

# MPI: A Message-Passing Interface Standard

## Version 3.1

Message Passing Interface Forum

February 25, 2015

1 This document describes the Message-Passing Interface (MPI) standard, version 3.0.  
2 The MPI standard includes point-to-point message-passing, collective communications, group  
3 and communicator concepts, process topologies, environmental management, process cre-  
4 ation and management, one-sided communications, extended collective operations, external  
5 interfaces, I/O, some miscellaneous topics, and a profiling interface. Language bindings for  
6 C and Fortran are defined.

7 Historically, the evolution of the standards is from MPI-1.0 (June 1994) to MPI-1.1  
8 (June 12, 1995) to MPI-1.2 (July 18, 1997), with several clarifications and additions and  
9 published as part of the MPI-2 document, to MPI-2.0 (July 18, 1997), with new functionality,  
10 to MPI-1.3 (May 30, 2008), combining for historical reasons the documents 1.1 and 1.2  
11 and some errata documents to one combined document, and to MPI-2.1 (June 23, 2008),  
12 combining the previous documents. Version MPI-2.2 (September 2009) added additional  
13 clarifications and seven new routines. This version, MPI-3.0, is an extension of MPI-2.2.

14  
15 **Comments.** Please send comments on MPI to the MPI Forum as follows:

- 16  
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20 the version of the MPI standard and the page and line numbers on which you are  
21 commenting. Only use the official versions.

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Version 3.1: XX, XX, 2015. This document contains mostly corrections and clarifications to the MPI-3.0 document. The largest change is a correction to the Fortran binding introduced in MPI-3. A few routines were added but correct MPI-3 programs are correct MPI-3.1 programs.

Version 3.0: September 21, 2012. Coincident with the development of MPI-2.2, the MPI Forum began discussions of a major extension to MPI. This document contains the MPI-3 Standard. This draft version of the MPI-3 standard contains significant extensions to MPI functionality, including nonblocking collectives, new one-sided communication operations, and Fortran 2008 bindings. Unlike MPI-2.2, this standard is considered a major update to the MPI standard. As with previous versions, new features have been adopted only when there were compelling needs for the users. Some features, however, may have more than a minor impact on existing MPI implementations.

Version 2.2: September 4, 2009. This document contains mostly corrections and clarifications to the MPI-2.1 document. A few extensions have been added; however all correct MPI-2.1 programs are correct MPI-2.2 programs. New features were adopted only when there were compelling needs for users, open source implementations, and minor impact on existing MPI implementations.

Version 2.1: June 23, 2008. This document combines the previous documents MPI-1.3 (May 30, 2008) and MPI-2.0 (July 18, 1997). Certain parts of MPI-2.0, such as some sections of Chapter 4, Miscellany, and Chapter 7, Extended Collective Operations, have been merged into the Chapters of MPI-1.3. Additional errata and clarifications collected by the MPI Forum are also included in this document.

Version 1.3: May 30, 2008. This document combines the previous documents MPI-1.1 (June 12, 1995) and the MPI-1.2 Chapter in MPI-2 (July 18, 1997). Additional errata collected by the MPI Forum referring to MPI-1.1 and MPI-1.2 are also included in this document.

Version 2.0: July 18, 1997. Beginning after the release of MPI-1.1, the MPI Forum began meeting to consider corrections and extensions. MPI-2 has been focused on process creation and management, one-sided communications, extended collective communications, external interfaces and parallel I/O. A miscellany chapter discusses items that do not fit elsewhere, in particular language interoperability.

Version 1.2: July 18, 1997. The MPI-2 Forum introduced MPI-1.2 as Chapter 3 in the standard “MPI-2: Extensions to the Message-Passing Interface”, July 18, 1997. This section contains clarifications and minor corrections to Version 1.1 of the MPI Standard. The only new function in MPI-1.2 is one for identifying to which version of the MPI Standard the implementation conforms. There are small differences between MPI-1 and MPI-1.1. There are very few differences between MPI-1.1 and MPI-1.2, but large differences between MPI-1.2 and MPI-2.

Version 1.1: June, 1995. Beginning in March, 1995, the Message-Passing Interface Forum reconvened to correct errors and make clarifications in the MPI document of May 5, 1994,

referred to below as Version 1.0. These discussions resulted in Version 1.1. The changes from Version 1.0 are minor. A version of this document with all changes marked is available.

**Version 1.0: May, 1994.** The Message-Passing Interface Forum (MPIF), with participation from over 40 organizations, has been meeting since January 1993 to discuss and define a set of library interface standards for message passing. MPIF is not sanctioned or supported by any official standards organization.

The goal of the Message-Passing Interface, simply stated, is to develop a widely used standard for writing message-passing programs. As such the interface should establish a practical, portable, efficient, and flexible standard for message-passing.

This is the final report, Version 1.0, of the Message-Passing Interface Forum. This document contains all the technical features proposed for the interface. This copy of the draft was processed by L<sup>A</sup>T<sub>E</sub>X on May 5, 1994.

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### MPI-3.1:

MPI-3.1 is a minor update to the MPI Standard.

The editors and organizers of the MPI-3.1 have been:

- Martin Schulz, Meeting Convener, and MPI-3.1 chair
- William Gropp, Steering committee, Front matter, Introduction, One-Sided Communications, and Bibliography; Overall editor

- Rolf Rabenseifner, Steering committee, Terms and Definitions, and Fortran Bindings, Deprecated Functions, Annex Change-Log, and Annex Language Bindings
- Dan Holmes, Point-to-Point Communication,
- George Bosilca, Datatypes and Environmental Management
- Torsten Hoefler, Collective Communication and Process Topologies
- Pavan Balaji, Groups, Contexts, and Communicators, and External Interfaces
- Jeff Hammond, The Info Object
- David Solt, Process Creation and Management
- Quincey Koziol, I/O
- Kathryn Mohror, Tool Support
- Rajeev Thakur, One-Sided Communications
- Jeffrey M. Squyres, Language Bindings and MPI-3.1 Secretary

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