ChapelCon ‘24

7 June 2024

ChapelCon '24 Organization

- **General Chair:**
  Engin Kayraklioglu, *Hewlett Packard Enterprise*
- **Program Committee Chair:**
  Josh Milthorpe, *Oak Ridge National Laboratory*
- **Tutorial Day Chair:**
  Ben McDonald, *Hewlett Packard Enterprise*
- **Coding Day Chair:**
  Brandon Neth, *Hewlett Packard Enterprise*
- **Publicity Chair:**
  Sarah Coghlan, *Hewlett Packard Enterprise*

•**Program Committee:**
•Marjan Asgari, *Natural Resources Canada*
•Scott Bachman, *[C]Worthy*
•Tiago Carneiro, *Interuniversity Microelectronics Centre*
•Johannes Doerfert, *Lawrence Livermore National Laboratory*
•Paul H. Hargrove, *Lawrence Berkeley National Laboratory*
•Tess Hayes, *Bytoa*
•Harumi Kuno, *Hewlett Packard Enterprise*
•Nelson Luís Dias, *Federal University of Paraná*
•Damian McGuckin, *Pacific ESI*
•Stephen Olivier, *Sandia National Laboratories*
•Tyler Simon, *University of Maryland*
•Tom Westerhout, *Radboud University*

•**Advisory Committee:**
•Brad Chamberlain, *Hewlett Packard Enterprise*
•Michelle Strout, *Hewlett Packard Enterprise*

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8:05–8:35 PDT **State of the Project**

Brad Chamberlain (*Hewlett Packard Enterprise*)

This talk will give a brief summary of highlights and milestones achieved within the Chapel project since last year.

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Session 1: Tooling
Session chair: Shreyas Khandekar (*Hewlett Packard Enterprise*)

8:35–8:55 PDT **WWU Chapel Debugger**
Henry Baker, Drake Riley, Cole Yamamura and Phil Nelson (*Western Washington University*)

8:55–9:15 PDT **Advanced Editor Tooling for Chapel**
Daniel Fedorin, Jade Abraham (*Hewlett Packard Enterprise*)

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Session 2: Performance Studies
Session chair: Tom Westerhout (*Radboud University*)

9:30–9:40 PDT **The Computer Language Benchmarks Game and Chapel 2.0**

Brad Chamberlain (*Hewlett Packard Enterprise*)

9:40–10:00 PDT **Performance Portability of Chapel on Diverse Architectures**

Josh Milthorpe, Xianghao Wang and Ahmad Azizi (*Australian National University*)

10:00–10:10 PDT **Investigating Portability in Chapel for Tree-based Optimization on GPU-powered Clusters**

Tiago Carneiro Pessoa, Engin Kayraklioglu, Guillaume Helbecque and Nouredine Melab (*IMEC - Leuven*, *Hewlett Packard Enterprise*, *University of Luxembourg*, *University of Lille*)

10:10–10:30 PDT **Braiding a Million Threads: Scalable GPU Sort on Frontier**

Josh Milthorpe, Brett Eiffert and Jeffrey Vetter (*Oak Ridge National Laboratory*)

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Keynote
Session chair: Brad Chamberlain (*Hewlett Packard Enterprise*)

10:45–11:45 PDT

A Case for Parallel-First Languages in a Post-Serial, Accelerated World

Paul Sathre (*Virginia Tech*)

Abstract: Parallel processors have finally dominated all scales of computing hardware, from the personal and portable to the ivory tower datacenters of yore. However, dominant programming models and pedagogy haven't kept pace, and languish in a post-serial mix of libraries and language extensions. Further, heterogeneity in the form of GPUs has dominated the performance landscape of the last decade, penetrating casual user markets thanks to data science, crypto and AI booms. Unfortunately GPUs' performance remains largely constrained to expert users by the lack of more productive and portable programming abstractions. This talk will probe questions about how to rethink and democratize parallel programming for the masses. By reflecting on lessons learned from a decade and a half of accelerated computing, I'll show where Chapel 2.0 fits into the lineage of GPU computing, can capitalize on GPU momentum, and lead a path forward.

Bio: Paul Sathre is a Research Software Engineer in the Synergy Lab and NSF Center for Space, High-performance, and Resilient Computing (SHREC) at Virginia Tech. His research interests encompass systems software and tools and programming systems, particularly with respect to democratizing access to high-performance computing. More recently, his work has focused on the intersection of computational co-design with portable and productive languages, tools, and libraries for heterogeneous computing

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Session 3: Outreach
Session chair: Tess Hayes (*Bytoa*)

12:00–12:20 PDT **Building a Chapel Curriculum on Exercism**
Luca Ferranti (*Individual Contributor*)

12:20–12:30 PDT **Exploring Machine Learning Capabilities in Chapel: An Internship Journey**
Iain Moncrief (*Oregon State University*)

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Session 4: Algorithms
Session chair: Marjan Asgari (*Natural Resources Canada*)

12:45–12:55 PDT **Unbalanced Tree-Search at Scale Using the Chapel's DistributedBag Module**
Guillaume Helbecque, Tiago Carneiro, Jan Gmys, Nouredine Melab and Pascal Bouvry (*University of Luxembourg*, *IMEC - Leuven*, *University of Lille*)

12:55–1:15 PDT **Arrays as Arguments in First-Class Functions: the Levenberg-Marquardt Algorithm in Chapel**
Nelson Dias, Débora Roberti and Vanessa Arruda Dias (*Federal University of Paraná*, *Federal University of Santa Maria*)

1:15–1:35 PDT **On the Design of Graph Analytical Software in Chapel**
Oliver Alvarado Rodriguez, David A. Bader and Zhihui Du (*New Jersey Institute of Technology*)

1:35–1:45 PDT **Implementing Imaginary Elementary Mathematical Functions**
Damian McGuckin, Peter Harding (*Pacific ESI*)

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Session 5: Chapel in the HPC Ecosystem
Session chair: Andy Stone (*Hewlett Packard Enterprise*)

2:00–2:10 PDT **Chapel in a Petabyte-Scale GPU Database Engine with Voltron Data's Theseus**
Trent Nelson and Fernanda Foertter (*Voltron Data*)

2:10–2:20 PDT **Chplx: an HPX Foundation for Chapel**
Shreyas Atre, Chris Taylor, Patrick Diehl and Hartmut Kaiser (*Louisiana State University*, *Tactical Computing Labs, LLC*)

2:20–2:40 PDT **Follow-Up on Chapel-Powered HPC Workflows for Python**
John Byrne, Harumi Kuno, Chinmay Ghosh, Porno Shome, Amitha C, Sharad Singhal, Clarete Riana Crasta, David Emberson and Abhishek Dwaraki (*Hewlett Packard Enterprise*)

2:40–?:?? PDT **Open Discussion Session**
This final session is designed to support open discussion and interaction among the ChapelCon attendees, and to provide an opportunity for lightning talks.