Productive Programming in Chapel:
A Next-Generation Language for General, Locality-Aware Parallelism

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Bergen Language Design Laboratory: April 10\textsuperscript{th}, 2013
What is Chapel?

• An emerging parallel programming language
  • Design and development led by Cray Inc.
    • in collaboration with academia, computing centers, industry
  • Initiated under the DARPA HPCS program

• **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

• A work-in-progress
Chapel's Implementation

- Being developed as open source at SourceForge
-Licensed as BSD software

**Target Architectures:**
- Cray architectures
- multicore desktops and laptops
- commodity clusters
- systems from other vendors
- (in-progress: CPU+accelerator hybrids, manycore, ...)

Today's Goals

- Introduce you to the Chapel language in-depth
  - motivating themes
  - central language concepts and features
  - project status
- Demonstrate the Chapel compiler interactively
- Point you toward resources for future reference
- Get your feedback on Chapel
Who Are You?

Type of Institution?
- Academic, Industry, HPC Lab, Gov’t, ...

Role?
- Student, postdoc, faculty, developer, researcher, ...

Favorite Languages?
- Fortran, C, C++, Java, Matlab, Python, Perl, C#, ...

Parallel Programming Models?
- MPI, OpenMP, UPC, CAF, Pthreads, CUDA, ...
Ground Rules

- Please ask questions as we go
- Also feel free to ask me questions during the break and afterwards
This Morning's Plan

10:00 – Welcome
10:10 – **Background**
10:30 – **Base Language**
11:00 – **Data Parallelism**
11:30 – **Task Parallelism**
12:00 – Lunch
12:30 – **Locales**
13:00 – **Domain Maps**
13:30 – **Project Overview** & Hands-on Demo
14:00 – Done!
Resources For After Today

Chapel project page: [http://chapel.cray.com](http://chapel.cray.com)
- overview, papers, presentations, language spec, ...

Chapel SourceForge page: [https://sourceforge.net/projects/chapel/](https://sourceforge.net/projects/chapel/)
- release downloads, public mailing lists, code repository, ...

IEEE TCSC Blog Series:
- *Myths About Scalable Parallel Programming Languages*

Mailing Lists:
- chapel_info@cray.com: contact the team
- chapel-users@lists.sourceforge.net: user-oriented discussion list
- chapel-developers@lists.sourceforge.net: dev.-oriented discussion
- chapel-education@lists.sourceforge.net: educator-oriented discussion
- chapel-bugs@lists.sourceforge.net/chapel_bugs@cray.com: public/private bug forum
Any Final Questions or Comments?