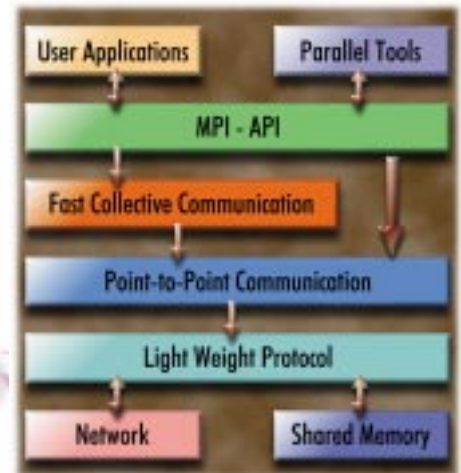


Optimized MPI for Cluster of Multi Processors

INTRODUCTION

The message-passing model of parallel computation has emerged as an efficient and well-understood paradigm for parallel programming. Message Passing Interface (MPI) is a standard for message passing defined by a forum of parallel programming industry leaders including representatives from national laboratories, universities and key parallel system vendors. A large number of parallel applications have been implemented using MPI calls. C-MPI* is a high performance implementation of the MPI standard for a Cluster of Multi Processors (CLUMPS). By adhering to the standards, C-MPI supports execution of the multitude of MPI applications with enhanced performance on a CLUMPS.



OVERVIEW OF MPI

MPI is a message-passing application programming interface. It includes point-to-point message passing and collective (global) operations. MPI also provides three additional classes of services: environmental inquiry, basic timing information, and a profiling interface for performance monitoring. It supports heterogeneous data conversion by requiring datatype specifications for all communication operations.

MPI provides support for both SPMD and MIMD modes of parallel programming. It also supports interapplication communications through intercommunicator operations, which support communication between groups rather than within a single group. MPI supports a thread-safe application-programming interface.

To facilitate simultaneous communication among many parallel processes, MPI provides collective communication functions.

Collective operations under MPI are of two kinds :

- ❑ Data movement operations which are used to rearrange data among the processes. Broadcast and many elaborate scattering and gathering data movement operations are supported in MPI.
- ❑ Collective computation which includes standard operations like minimum, maximum, sum, logical OR and user defined operations.

HIGHLIGHTS

- ❑ Adheres to MPI standards. Based on the MPICH implementation from Argonne National Lab and Mississippi State University.
- ❑ Provides optimal performance for MPI applications on a Cluster of Multi Processors (CLUMPS).
- ❑ Supports applications written in Fortran, C.
- ❑ On PARAM OpenFrame provides enhanced performance exploiting hardware communication features.

C-MPI OPTIMIZATION MODEL

C-MPI optimises a subset of MPI collective calls by using efficient algorithms for a Cluster of Multi Processors architecture. It also leverages on the fact that most of the high performance networks provide substantial exchange communication bandwidths. This allows the tuned algorithms to simultaneously send and receive messages over the network, which helps in reducing the number of communication hops. In addition, the algorithms effectively use the higher

shared memory communication bandwidths on multi processor nodes.

On the PARAM OpenFrame, for optimal performance C-MPI can be run directly over the high performance system area networks in user space using lightweight communication protocols. These protocols provide substantial improvement in the point-to-point communication performance. As a result, the C-MPI collective calls perform even better compared to the implementation over the Internet Protocol (IP).

COMPATIBILITY WITH MPI

C-MPI is based on the MPICH implementation from Argonne National Lab and Mississippi State University and implements all MPI functions. The implementation closely follows the published standard and allows programmers to write portable parallel applications, which run on the PARAM OpenFrame system and other Cluster systems supporting the standard. MPI applications only need to be relinked with C-MPI libraries to run on the Cluster of Multi Processors.

AVAILABILITY

Supported Hardware	:	Workstation Clusters
Supported Operating System	:	Solaris 2.5 and above
User Interfaces	:	Command Line
Supported Languages	:	Fortran and C
Prerequisite Hardware for Lightweight Protocols	:	ParamNet, Myrinet



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Additional Information

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