MPI) software is also available for download. Upon receiving their order, customers will receive a physical document, which includes the website URL and additional license information. Software will be available for download via the Software Updates and Licensing Portal.

Patches may be required and will be delivered via the Software Download Repository. Release notes will be made available for any patches issued to customers.

Factory installation is available for the HPE SGI 8600, Apollo 20 and Apollo 40 systems. Additional platforms are not supported at this time. Please select PN Q8K21A for factory installation.

Customers may also download user guides and other documentation at **www.hpe.com/software/mpi**

Standard Features

Software Specifications

Standards & Programming Languages

HPE Message Passing Interface (MPI) is compliant with these standards:

- MPI-3.1
- OpenSHMEM 1.4

The Message Passing Interface (MPI) standard supports C, C++ and Fortran programs with a library and supporting commands. MPI operates through a technique known as “message passing,” which is the use of library calls to request data delivery from one process to another, or between groups of processes. MPI also supports parallel file I/O and remote memory access (RMA).

In addition, HPE Message Passing Interface (MPI) supports the OpenSHMEM 1.4 standard. The OpenSHMEM standard describes a low-latency library that supports RMA on symmetric memory in parallel environments. The OpenSHMEM programming model is a partitioned global address space (PGAS) programming model that presents distributed processes with symmetric arrays that are accessible via PUT and GET operations.

Support for the MPI and OpenSHMEM standards is built on top of a message passing toolkit (MPT), which is available within the HPE Message Passing Interface (MPI).

Operating System Compatibility

The HPE Message Passing Interface (MPI) is operational on:

- Red Hat Enterprise Linux (RHEL) 8.7, 8.8, 9.1 & 9.2 on x86_64 platforms; RHEL 8.8 & 9.2 on aarch64 platforms
- SUSE Linux Enterprise Server (SLES) 15 SP4 & SLES15 SP5 on x86_64 platforms; SLES15 SP5 on aarch64 platforms
- Rocky Linux 8.7, 8.8, 9.1 & 9.2; Rocky Linux 8.8 & 9.2 on aarch64 platforms
- SELinux

Supported Hardware

The HPE Message Passing Interface (MPI) is supported on the following HPE systems:

- HPE SGI 8600
- HPE Apollo Systems, including the Apollo 2000, 6000 and 6500 (Gen9, Gen10 and Gen10+)
- HPE Apollo 20 and 40 systems
- ARM processor-based Apollo 70 and 80 systems
- HPE ProLiant DL360, DL380, DL385
- HPE Integrity MC990X, HPE Superdome Flex family, and HPE Compute Scale-up Servers

Fabric Support

The HPE Message Passing Interface supports all major interconnects/ fabrics over multiple generations and does not require changes to software environment. Comprehensive fabric support and corresponding features make HPE Message Passing Interface (MPI) an ideal MPI library for HPE high performance computing systems.
Fabric support includes:

- Multi-rail Intel® Omni-Path
- Multi-rail Mellanox Infiniband™

Data transfer optimization for HPE-proprietary HPE Superdome Flex Grid where available, including single-copy data transfer TCP/IP

Standard Features

Third Party Software Integration

HPE Message Passing Interface (MPI) allows for tight integration with third-party debugging and profiling tools, as well as workload schedulers and fabric software. Such applications include:

Compilers & Debuggers:

- Intel Parallel Studio XE*
- PGI Professional Edition
- Allinea Forge*
- Rogue Wave TotalView*
- Tuning and Analysis Utilities (TAU), Vampir
- GCC, Gfortran, GDB

Workload Management Tools:

- Altair PBS Professional*
- SLURM
- Univa Grid Engine
- IBM Spectrum LSF
- Adaptive Computing Moab/ TORQUE

Fabric Software:

- Mellanox Fabric Collective Accelerator (FCA)

Notes:*3rd party software solutions sold by HPE.

Interoperability with Other MPI Solutions

HPE Message Passing Interface (MPI) can optimize performance of applications compiled with the following MPI implementations:

- Intel® MPI
- IBM Spectrum MPI
- Open MPI
- Mellanox HPC-X MPI
- Cray MPI
- MPICH
- MVAPICH

HPE Message Passing Interface (MPI) Features

HPE Message Passing Interface (MPI) consists of the MPI library, message passing toolkit, and several complementary libraries and profiling and analysis tools that enable and speed development of scalable HPC applications.

