Network communication can become a bottleneck when scaling applications to large parallel machines. Topology aware task mapping can improve performance of parallel applications significantly by reducing the congestion on the network. We have developed a generic framework, called Chizu, which facilitates mapping of tasks. It uses the communication graph of the application and the network topology of the machine to optimize network communication. Chizu can exploit various graph partitioning and mapping libraries to perform mapping. We present our preliminary work on studying the communication and mapping of applications using Chizu.

Motivation

• Performance of communication bound applications is affected by latency and bandwidth
• Mapping tries to minimize network communication
• Wanted a generic framework to use and test existing and new mapping algorithms
• Wanted a simple library to support plug and play of different mapping strategies

Chizu

Framework to facilitate mapping of tasks.
• Can exploit many mapping algorithms
• Many applications can use this common library
• Can be used as a library or standalone binary
• The mapping produced can be used with srun:
srun --launcher-opts='--mapping map.txt' pgm

AMG Benchmark

Communication pattern at each level of AMG solve

Application 1

Mapping results

Summary

• Implemented a library, Chizu, which facilitates mapping of tasks given communication graph
• Chizu can be used as a library or standalone binary
• Chizu supports easy plug and play of different mapping strategies
• Studied communication pattern of AMG
• Used Chizu library on AMG

AMG2013 is a parallel algebraic multigrid solver for linear systems derived from BoomerAMG solver developed at LLNL. AMG has a multi-level communication pattern where the grid is coarsened at each level.

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Mapping results for AMG

<table>
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