Chapel: An Emerging Parallel Programming Language
A Call To Arms

Q: Why doesn’t HPC have languages as enjoyable and productive as Python / Java / Matlab / ___(your favorite language here)___?

A: We believe it’s due not to any particular technical challenge, but rather to a lack of sufficient…

…long-term efforts
…resources
…community will
…co-design between developers and users
…patience

Let’s change this!
What is Chapel?

- An emerging parallel programming language
  - Design and development led by Cray Inc.
    - in collaboration with academia, labs, and industry (both domestically and internationally)

- A work-in-progress

- Chapel’s overall goal: Improve programmer productivity
  - Improve the programmability of parallel computers
  - Match or beat the performance of current programming models
  - Support better portability than current programming models
  - Improve the robustness of parallel codes
Chapel's Implementation

● Developed as open source at SourceForge

● Licensed as BSD software

● A Community Effort
  ● 19 developers from 8 organizations and 5 countries contributed to version 1.8

● Target Architectures:
  ● multicore desktops and laptops
  ● commodity clusters and the cloud
  ● HPC systems from Cray and other vendors
  ● in-progress: CPU+accelerator hybrids, manycore, …
**Chapel’s Multiresolution Design**

**Multiresolution Design:** Support multiple tiers of features

- higher levels for programmability, productivity
- lower levels for greater degrees of control

Chapel language concepts:

- Domain Maps
- Data Parallelism
- Task Parallelism
- Base Language
- Locality Control
- Target Machine

High-level forall loops and whole-array ops

Explicit tasking and data-centric synchronization

User-specified parallel arrays and loops

A productive core language

Placement of data and tasks
A Team Effort — Join Us!
Chapel at SC13

- **Meet a Developer**: Chapel team members will be staffing this booth all week

- **Poster** *(Tues @ 5:15)*: Towards Co-Evolution of Auto-Tuning and Parallel Languages
  - Ray Chen (University of Maryland), Posters Session

- **Talk** *(Tues @ 3:20)*: Hierarchical Locales: Exposing the Node Architecture in Chapel
  - Sung-Eun Choi (Cray Inc.), KISTI booth #3713

- **Chapel Lightning Talks BoF** *(Wed @ 12:15)*
  - 5-minute talks on Chapel and… education! MPI-3! Big Data! Autotuning! Futures! MiniMD!

- **Talk** *(Wed @ 4:30)*: Chapel, an Emerging Parallel Language
  - Brad Chamberlain (Cray Inc.), HPC Impact Theatre (right next door)

- **Happy Hour** *(Wed @ 5pm)*: 4th annual Chapel Users Group (CHUG) Happy Hour
  - Pi Bar (just across the street)

- **HPC Educators** *(Thus @ 1:30pm)*: High-Level Parallel Programming Using Chapel
  - David Bunde (Knox College) and Kyle Burke (Colby College)