The Message Passing Toolkit (MPT) is a high-performance communications middleware software that is a component of the HPE Message Passing Interface (MPI). This toolkit is the core of the HPE Message Passing Interface (MPI) performance engine as it provides the flexibility users need to develop and run MPI programs. The MPT increases the speed of an application from launch. The environment includes HPE-proprietary software that enables parallel applications to run on multiple hosts in a cluster, resulting in the ability to launch 100,000 cores in a matter of seconds.
The HPE MPI library accelerates performance of all HPE HPC systems and wide variety of interconnects (as per Specifications).

HPE Message Passing Interface (MPI) also includes a tool that uses a wrapper library to run applications compiled against other MPI implementations through MPT, without requiring the user to relink or recompile their code. This allows users with applications compiled against Cray MPI, Intel® MPI, IBM Spectrum MPI, Open MPI, Mellanox X-MPI, MPICH, MVAPICH
to still run their applications through the HPE Message Passing Interface (MPI) engine and increase overall application performance.

Standard Features

Application Performance Optimization

- HPE Message Passing Interface (MPI) accelerates application performance through tools designed to tune applications at runtime without recompiling code, as well as libraries which optimize performance through specialized algorithms.

- These tools and libraries allow customers to:
- Restrict the number of processor and memory resources used for a specific process, or set of processes to avoid oversubscribing the system and possible interference between applications.
- Improve performance for I/O intensive applications without recompiling or retooling the software logic.
- Enable data placement to specific memory locations to limit communications overhead.

Users also gain access to profiling and analysis tools with HPE Message Passing Interface (MPI). One such tool captures communication analytics, pinpoints bottlenecks and identifies load imbalances during the application run. Once the tool is implemented and the application completes its run, users will receive a file outlining key statistics from the run.

This information includes:

- Time spent in computation, communication and file I/O
- The size and number of each data request
- The size of the communicator used for collectives
- The number of times each rank was a root in a collective
- Size distributions
- Collective wait time and send late time

Users also have the option to analyze subsets of the application run by inserting start and stop commands into their program. The tool will begin analyzing the application run when the start command is executed and will generate the statistics file after the stop command is executed.

The profiling and analysis tools available within HPE Message Passing Interface (MPI) can be used for applications compiled against the Cray MPI, Intel® MPI, IBM Spectrum MPI, Open MPI, Mellanox X-MPI, MPICH and MVAPICH.

Additional features within the HPE Message Passing Interface (MPI) environment include a runtime tool to optimize processes and data placement on a set of nodes.

HPE Message Passing Interface (MPI) includes tools to optimize the placement of worker processes within the cluster. Users first run their application with HPE MPI's profiling tool to record the communication pattern between the workers. In future runs, the MPI's placement optimization tool takes this pattern information and combines it with information about where the application will be running to create a placement file assigning workers to specific locations in the cluster. This improves performance by putting workers that intercommunicate a lot close to each other, minimizing transfer costs.

It is important for HPE Message Passing Interface (MPI) fabric support to drive performance and resource optimizations, features include:

- Adding more resources to a running application with MPI spawn is available for systems using Intel® Omni-Path, Mellanox® InfiniBand, TCP/IP, and HPE Superdome Flex Grid technology
- Faster MPI performance for systems with NVIDIA® GPU with Mellanox® InfiniBand remote direct memory access (RDMA)
- Increase application performance by creating fewer memory copies and non-blocking activity with Mellanox InfiniBand™ tag matching

Standard Features

Software Licensing Information

For the Software to be valid on an HPE Cluster, each socket in the HPE Cluster must have a valid HPE Message Passing Interface (MPI) license. Software licensing information can be found at **https://www.hpe.com/us/en/software/licensing.html**. Subject to the terms and conditions of this Agreement and the payment of any applicable license fee, Hewlett Packard Enterprise grants a non-exclusive, non-transferable license to use (as defined below), in object code form, one copy of the Software on one device (socket) at a time for internal business purposes, unless otherwise indicated above or in applicable Transaction Document(s). "Use" means to install, store, load, execute and display the Software in accordance with the Specifications.

Use of the Software is subject to these license terms and to the other restrictions specified by Hewlett Packard Enterprise in any other tangible or electronic documentation delivered or otherwise made available with or at the time of purchase of the Software, including license terms, warranty statements, Specifications, and "readme" or other informational files included in the Software itself. Such restrictions are hereby incorporated in this Agreement by reference.

