



Argonne
NATIONAL
LABORATORY

... for a brighter future



U.S. Department
of Energy

UChicago ►
Argonne_{LLC}



Office of
Science

U.S. DEPARTMENT OF ENERGY

A U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC

Panel: A Realistic Future

William D. Gropp
www.mcs.anl.gov/~gropp

MPI + C++ + Eclipse

- Better development and debugging support
- Integrated performance tuning, including adaptive and automated tuning
- Third-party distributed data structure support



MPI + OpenMP++ + Eclipse

- New language exploits features of limit case of multicore development
 - 64 - 512 cores, torus, mesh, or omega network interconnection
 - (Think Cell with fixes)
- Language features to help with memory architecture
 - Streams
 - Recursive subdivision into blocks
 - Data-centric description
 - Compilation and runtime tools integrated with language to test memory fit and performance contracts
 - CAF has interesting features that are relevant here



All new language

- Assume remote load/store, atomic remote RMW operations, latency hiding, fast collective computation (allreduce, scan)
- Must be intrinsically parallel, race-free model
 - Ideas here include transactional memory
- Representations may (finally!) depart from the 1-d or 2-d, text-oriented model
 - Hierarchical representations
 - Parallelism clearly expressed (in a scalable way, not as individual tasks)
 - Avoid “action at a distance”
- Use of formal methods to aid the programmer
 - There were two (!!) talks on formal methods at the EuroPVMMPI 2006 meeting in Bonn.
- Must map efficiently onto the architectures on the previous slide :)
- Must also interface with legacy MPI programs



And the winner is...

- Which do you think we'll see in 5 years? In 10?

