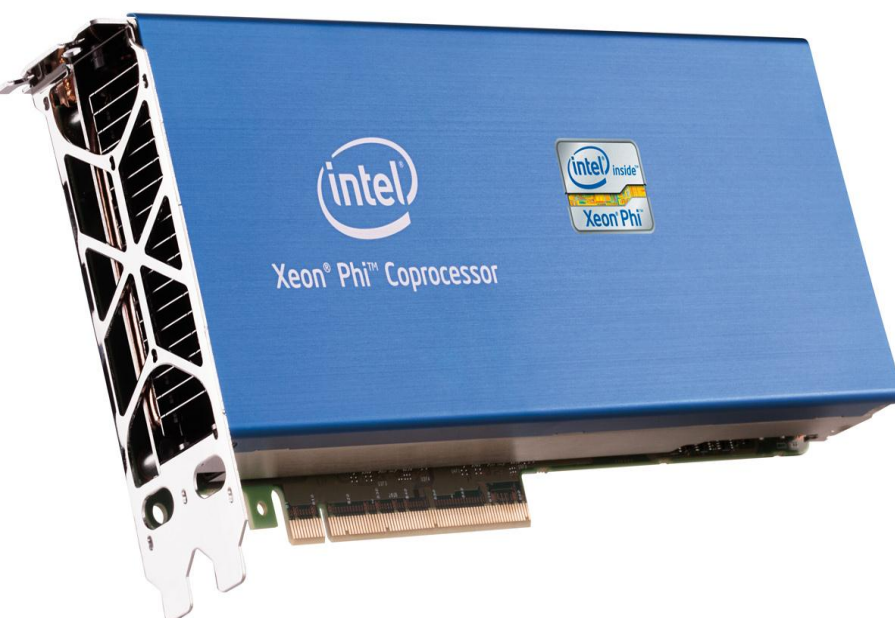
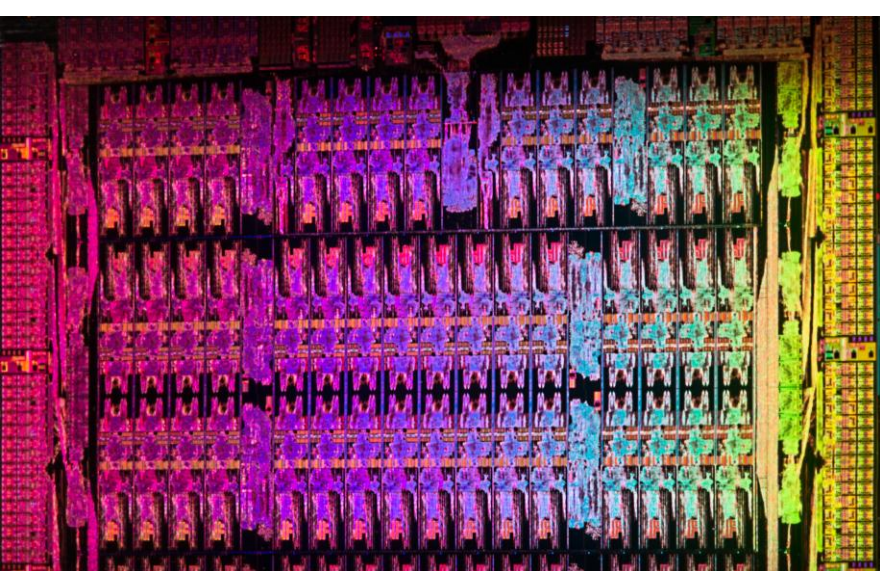


Co-Design in Action: HPCCG and the Intel Phi

-Jacob Hemstad
 Computer Engineering
 1st Year PhD Student
 University of Minnesota
 Scalable Algorithms - 1426