Some Software may require license keys or contain other technical protection measures. HPE reserves the right to monitor compliance with Use restrictions remotely or otherwise. Hewlett Packard Enterprise may make a license management program available which records and reports license usage information. If so supplied, customer agrees to install and run such license management program beginning no later than one hundred and eighty (180) days from the date it is made available and continuing for the period that the Software is used.

Other terms of the HPE Software License are provided on the license agreement that is delivered with the HPE Message Passing Interface (MPI) software.

Service and Support

HPE Services

No matter where you are in your digital transformation journey, you can count on HPE Services to deliver the expertise you need when, where and how you need it. From planning to deployment, ongoing operations and beyond, our experts can help you realize your digital ambitions.

https://www.hpe.com/services

Consulting Services

No matter where you are in your journey to hybrid cloud, experts can help you map out your next steps. From determining what workloads should live where, to handling governance and compliance, to managing costs, our experts can help you optimize your operations.

https://www.hpe.com/services/consulting

HPE Managed Services

HPE runs your IT operations, providing services that monitor, operate, and optimize your infrastructure and applications, delivered consistently and globally to give you unified control and let you focus on innovation.

HPE Managed Services | HPE

Operational services

Optimize your entire IT environment and drive innovation. Manage day-to-day IT operational tasks while freeing up valuable time and resources. Meet service-level targets and business objectives with features designed to drive better business outcomes.

https://www.hpe.com/services/operational

HPE Complete Care Service

HPE Complete Care Service is a modular, edge-to-cloud IT environment service designed to help optimize your entire IT environment and achieve agreed upon IT outcomes and business goals through a personalized experience. All delivered by an assigned team of HPE Services experts. HPE Complete Care Service provides:

- A complete coverage approach -- edge to cloud
- An assigned HPE team
- Modular and fully personalized engagement
- Enhanced Incident Management experience with priority access
- Digitally enabled and AI driven customer experience

https://www.hpe.com/services/completecare

HPE Tech Care Service

HPE Tech Care Service is the operational support service experience for HPE products. The service goes beyond traditional support by providing access to product specific experts, an AI driven digital experience, and general technical guidance to not only reduce risk but constantly search for ways to do things better. HPE Tech Care Service delivers a customer-centric, AI driven, and digitally enabled customer experience to move your business forward. HPE Tech Care Service is available in three response levels. Basic, which provides 9x5 business hour availability and a 2-hour response time. Essential which provides a 15-minute response time 24x7 for most enterprise level customers, and Critical which includes a 6-hour repair commitment where available and outage management response for severity 1 incidents.

https://www.hpe.com/services/techcare

Service and Support

HPE Lifecycle Services

HPE Lifecycle Services provide a variety of options to help maintain your HPE systems and solutions at all stages of the product lifecycle. A few popular examples include:

- Lifecycle Install and Startup Services: Various levels for physical installation and power on, remote access setup, installation and startup, and enhanced installation services with the operating system.
- HPE Firmware Update Analysis Service: Recommendations for firmware revision levels for selected HPE products, taking into account the relevant revision dependencies within your IT environment.
- HPE Firmware Update Implementation Service: Implementation of firmware updates for selected HPE server, storage, and solution products, taking into account the relevant revision dependencies within your IT environment.
- Implementation assistance services: Highly trained technical service specialists to assist you with a variety of activities, ranging from design, implementation, and platform deployment to consolidation, migration, project management, and onsite technical forums.
- HPE Service Credits: Access to prepaid services for flexibility to choose from a variety of specialized service activities, including assessments, performance maintenance reviews, firmware management, professional services, and operational best practices.

Notes: To review the list of Lifecycle Services available for your product go to:
https://www.hpe.com/services/lifecycle

For a list of the most frequently purchased services using service credits, see the **HPE Service Credits Menu**

Other Related Services from HPE Services:

HPE Education Services

Training and certification designed for IT and business professionals across all industries. Broad catalogue of course offerings to expand skills and proficiencies in topics ranging from cloud and cybersecurity to AI and DevOps. Create learning paths to expand proficiency in a specific subject. Schedule training in a way that works best for your business with flexible continuous learning options.
https://www.hpe.com/services/training

Defective Media Retention

An option available with HPE Complete Care Service and HPE Tech Care Service and applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction.

Consult your HPE Sales Representative or Authorized Channel Partner of choice for any additional questions and services options.

