Productive Programming in Chapel:

A Next-Generation Language for General, Locality-Aware Parallelism

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Bergen Language Design Laboratory: April 10th, 2013

Bergen
Language
Design
Laboratory

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

- overview, papers, presentations, language spec, …

Chapel SourceForge page: 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?