

# **The Communication Semantics of the Message Passing Interface**

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## ***Abstract***

The Message Passing Interface (MPI) standard is a natural language document that describes a software library for interprocess communication. Automatic reasoning about the reactive nature of programs communicating via MPI libraries is not possible without also analyzing the library being used. Many distributed programs that use MPI are relatively brief compared to the libraries that implement MPI. A formal specification of the communication semantics of the MPI standard (i) enables modular automatic reasoning of MPI based parallel programs independent of the library implementation, (ii) provides a mathematically precise declaration of the natural language intent of the MPI specification, (iii) enables mathematical reasoning about libraries that implement the standard, and (iv) allows for reasoning about the standard itself. We have created such a specification of the point to point operations and present it in this report. We also discuss some preliminary efforts to accomplish (i) above.