

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