

Design and Implementation of MP, a Protocol for Efficient Exchange of Mathematical Expressions

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Abstract

The Multi Project is an ongoing research effort at Kent State University aimed at providing an environment for distributed scientific computing. An integral part of this environment is the Multi Protocol (MP) which is designed to support efficient communication of mathematical data between scientifically-oriented software tools. MP exchanges data in the form of linearized annotated syntax trees. Syntax trees provide a simple, flexible and tool-independent way to represent and exchange data, and annotations provide a powerful and generic expressive facility for transmitting additional information. At a level above the data exchange protocol, dictionaries provide definitions for operators and constants, providing shared semantics across heterogeneous packages. A clear distinction between MP-defined and user-defined entities is enforced. Binary encodings are used for efficiency. Commonly used values and blocks of homogeneous data are further optimized. The protocol is independent of the underlying communication paradigm and can support parallel computation, distributed problem solving environments, and the coupling of tools for specific applications.