Derek G. Murray   Curriculum Vitae

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Background

Objective: To carry out world-class research in large-scale distributed systems, as faculty at a leading university, or in a top industrial research laboratory.

My research focuses on creating new systems and programming models that simplify the task of implementing parallel computations on distributed clusters. To that end, I have been instrumental in creating the CIEL distributed execution engine, Skywriting programming language, and Naiad differential dataflow system. As more efficient execution models become prevalent, there will be a need for low-level systems research into fine-grained scheduling, network protocols, and language runtimes, amongst other topics. My experience in developing and enhancing existing frameworks will be valuable when carrying out this research.

Education

2007–2011

Ph.D Computer Science, University of Cambridge

- Thesis: *A distributed execution engine supporting data-dependent control flow*
- Supervisor: Dr. Steven Hand
- Submitted July 2011, examined October 2011, graduated May 2012
- Received EuroSys Roger Needham PhD Award in 2012
- Lecturing experience: Introduction to data center computing
- Other teaching experience: supervised undergraduate students in Computer Fundamentals, Digital Electronics, Operating Systems, Computer Design, Distributed Systems, Information Retrieval and Advanced Systems Topics.

2005–2006

MSc. High Performance Computing, University of Edinburgh

- Grade: Distinction (awarded class medal)
- Dissertation: *Gathering BLOBs with OGSA-DAI*
- Taught courses included: Message Passing Programming, Shared Memory Programming, Parallel Decomposition, Exploiting the Computational Grid, and Hardware, Compilers & Performance Optimization

2001–2005

BSc. (Hons) Computing Science, University of Glasgow

- Grade: First class honours (awarded faculty and departmental prizes)
- Major project work included building a distributed, event-based economic simulator, and a distributed topic-driven web crawler.
- Other courses included Mathematics, Electronic Engineering and Economics.

Community service

- 2012 ACM Symposium on Cloud Computing – PC member.
- 2012 Workshop on Systems for Future Multicore Architectures – PC co-chair.
- 2012 ACM ASPLOS and VEE – travel grants chair.
- 2011 Workshop on Systems for Future Multicore Architectures – PC member.
- 2008 USENIX NSDI – external reviewer and HotCRP administrator.

List of publications

- Differential dataflow. Frank McSherry, Derek G. Murray, Rebecca Isaacs and Michael Isard. In *Proceedings of CIDR*, 2013.

- The seven deadly sins of cloud computing research. Malte Schwarzkopf, Derek G. Murray and Steven Hand. In *Proceedings of HotCloud*, 2012.

- Parallelizing the training of the Kinect body parts labeling algorithm. Mihai Budiu, Jamie Shotton, Derek G. Murray and Mark Finocchio. In *Proceedings of BigLearn*, 2011.

- Steno: automatic optimization of declarative queries. Derek G. Murray, Michael Isard and Yuan Yu. In *Proceedings of PLDI*, 2011.

- Non-deterministic parallelism considered useful. Derek G. Murray and Steven Hand. In *Proceedings of HotOS*, 2011.

- Condensing the cloud: running CIEL on many-core. Malte Schwarzkopf, Derek G. Murray and Steven Hand. In *Proceedings of SFMA*, April 2011.

- CIEL: a universal execution engine for distributed data-flow computing. Derek G. Murray, Malte Schwarzkopf, Christopher Smowton, Steven Smith, Anil Madhavapeddy and Steven Hand. In *Proceedings of NSDI*, 2011.

- Skywriting on CIEL: programming the data center. Derek G. Murray and Steven Hand. In *;login: magazine*, USENIX Association, 2011.

- The case for crowd computing. Derek G. Murray, Eiko Yoneki, Jon Crowcroft and Steven Hand. In *Proceedings of MobiHeld*, 2010.

- Scripting the cloud with Skywriting. Derek G. Murray and Steven Hand. In *Proceedings of HotCloud*, 2010.

- Using dust clouds to enhance anonymous communication. Richard Mortier, Anil Madhavapeddy, Theodore Hong, Derek G. Murray and Malte Schwarzkopf. In *Proceedings of the International Workshop on Security Protocols*, 2010.

- Satori: Enlightened page sharing. Grzegorz Miłos, Derek G. Murray, Steven Hand and Michael Fetterman. In *Proceedings of USENIX ATC*, 2009.

- Xen and the beauty of virtualization. Derek Murray and Keir Fraser. In *Beautiful Architecture: Leading Thinkers Reveal the Hidden Beauty in Software Design*, O'Reilly Media, 2009.

