



Project Status, Next Steps



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A Year in the Life of Chapel

- **Two major releases per year** (April / October)
 - latest release: version 1.10, October 2nd, 2014
 - a month later: detailed release notes
 - release and notes available at: <http://chapel.cray.com/download.html>
- **SC activities** (Nov)
 - Chapel tutorials (most years)
 - CHUG meet-up / happy hour (past four years)
 - lightning talks BoF (past three years)
 - educators forum (past two years)
 - talks, posters, emerging technology booth, etc. (whenever possible)
- **CHIUW: The Chapel Implementers and Users Workshop** (May-June)
 - Highlighting Chapel work being done around the community in talks and discussion
- **Talks, panels, tutorials, research visits, papers, blogs, ...** (year-round)
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Chapel version 1.10 Highlights

- lighter-weight tasking via Sandia's Qthreads
- initial support for Intel Xeon Phi Knights Corner (KNC)
- renewed focus on standard libraries
- support for Lustre and cURL-based data channels
- expanded array capabilities
- improved semantic checks, bug fixes, third-party packages, ...
- significant performance improvements

<https://github.com/chapel-lang/chapel/releases/tag/1.10.0>

Implementation Status -- Version 1.10 (Oct 2014)

Overall Status:

- **User-facing Features:** generally in good shape
 - some require additional attention (e.g., strings, OOP)
- **Multiresolution Features:** in use today
 - their interfaces are likely to continue evolving over time
- **Error Messages:** not always as helpful as one would like
 - correct code works well, incorrect code can be puzzling
- **Performance:** hit-or-miss depending on the idioms used
 - Chapel designed to ultimately support competitive performance
 - effort to-date has focused primarily on correctness

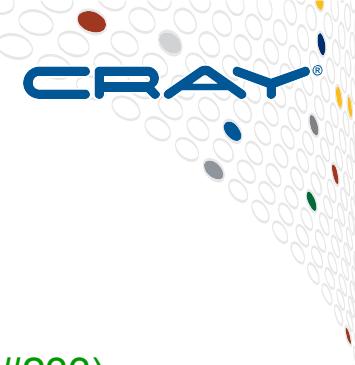
This is a good time to:

- Try out the language and compiler
- Use Chapel for non-performance-critical projects
- Give us feedback to improve Chapel
- Use Chapel for parallel programming education

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Chapel at SC14



Chapel Tutorial (Sun @ 8:30)

"A Computation-Driven Introduction to Parallel Computing in Chapel"

Hierarchical Locales Exhibit at Emerging Technologies Booth (all week, booth #233)

poster staffed by members of the Chapel team

Chapel Lightning Talks BoF (Tues @ 12:15, room 293)

5-minute talks on Chapel + HSA, HDFS/Lustre/cURL, tilings, LLVM, ExMatEx, Python

Talk on Hierarchical Locales (Tues @ 4:30, Emerging Technologies Theater, booth #233)

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"Orthogonal Scheduling of Stencil Computations with Chapel Iterators", Ian Bertolacci (Colorado State)

Chapel Users Group (CHUG) BoF (Wed @ 5:30, room 383-84-85)

Chapel overview and current events, followed by community Q&A and discussion

5th Annual CHUG Happy Hour (Wed @ 7:15, Mulate's at 201 Julia St)

social gathering just across the way; open to general public, dutch treat

Participation in other BoFs:

- **LLVM in HPC** (Tues @ 12:15, room 283-84-85)
- **Programming Abstractions for Data Locality** (Wed @ 12:15, room 391-92)
- **PGAS: Partitioned Address Space Programming Model** (Wed @ 12:15, room 273)

Chapel Lightning Talks 2014



Chapel Overview

Greg Titus, Cray Inc.

