# Building Blocks for the Rapid Development of Parallel Simulations

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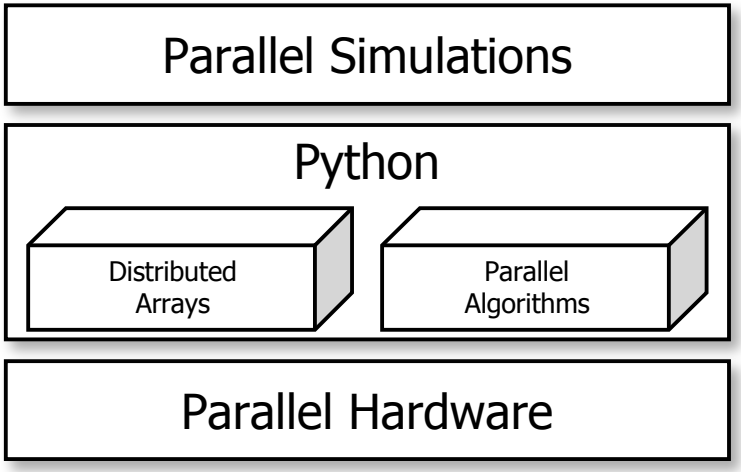
## Identification and Significance of Innovation

- Enable the high-level programming language **Python** to be used for parallel application development.
- Create **building blocks with user friendly interfaces** that hide parallelism from the user:
  - Distributed arrays
  - Algorithms (FFT, linear algebra, statistics, etc.)
- **Interactive parallel computation**: a user working at a laptop/desktop could use a remote supercomputer interactively.
- **High performance implementations** using proven parallel libraries (ScaLAPACK, FFTW, Trilinos, SuperLU).




## Technical Objectives

Demonstrate the feasibility of:

- Creating high-level distributed arrays in Python.
- Creating high-level interfaces for parallel algorithms in Python.
- Integrating these building blocks into IPython's interactive parallel development environment.

## Work Plan

- Implement a prototype of distributed arrays in Python.
- Implement prototype high-level interfaces for parallel algorithms that utilize distributed arrays.
- Perform performance benchmarks to test the prototype design.
- Integrate prototypes into IPython's interactive environment and develop NASA relevant examples.

## NASA Applications

- General purpose, open-source, rapid development tool for NASA parallel simulations and data analysis.
- Parallel capabilities for NASA's (STSci) PyRAF image analysis package.

## Non-NASA Applications

- General platform for rapid parallel development for science, engineering, finance, data-mining and oil&gas applications.
- Minimal learning curve and time-to-solution for even novice users.

## Firm Contacts

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