Programming Models

• **Category I: Uniquely Exascale**
  • Exascale programming model
  • Scalable, fault-tolerant MPI
  • Application development tools

• **Category II: Exascale plus trickle down**
  • Heterogeneous node programming model
  • Domain-specific programming models
  • Language features for massively parallel I/O
  • Language support for adaptive computation

• **Category III: Primarily Sub-exascale.**
  • Interoperability between models
Compilers

• Category I: Uniquely Exascale
  – Implement exascale language(s)
  – Support for resilience

• Category II: Exascale plus trickle down
  – Implement heterogeneous programming model
  – Support for massive I/O
  – New optimization frameworks
    • Locality optimizations, parallel program analyses, architecture-aware optimizations
    • Power optimizations
  – Interactions between compilers and tools, runtime

• Category III: Primarily Sub-exascale.
  – Implement enhancements to existing languages / APIs
    • MPI awareness in compilers
    • Interoperability
  – Automatic parallelization
  – Dynamic (re)compilation, feedback optimizations
  – Autotuning
  – Refactoring tools