

HeteroPar 06: <http://dis.um.es/heteropar>

What is the best way to migrate homogeneous parallel routines (e.g., ScaLAPACK) to heterogeneous systems?

Rewrite the code?

Use sophisticated porting tools?

Rewrite the code?

- Requires massive efforts
 - Complex code base
 - Lots of features
 - Design patterns
- Intractable issues involved
 - Heterogeneous matrix data distribution (NP-Complete)
 - Optimal arrangement of processors in a two-dimensional grid (NP-Complete)
 - Optimal mapping of processes to the executing computers of the network (NP-Complete)
 - Design patterns

Sophisticated porting tools?

- Automate determination of the optimal algorithmic parameters
 - Blocking factor
 - Optimal grid arrangement
- Automate determination of the platform parameters accurately
 - Speeds of the processors
 - Latencies and bandwidths of the communication links between different pairs of processors
 - Automate selection of the optimal set of processes
- Reuse the legacy code completely

HeteroMPI

- Uses HEHO approach
 - Allows complete reuse of ScaLAPACK
- Automates all the tedious and error-prone tasks
- ScaLAPACK programmer just provides two inputs
 - Problem parameters
 - Legacy ScaLAPACK code
- PBLAS PDGEMM already ported
- Superlinear speedups observed
 - Moderately heterogeneous network of 25 processors
 - Ratio of speed of the fastest processor to the speed of the slowest processor is 3
 - Homogeneous communication layer
 - Speedup of 40 observed

Ravi Reddy, Alexey Lastovetsky: HeteroMPI+ScaLAPACK:

Towards a ScaLAPACK (Dense Linear Solvers) for Heterogeneous Networks of Computers. HiPC 2006, Bangalore.