CoMD in Chapel: The Good, the Bad, and the Ugly

David Richards, Lawrence Livermore National Laboratory

Chapel for Python Programmers

Simon Lund, University of Copenhagen

Chapel Iterators: Providing Tiling for the Rest of Us

Ian Bertolacci, Colorado State University

Chapel I/O: Getting to Your Data Wherever It Is

Tim Zakian, Indiana University

LLVM-based Communication Optimizations for Chapel

Akihiro Hayashi, Rice University

COHX: Chapel on HSX + XTQ

(Adventures of a PGAS Language in a Heterogenous World)

Deepak Majeti, Rice University

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CHIUW 2014 Talks and Speakers

User Experiences with a Chapel Implementation of UTS

Jens Breitbart, Technische Universität München

Evaluating Next Generation PGAS Languages for Computational Chemistry

Daniel Chavarria-Miranda, Pacific Northwest National Laboratory

Programmer-Guided Reliability in Chapel

David E. Bernholdt, Oak Ridge National Laboratory

Towards Interfaces for Chapel

Chris Wailes, Indiana University

Affine Loop Optimization using Modulo Unrolling in Chapel

Aroon Sharma, University of Maryland

Keynote: Walking to the Chapel

Robert Harrison, Stony Brook University / Brookhaven National Laboratory

LLVM Optimizations for PGAS Programs

Akihiro Hayashi, Rice University

Opportunities for Integrating Tasking and Communication Layers

Dylan T. Stark, Sandia National Laboratories

Caching in on Aggregation

Michael Ferguson, Laboratory for Telecommunication Sciences

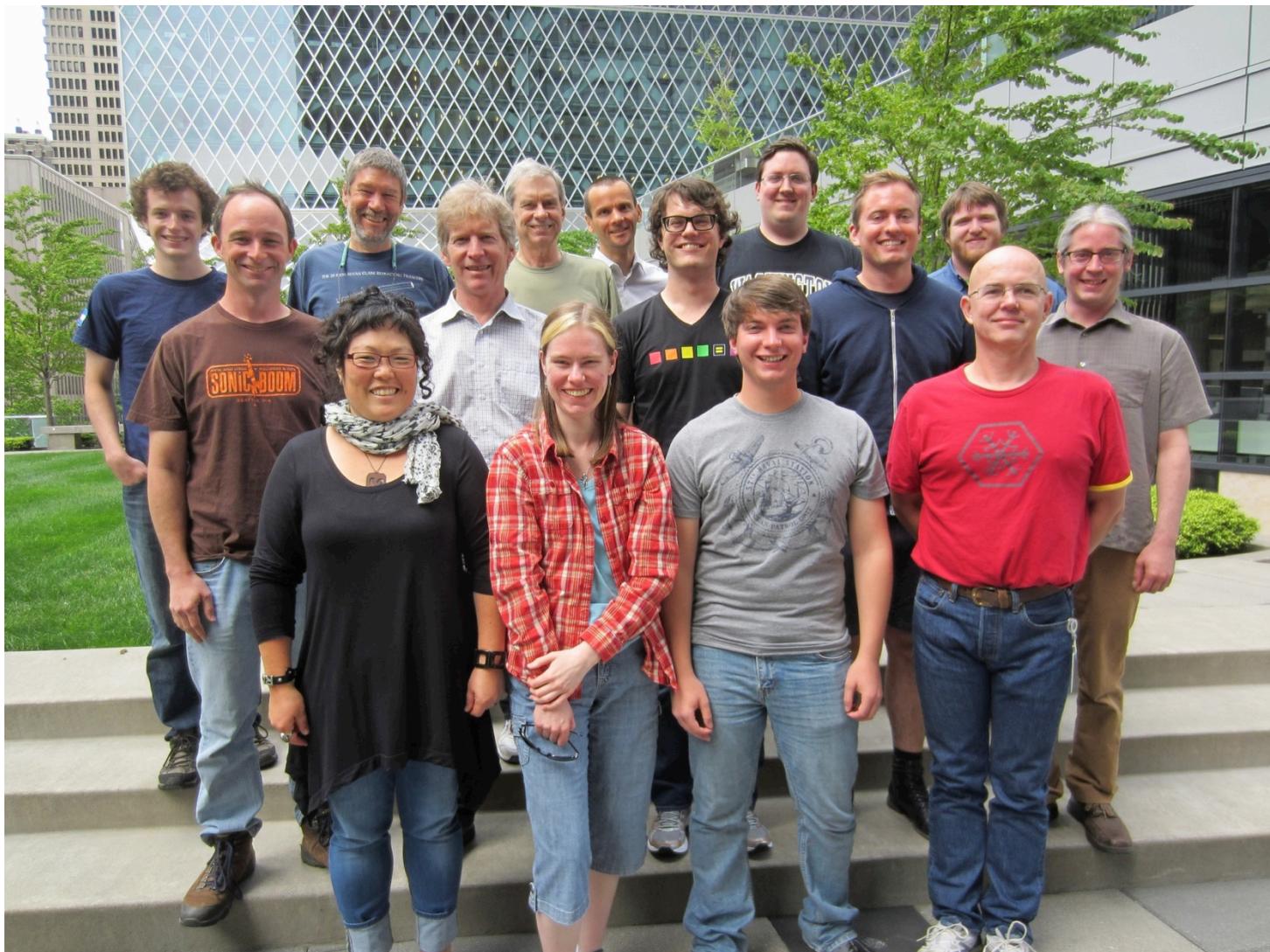
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Chapel: the next five years