-Michael Heroux
 Mentor
 Scalable Algorithms - 1426
 -Robert Hoekstra
 Manager
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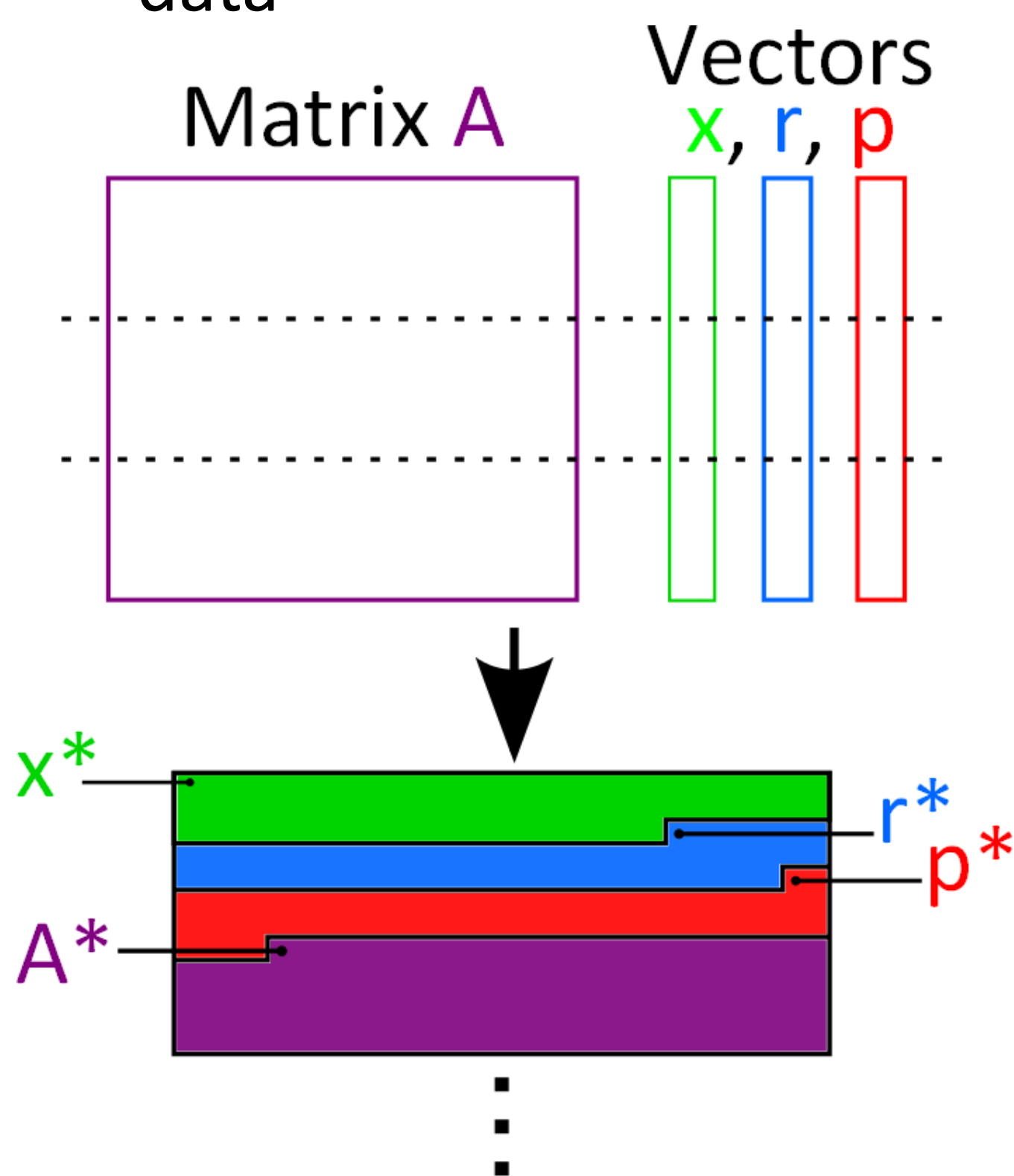


— HPCCG —

- Conjugate Gradient, Sparse Linear System Solver
- Solves $y=Ax$ for unknown x vector, known A and y matrix and vector
- Built of dot products, vector updates, and matrix vector multiplications