- Spread-spectrum computation. Derek G. Murray and Steven Hand. In *Proceedings of HotDep*, 2008.

- Boxing clever with IOMMUs. Grzegorz Miłos and Derek G. Murray. In *Proceedings of VMSec*, 2008.

- Privilege separation made easy. Derek G. Murray and Steven Hand. In *Proceedings of EuroSec*, 2008.

- Improving Xen security through disaggregation. Derek G. Murray, Grzegorz Miłos and Steven Hand. In *Proceedings of VEE*, 2008.

Invited talks

- *Naiad: a system for incremental, iterative and interactive parallel computation.* Twitter, San Francisco, November 2012; UBC, November 2012; Systems Lunch, Cornell, October 2012; NYU, October 2012; Cloudera, San Francisco, October 2012; Google, Mountain View, September 2012; MIT, September 2012; PL seminar, Harvard, September 2012.

- *Programming the cloud: systems, language and security issues.* ISSNet summer school, University of Calgary, July 2011.

- *Programming the cloud with CIEL.* Commnet summer school, University of Edinburgh, June 2011.

- *Programming models for clouds and data centres.* RESCOM summer school, La Palmyre, France, June 2011.

- *Programming the cloud with Skywriting.* Vancouver Systems Colloquium, UBC, October 2010; LSDS Group Seminar, Imperial College London, May 2010.

- *Spread-spectrum computation.* UBC, December 2008; Microsoft Research Silicon Valley, December 2008.

- *Improving Xen security through disaggregation.* UBC, March 2008.

Employment

2011–2013	Postdoctoral Researcher, Microsoft Research Silicon Valley
	I am presently working on the Naiad project, in which we are building a new distributed data-parallel system that unifies iteration and incremental computation. My main contribution has been to develop the high-throughput, low-latency runtime that reliably coordinates execution across a cluster of multicore servers. With colleagues, I wrote a paper describing the execution model that will be published at CIDR 2013, and I am now working on a paper describing the implmentation of Naiad as a distributed system.
Summer 2009	Research Intern, Microsoft Research Silicon Valley
	During this internship, I worked for Yuan Yu and Michael Isard on the DryadLINQ project. I developed and optimized several distributed algorithms that were applied to real-world data. My main contribution was an automatic optimizer for LINQ queries that reduced the end-to-end execution of some DryadLINQ jobs by as much as 50%, and which was published at PLDI 2011.
2006–2007	Research Assistant, University of Cambridge Computer Laboratory
	I participated in the XenSE and OpenTC projects, and worked in the area of secure virtualization. In particular, I developed a disaggregated domain builder for the Xen hypervisor, which formed the basis of a paper that I presented at VEE 2008.
Summer 2005	Research Intern, Department of Computing Science, University of Glasgow
	This internship was an opportunity to pursue my research interests in the area of simulation software. In conjunction with my supervisor, Dr. Peter Dickman, I developed expressive languages that enable non-expert users to create simulation environments. Additionally, I helped to run the 5th UK Memory Management Network (MMNet) workshop.
Summer 2004	Summer work placement (National Security Products), Detica, Guildford
	The placement involved developing a compression algorithm for future use in a major product. My role was to design the algorithm, implement a prototype in the C programming language, evaluate the results and present the findings to members of the project team.

Selected awards

- EuroSys Roger Needham Ph.D Award, 2012
- Brendan Murphy Memorial Young Researcher Prize, Cosener's Multi-Service Networks workshop, 2010
- Best paper award, USENIX ATC 2009
- EPSRC Doctoral Training Account Ph.D scholarship, 2007
- Class medal, MSc. in High Performance Computing, University of Edinburgh, 2006
- EPSRC Master's Training Programme/Collaborative Training Account MSc. scholarship, 2005
- Ede & Ravenscroft Prize for the most distinguished graduate in the Faculty of Information & Mathematical Sciences, University of Glasgow, 2005
- Class prizes, Department of Computing Science, University of Glasgow, 2002–2005
- Class prizes, Department of Mathematics, University of Glasgow, 2002–2003
- Alexander Smart Memorial Bursary in Economics, University of Glasgow, 2003

Technical skills

- Main programming languages: C, C$^\sharp$, Java, Python
- Operating systems: Linux (including kernel development), Mac OS X, Microsoft Windows
- Parallel frameworks: DryadLINQ, Hadoop, MPI, .NET Task Parallel Library, OpenMP, pthreads