- **Harden prototype to production-grade**
 - optimize performance
 - add/improve lacking features
 - improve interoperability
- **Target more complex/modern compute node types**
 - e.g., Intel MIC, CPU+GPU, AMD APU, ...
- **Continue to grow the user and developer communities**
 - including nontraditional circles: desktop parallelism, “big data”
 - transition Chapel from Cray-managed to community-governed

The Cray Chapel Team (Summer 2014)



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Chapel...

...is a collaborative effort — join us!



Colorado
State
University



RICE®



ETH Zürich

 Lawrence Livermore
National Laboratory

 Sandia National Laboratories



Lawrence Berkeley
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MARYLAND

Chapel and Education

- When teaching parallel programming, I like to cover:
 - data parallelism
 - task parallelism
 - concurrency
 - synchronization
 - locality/affinity
 - deadlock, livelock, and other pitfalls
 - performance tuning
 - ...
- I don't think there's been a good language out there...
 - for teaching *all* of these things
 - for teaching *some* of these things well at all
 - *until now:* We believe Chapel can play a crucial role here
(see <http://chapel.cray.com/education.html> for more information and
<http://cs.washington.edu/education/courses/csep524/13wi/> for my use of Chapel in class)

Chapel: Educator Advocates

- And now, educators are making the argument for us:



SC13
Denver, CO 2013
Association for Computing Machinery
HPC Event

About New Attendees Technical Program Help

SC13 Home > SC13 Schedule > SC13 Presentation - High-Level Parallel Programming Using Chapel

SCHEDULE: NOV 16-22, 2013

When viewing the Technical Program schedule, on the far right select an event and want to add it to your personal schedule, that event will be stored there. As you select events in this ma

ENTIRE WEEK	SATURDAY	SUNDAY
High-Level Parallel Programming Using Chapel		
SESSION: High-Level Parallel Programming using Chapel		
EVENT TYPE: HPC Interconnections, HPC Educator Program		
TIME: 1:30PM - 5:00PM		
SESSION CHAIR: Steven Brandt		
PRESENTER(S): David P. Bunde, Kyle Burke		
ROOM: 708/710/712		
ABSTRACT:		

Chapel is a parallel programming language that provides a wide variety of undergrads courses. Chapel is easy to learn since it supports a low-overhead style similar to scripting languages. Of parallel reduction. Data parallelism is easily expressed using annotations such as those make Chapel well suited for education.

Conference Dates: Exhibition Dates:
Nov. 17-22, 2013 Nov. 18-21, 2013

The International Conference for

Today's LeSSon

Programming Zero
to

Parallel Hero

...in Six Hours

by Tim Stitt Ph.D.



