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

Chapel Team, Cray Inc.

SC12: November 11th, 2011
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, ...)

SC12: Productive Programming in Chapel
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
Our Team For Today's Tutorial

- Brad Chamberlain
- Sung-Eun Choi
- Martha Dumler
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 us questions during the break and afterwards
This Morning You Should Receive

1. A Chapel USB Stick with...
   - the final tutorial slides
   - the Chapel release
   - Chapel documentation and materials

2. A spiffy Chapel backpack

3. A Chapel-specific survey on the tutorial and language
   - please return to us by the end of the session
   - **Note:** SC also has a survey you should complete today
     - return these to the student volunteers
This Morning's Plan

8:30 – Welcome
8:40 – Background
9:00 – Base Language
9:30 – Data Parallelism
10:00 – Break
10:30 – Task Parallelism
11:00 – Locales
11:20 – Domain Maps
11:40 – Project Overview
12:00 – 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 list
- chapel-education@lists.sourceforge.net: educator-oriented discussion list
- chapel-bugs@lists.sourceforge.net/chapel_bugs@cray.com: public/private bug forum
Final Notes

**Surveys**

Please take the time to fill out and return both ours and SC12’s

**Thanks!**

For your interest in Chapel and your feedback
Any Final Questions or Comments?