Parts and Materials

HPE will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

How to Purchase Services

Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from HPE or an enterprise reseller are quoted using HPE order configuration tools.
- Customers purchasing from a commercial reseller can find services at **https://ssc.hpe.com/portal/site/ssc/**

Service and Support

AI Powered and Digitally Enabled Support Experience

Achieve faster time to resolution with access to product-specific resources and expertise through a digital and data driven customer experience

Sign into the HPE Support Center experience, featuring streamlined self-serve case creation and management capabilities with inline knowledge recommendations. You will also find personalized task alerts and powerful troubleshooting support through an intelligent virtual agent with seamless transition when needed to a live support agent.
https://support.hpe.com/hpesc/public/home/signin

Consume IT On Your Terms

HPE GreenLake edge-to-cloud platform brings the cloud experience directly to your apps and data wherever they are—the edge, colocations, or your data center. It delivers cloud services for on-premises IT infrastructure specifically tailored to your most demanding workloads. With a pay-per-use, scalable, point-and-click self-service experience that is managed for you, HPE GreenLake edge-to-cloud platform accelerates digital transformation in a distributed, edge-to-cloud world.

- Get faster time to market
- Save on TCO, align costs to business
- Scale quickly, meet unpredictable demand
- Simplify IT operations across your data centers and clouds

To learn more about HPE Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Contact information for a representative in your area can be found at "Contact HPE"
https://www.hpe.com/us/en/contact-hpe.html

For more information
http://www.hpe.com/services

Configuration Information

HPE Services Services

Flex Support Services for 4 Year Support Plan

HPE 4Y NBD Proactive Care SVC	H1K90A4
HPE 4Y NBD w DMR Proactive Care SVC	H1K91A4
HPE 4yr Foundational Care 24x7 Service	H7J34A4
HPE 4yr Foundational Care 24x7 w DMR SVC	H7J35A4
HPE 4Y 4 hr 24x7 Proactive Care SVC	H1K92A4
HPE 4Y 4 hr 24x7 DMR Proactive Care SVC	H1K93A4
HPE 4yr Foundational Care CTR Service	H7J36A4
HPE 4Y Foundational Care CTR DMR Service	H7J37A4
HPE 4Y 6 hr CTR Proactive Care SVC	H1K94A4
HPE 4Y 6 hr CTR w DMR Proactive Care SVC	H1K95A4

Flex Support Services for 5 Year Support Plan

HPE 5Yr Foundational Care NBD Service	H7J32A5
HPE 5Y Foundational Care NBD DMR SVC	H7J33A5
HPE 5Y NBD Proactive Care SVC	H1K90A5
HPE 5yr Foundational Care 24x7 Service	H7J34A5
HPE 5yr Foundational Care 24x7 w DMR SVC	H7J35A5
HPE 5Y 4 hr 24x7 Proactive Care SVC	H1K92A5
HPE 5Y 4 hr 24x7 DMR Proactive Care SVC	H1K93A5
HPE 5yr Foundational Care CTR Service	H7J36A5
HPE 5Y Foundational Care CTR DMR Service	H7J37A5
HPE 5Y 6 hr CTR Proactive Care SVC	H1K94A5
HPE 5Y 6 hr CTR w DMR Proactive Care SVC	H1K95A5

Summary of Changes

Date	Version History	Action	Description of Change
22-Jan-2024	Version 11	Changed	Updated the following sections for MPI 1.94: Overview, What's New, Operating System Compatibility and Supported Hardware.
04-Dec-2023	Version 10	Changed	HPE Services Rebranding Obsolete SKUs were removed
15-Nov-2021	Version 9	Changed	Service and Support section was updated.
09-Dec-2019	Version 8	Changed	Overview and Standard Features sections were updated
03-Jun-2019	Version 7	Changed	Overview and Standard Features sections were updated
17-Dec-2018	Version 6	Changed	Overview and Standard Features sections were updated
24-Oct-2018	Version 5	Changed	Overview section was updated and PB ID was corrected in Summary of Changes section. Link was corrected in Standard Features section.
04-Jun-2018	Version 4	Changed	Updated the following sections: Overview, What's new, hardware compatibility
04-Dec-2017	Version 3	Changed	Updated the following sections: Overview, What's New, Models and Licenses, Hardware Compatibility
25-Sept-2017	Version 2	Changed	Updated the Models and Licenses section
07-Aug-2017	Version 1	New	Create QuickSpecs for HPE Performance Software – Message Passing Interface

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