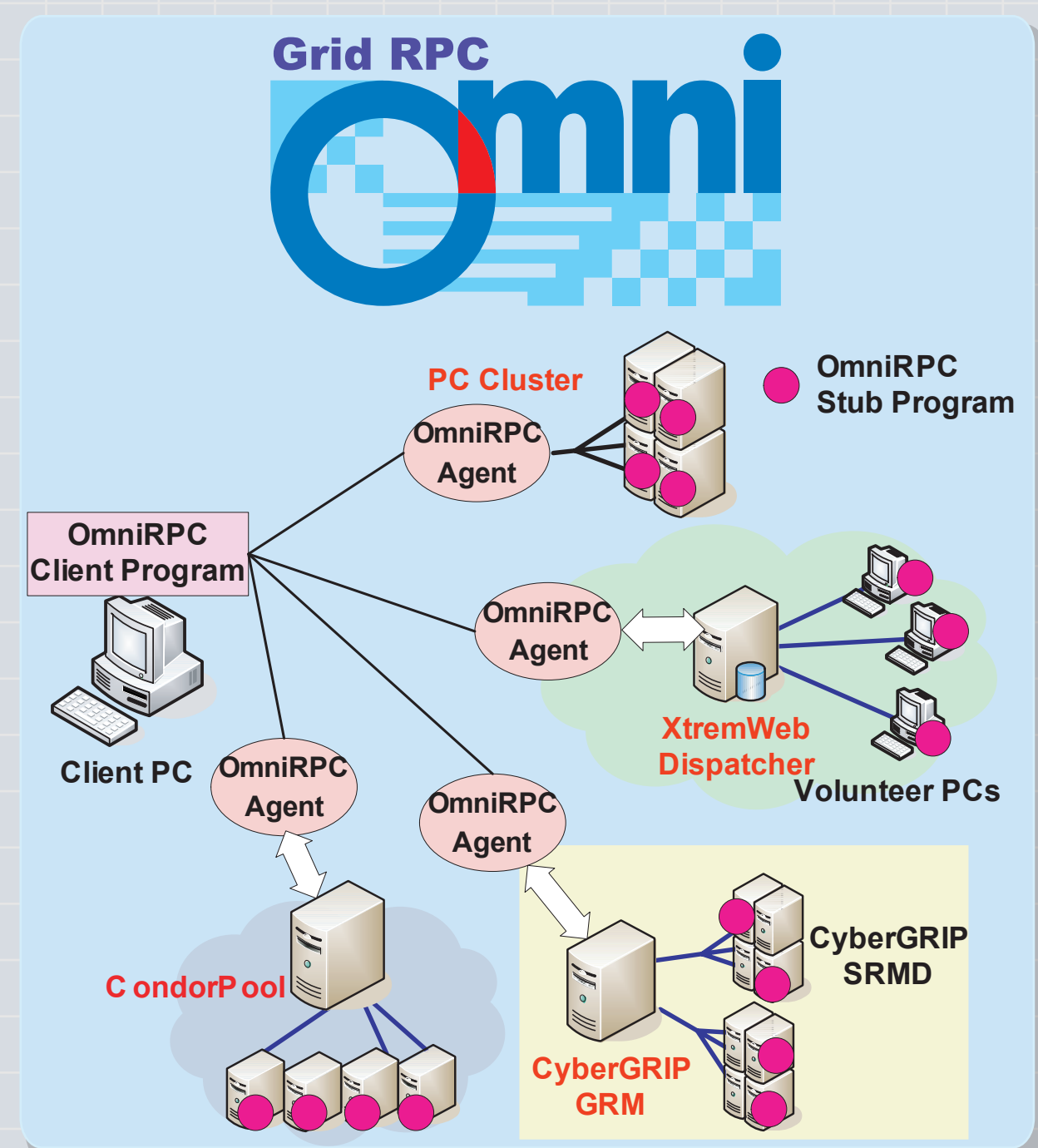




Research on High Performance Computing Systems

OmniRPC: A Grid RPC System for Parallel Computing

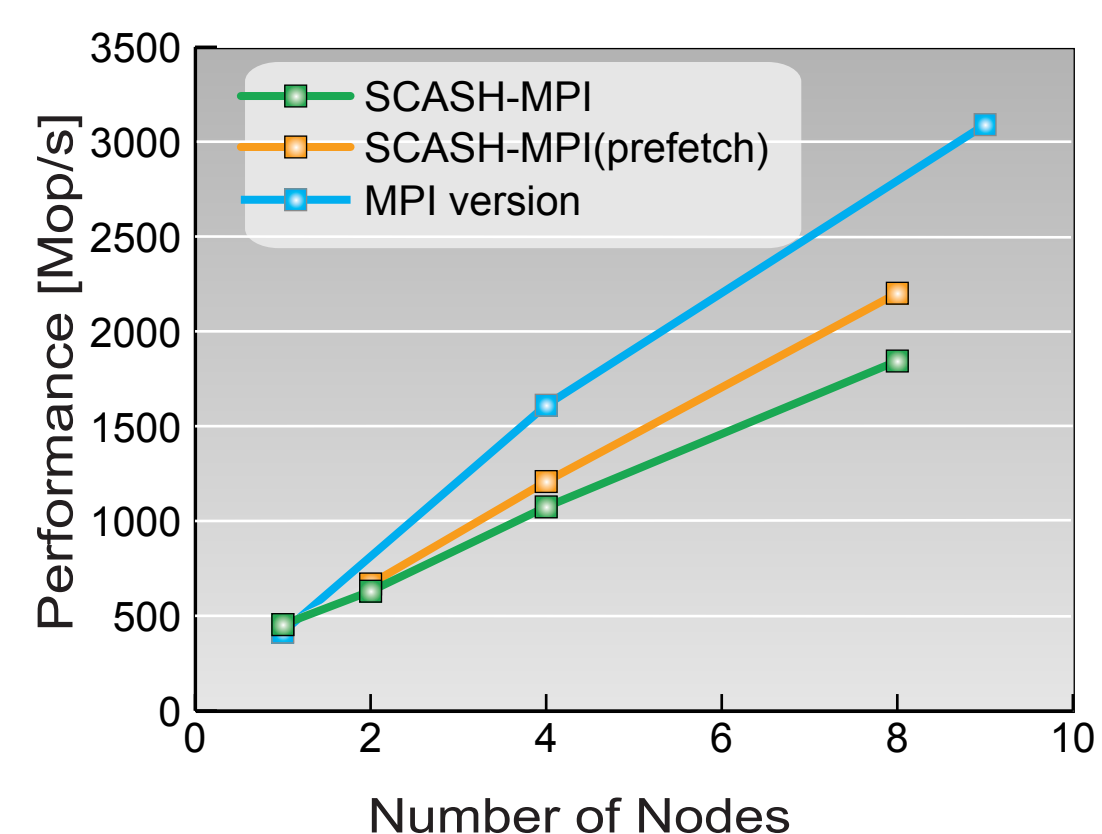
- ▶ OmniRPC is a Grid RPC system for parallel programming and is designed as **Thread-safe RPC** in order to allow client programs to use in **OpenMP**.
- ▶ Support of **master-workers programming model** for parametric search grid applications.
- ▶ Integrating computing resources on various execution platform:
 - XtremWeb, Condor, CyberGRIP, Grid Engine.
 - **Clusters with private IP address and NATs.**
- ▶ Applications:
 - CONFLEX-G: Grid-enabled Molecular Conformational Space Search Program
 - HMCS-G: Grid-enabled Hybrid Computing System for Computational Astrophysics.
 - Master-Worker parallel program for large eigen value program (Prof. Sakurai, U. Tsukuba)
 - PAML-G: Phylogenetic Analysis by Maximum Likelihood on the grid.
 - Used as a backend for YML (Prof. Petiton, LIFL, France)
- ▶ Webpage: <http://www.omni.hpcc.jp/OmniRPC/>



Omni OpenMP: Cluster-enabled OpenMP by SCASH-MPI

- ▶ The **Omni OpenMP compiler** enables an OpenMP program to run on a PC-cluster with MPI enabled.
 - The compiler can generate parallel codes for a software DSM system