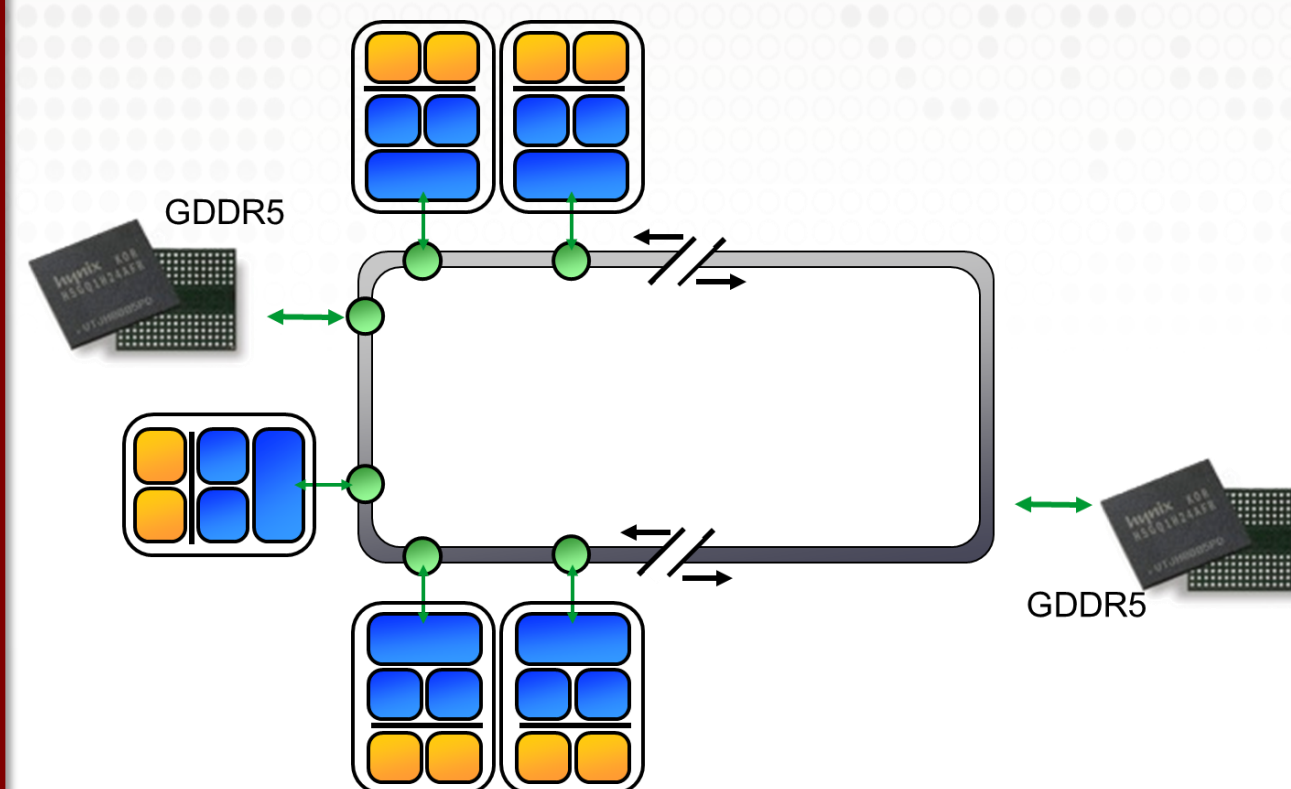
— Block Partitioning —

- Split problem structures into blocks of contiguous data



- Leverage cache line strategies, e.g. pull in x , get part of r

— Intel Xeon Phi —

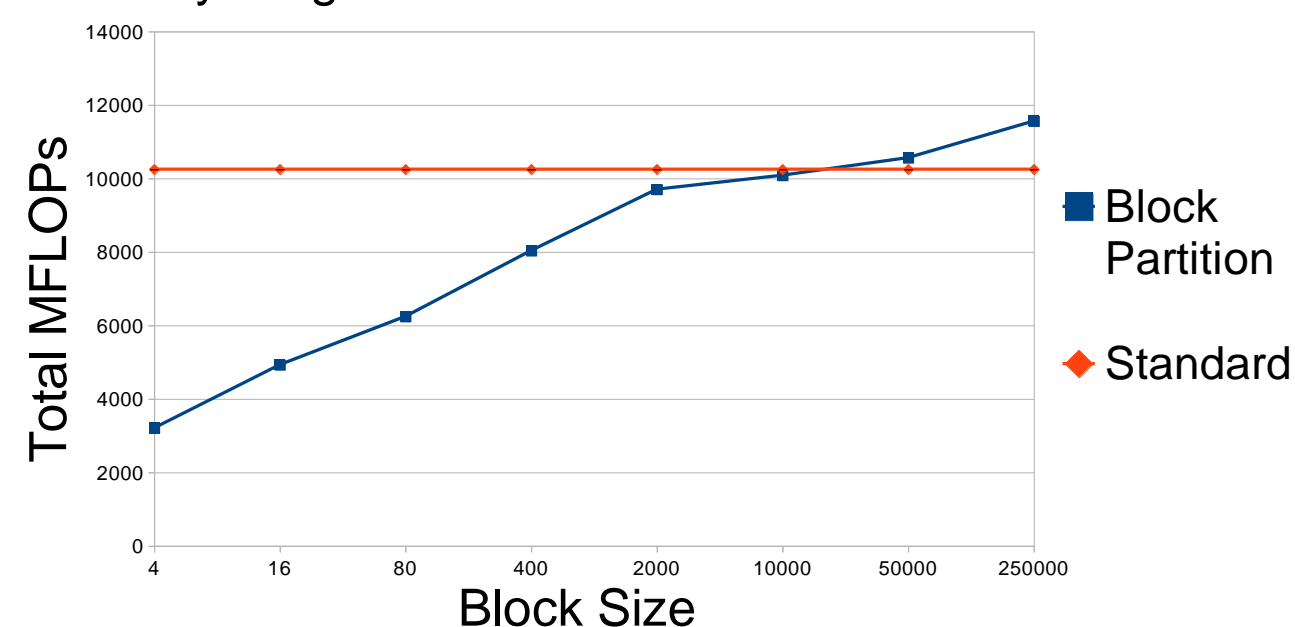


- 57 cores x 4 HyperThreads = 228 hardware threads
- 6GB GDDR5 w/ randomized Page storage
