Use of Python as a MATLAB Replacement for Algorithm Development and Execution in a Multi-Core Environment

Glen W. Mabey, Ph.D.
Southwest Research Institute
Signal Exploitation and Geolocation Division
San Antonio, Texas

Brian Granger, Ph.D.
Tech-X Corporation
Boulder, Colorado
(creator of IPython1)
Requirements

- Signals Intelligence algorithm development
- Non-cooperative energy detection
- Large data sets (½ terabyte)
- Signal processing operations
- Need to implement algorithms quickly yet be able to run them on large data sets
- Distribute over a large number of nodes
Approach

- Python: a powerful scripting language
- Numpy: numerical arrays for Python
- Matplotlib: MATLAB-like plotting facilities
- IPython1:
  - High-level parallel/distributed computing in Python
  - Supports many styles of parallelism
  - Fully asynchronous model with asynchronous exception propagation over the network
Results

- Input I/O bottleneck addressed using NFS
- Output I/O logs to database but also returns intermediate results to client
- Wideband recordings processed on 10-dual-dual Xeon blades (40 cores)
- 2,653 lines of code
- Up to 30x speedup