MPI on PIM

Processing-in-Memory (PIM) technology encompasses a broad range of novel features. The most unique features include extremely wide paths to memory, low latency memory access, and support for fine-grained multi-threading. In addition to enabling new computing paradigms, these features may be used to enhance more traditional commodity cluster architectures by accelerating the Message Passing Interface (MPI) libraries used for communication.

A key performance aspect of MPI is its ability to match incoming message headers to posted user buffers. PIM technology can accelerate this process in a number of ways. Multithreading can allow multiple incoming headers to traverse lists concurrently. Wide word (short vector) access can parallelize the matching operations. And the low latency access to memory can further accelerate the otherwise costly list traversal. Together, these techniques may be able to increase message throughput by up to an order of magnitude, improve latency, and make possible the next level of high performance networks.


Engineering Faculty: P. Kogge
Engineering Students: R. Murphy and A. Rodrigues
Sandia Collaborators: Keith Underwood, Ron Brightwell
Funding Sources: Cray Inc., DARPA, and Sandia National Labs