- Abundance of threads may favor threaded applications over pure MPI

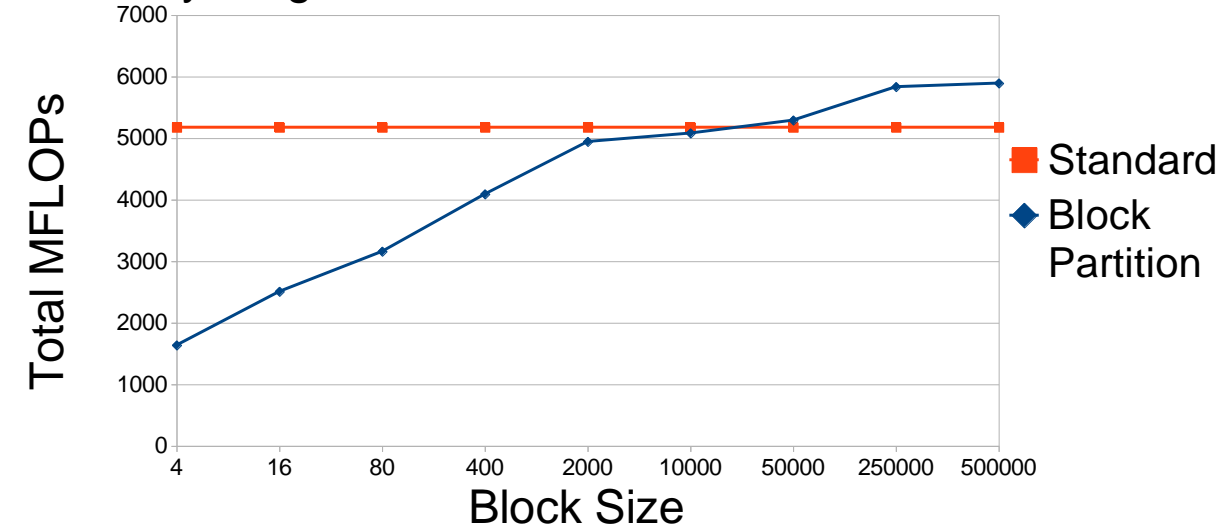
— Early Results —

- Only run on SandyBridge, Phi is next

SandyBridge: Standard vs. Block Partition 32 Cores



SandyBridge: Standard vs. Block Partition 16 Cores



- Early results promising, more work to be done



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