SIGCSE
ATLANTA
2014

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Chapel: A versatile tool for teaching undergraduate

Chapel is a programming language being developed for high-performance applications. It provides a wide variety of undergrads courses. Chapel is easy to learn since it supports a low-overhead style similar to scripting languages. Of parallel reduction. Data parallelism is easily expressed using annotations such as those make Chapel well suited for education.

Author(s):

David Bunde
Knox College
United States

Kyle Burke
Colby College
United States

<http://chapel.cray.com/education.html>

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"I like Chapel... How can I help?"

Give Chapel a try to see whether it's on a useful path for your computational idioms

- if not, help us course correct
- pair programming with us is a good approach
- evaluate performance based on potential, not present

Let others know about your interest in Chapel

- your colleagues and management
- Cray leadership
- the broader parallel community (HPC and mainstream)

Contribute to the project

- code contributions, research collaborations, funding

For More Information: Online Resources

Chapel project page: <http://chapel.cray.com>

- overview, papers, presentations, language spec, ...

Chapel Facebook page: <https://www.facebook.com/ChapelLanguage>

Chapel GitHub page: <https://github.com/chapel-lang>

- download 1.10.0 release, browse source repository

Chapel SourceForge page: <https://sourceforge.net/projects/chapel/>

- join community mailing lists; alternate release download site

Mailing Lists:

- chapel_info@cray.com: contact the team at Cray
- chapel-announce@lists.sourceforge.net: read-only list for announcements
- chapel-users@lists.sourceforge.net: user-oriented discussion list
- chapel-developers@lists.sourceforge.net: developer discussion
- chapel-education@lists.sourceforge.net: educator discussion
- chapel-bugs@lists.sourceforge.net: public bug forum

For More Information: Suggested Reading

Overview Papers:

- [A Brief Overview of Chapel](#), Chamberlain (pre-print of a chapter for *A Brief Overview of Parallel Programming Models*, edited by Pavan Balaji, to be published by MIT Press in 2014).
 - *a detailed overview of Chapel's history, motivating themes, features*
- [The State of the Chapel Union \[slides\]](#), Chamberlain, Choi, Dumler, Hildebrandt, Iten, Litvinov, Titus. CUG 2013, May 2013.
 - *a higher-level overview of the project, summarizing the HPCS period*

For More Information: Lighter Reading

Blog Articles:

- [Chapel: Productive Parallel Programming](#), [Cray Blog](#), May 2013.
 - *a short-and-sweet introduction to Chapel*
- [Why Chapel?](#) ([part 1](#), [part 2](#), [part 3](#)), [Cray Blog](#), June-August 2014.
 - *a current series of articles answering common questions about why we are pursuing Chapel in spite of the inherent challenges*
- [\[Ten\] Myths About Scalable Programming Languages](#) ([index available here](#)), [IEEE TCSC Blog](#), April-November 2012.
 - *a series of technical opinion pieces designed to combat standard arguments against the development of high-level parallel languages*

Final Notes

Surveys

Please take the time to fill out and return the surveys
(both ours and SC14's)

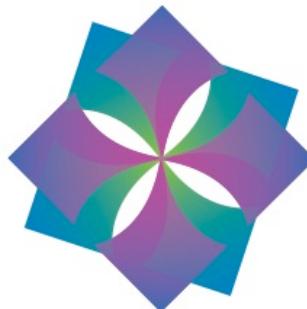
Thanks!

For your interest in Chapel and your feedback



Any Remaining Questions about Chapel?

Or, anything you'd like to see in a live demo?



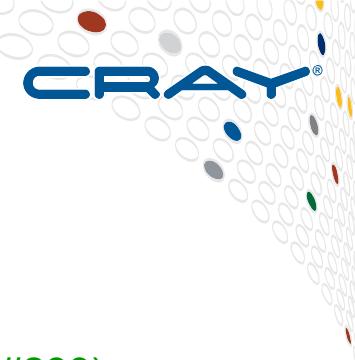
SC14
New Orleans, LA | hpc
matters.

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