

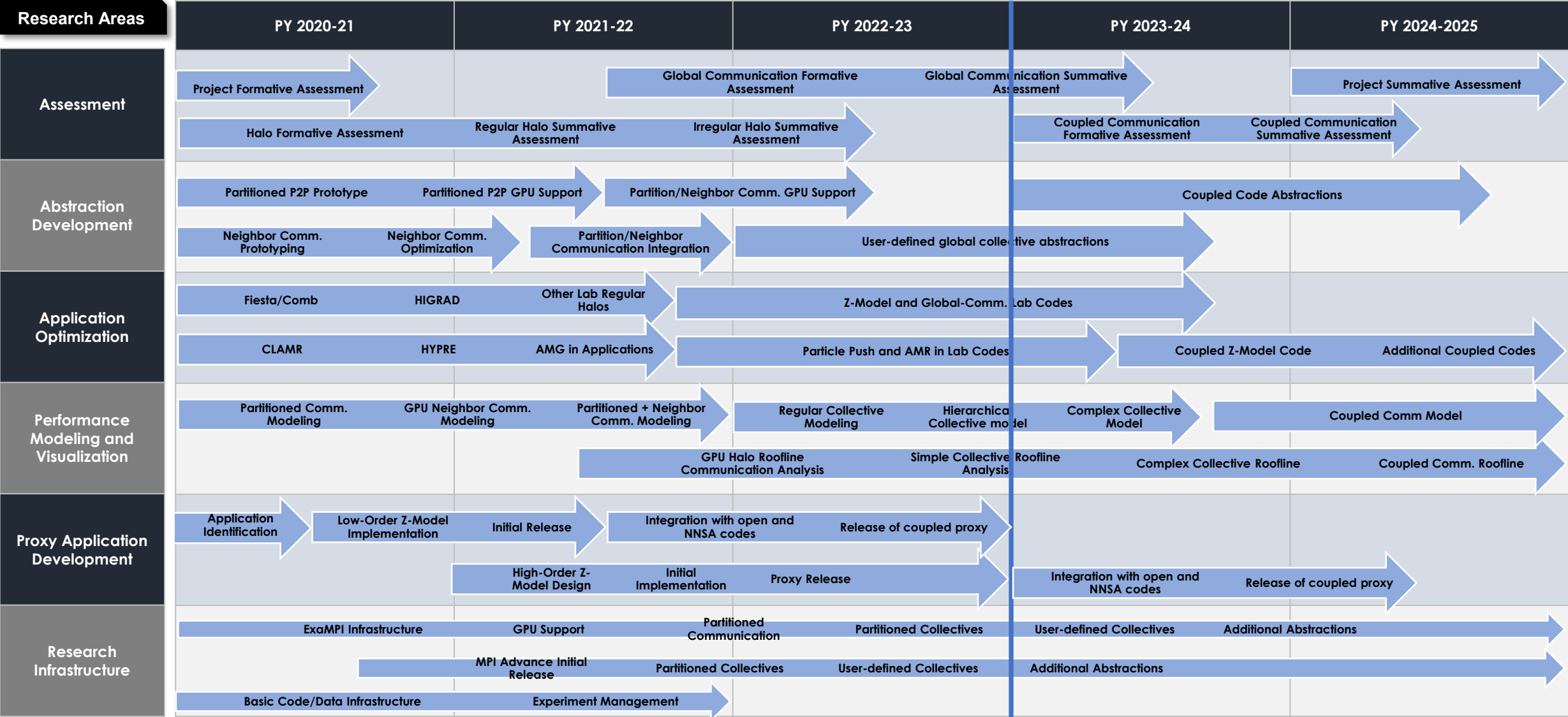
Year 3 Plans



Center for Understandable, Performant Exascale Communication Systems



5-year Project Roadmap



Year 3 Research Areas and Directions

- Assessment and Optimization
 - Finish formative assessment and optimization of irregular communication demands in DOE application
 - Summative assessment of optimized performance of different GPU halo communication approaches in DOE benchmarks and applications.
 - Global communication optimization and begin summative assessment
- New Abstraction Development
 - Submission of partitioned collective abstraction specification to MPI forum for future inclusion in MPI standard and revision based on community feedback.
 - Design user-defined global collective abstraction interface
- Fluid Interface Proxy
 - Release of higher-order fluid interface model benchmark specification, implementation, and initial performance results.
 - Design of initial coupling between low order model open and/or lab CFD code
- Modeling
 - Initiate modeling of partitioned neighbor collective performance
- Research Infrastructure
 - Design and initial implementation of GPU-triggered neighbor collective abstractions in MPI Advance



Year 3 Milestones

1. Formative assessment of irregular communication demands in DOE application, including but not limited to the LANL HOSS application
2. Submission of partitioned collective abstraction specification to MPI forum for future inclusion in MPI standard and revision based on community feedback.
3. Design and initial implementation of GPU-triggered neighbor collective abstractions in MPI Advance
4. Release of higher-order fluid interface model benchmark specification, implementation, and initial performance results.
5. Summative assessment of optimized performance of different GPU halo communication approaches in DOE benchmarks and applications.

Lessons Learned

- Need for alternatives to MPI datatypes (e.g. partitioning) for supporting high-level communication abstractions
- Large variation in GPU abstraction performance and need for better models of GPU abstraction tradeoffs
- Need for more active focus on recruitment and education of diverse students to the project
- Value of MPI Advance and ExaMPI for promulgating abstractions to the community
- Need for access to specifications and testbeds for state of the art and forthcoming systems