- ▶ **SCASH-MPI** is a software distributed shared memory system (DSM) **using MPI as a communication layer** of SCASH DSM.
 - The original SCASH is a DSM in the SCore cluster software.
 - A thread is created to handle remote memory access request by MPI.
 - By using MPI as a communication layer, one can exploit a high-performance network of clusters with high portability.
 - **History-based prefetching** for optimizing communication.
- ▶ Performance
 - Benchmark : NPB2.3 BT (parallelized with OpenMP)
 - Environment : Dual Opteron 1.8GHz * 8nodes + Gigabit Ethernet

Performance of NPB BT Class B



FFTE: A High-Performance FFT Library

- ▶ **FFTE** is a Fortran subroutine library for computing the Fast Fourier Transform (FFT) in one or more dimensions.
- ▶ The API of FFTE is similar to sequential SGI SCSL or Intel MKL routines.
- ▶ Features:
 - High speed. (Supports SSE2/SSE3)
 - Complex and mixed-radix transforms.
 - Parallel transforms: Shared / Distributed memory parallel computers (OpenMP, MPI and OpenMP+MPI)
 - High portability: Fortran77 + OpenMP + MPI
 - FFTE's 1-D parallel FFT routine has been incorporated into the **HPC Challenge (HPCC) benchmark.**
- ▶ Performance
 - Data: $N_1 \times N_2 \times N_3 = 2^{24} \times P$
 - Machines: Dual Xeon 2.8GHz + Myrinet2000

Performance of Parallel 3D FFTs

