

Bryan Ford

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Academic Positions

Assistant Professor of Computer Science 2009–present
Department of Computer Science Yale University
Research topics: Distributed operating systems, virtualization, security, Internet architecture.

Postdoctoral Researcher in Computer Science 2008–2009
Advisor: Peter Druschel Max Planck Institute for Software Systems
Research focus: next-generation Internet architecture.

Education

Ph.D. and M.Sc. Computer Science, Massachusetts Institute of Technology, September 2008
Ph.D. Thesis title: *UIA: A Global Connectivity Architecture for Mobile Personal Devices*
M.Sc. Thesis title: *Packrat Parsing: a Practical Linear-Time Algorithm with Backtracking*
Thesis Advisor: M. Frans Kaashoek

B.Sc. Computer Science, University of Utah, June 1998, *summa cum laude*
Thesis Advisor: Jay Lepreau

Teaching

Operating Systems Spring '10, '11
Building Decentralized Systems Fall '10
Advanced Systems Topics Seminar Fall '09

External Research Funding

NSF CNS-1065451: *Making OS Kernels Crash-Proof by Design and Certification*, Zhong Shao (PI) and Bryan Ford. Aug 2011–Jul 2015, \$1,116,262.

DARPA SAFER contract N66001-11-C-4018: *Dissent: Scalable and Disruption-Proof Anonymity for Interactive Internet Communication*, Bryan Ford (PI), Joan Feigenbaum, and Vitaly Shmatikov. Dec 2010–Oct 2014, \$3,699,999.

DARPA CRASH award FA8750-10-2-0254: *Advanced Development of Certified OS Kernels*, Zhong Shao (PI) and Bryan Ford. Oct 2010–Sep 2014, \$2,657,704.

NSF CNS-1017206: *An Operating System and Programming Model for Deterministic Parallel Computation*, Bryan Ford (PI). Aug 2010–Jul 2013, \$472,130.

ONR grant N00014-09-10757: *Proactively Removing the Botnet Threat*, Joan Feigenbaum, Steven M. Bellovin, Angelos Keromytis Salvatore J. Stolfo, Vitaly Shmatikov, Michael Walfish, and Bryan Ford. Apr 2009–Sep 2010, \$883,627.

NSF CNS-0916413: *Tng, a Next Generation Transport Services Architecture*, Bryan Ford (PI) and Janardhan Iyengar. Aug 2009–Jul 2011, \$328,260.

Invited Lectures (partial)

Efficient System-Enforced Deterministic Parallelism, Harvard Computer Science Colloquium, November 2011; IBM T.J. Watson Research Center, November 2010; Columbia University, November 2010.

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A Next-Generation Transport/Network Layering Model, Schloss Dagstuhl Perspectives Workshop on Naming and Addressing in a Future Internet, Germany, March 2009.

Breaking Up the Transport Logjam, TU-Darmstadt, Germany, March 2009; NEC Labs, Heidelberg, Germany, February 2009.

Structured Stream Transport, Ecole Polytechnique Fédérale de Lausanne, Switzerland, August 2007.

Persistent Personal Names for Globally Connected Mobile Devices, TU-Dresden, Germany, June 2007.

Service

Program Committees: EuroSys '12, ASPLOS '12 ERC, SOSP '11 PC and Poster/WIP chair, USENIX '11, CCS '11, CCSW '11, MobiHeld '11, OSDI '10, HotNets '10, PFLDnet '10 chair, IMC '09, NPSec '09, ICCCN '09, ROADS '08.

NSF panelist: '10, '11.

Honors and Awards

Jay Lepreau Best Paper award, Operating Systems Design and Implementation (OSDI), 2010.

Best Student Paper award, USENIX Annual Technical Conference, 2008.

Presidential Fellowship, Massachusetts Institute of Technology, 2000.

Computing Research Association Outstanding Undergraduate Award, 1995.

Barry M. Goldwater Excellence in Education scholarship, 1994.

Clyde Christensen College of Engineering scholarship, University of Utah, 1991.

Refereed Conference/Journal Publications (texts available at <http://www.bford.info/pub.html>)

1. *Eyo: Device-Transparent Personal Storage*, Jacob Strauss, Justin Mazzola Paluska, Chris Lesniewski-Laas, Bryan Ford, Robert Morris, and Frans Kaashoek. USENIX Annual Technical Conference, June 2011.
2. *A Dynamic Recursive Unified Internet Design (DRUID)*, J. Touch, I. Baldine, R. Dutta, G. Finn, B. Ford, S. Jordan, D. Massey, A. Matta, C. Papadopoulos, P. Reiher, and G. Rouskas. Computer Networks, Apr. 2011 (to appear).
3. *Efficient System-Enforced Deterministic Parallelism*, Amittai Aviram, Shu-Chun Weng, Sen Hu, and Bryan Ford. *Winner of Jay Lepreau Best Paper Award; selected for Communications of the ACM Research Highlights*. 9th USENIX Symposium on Operating Systems Design and Implementation (OSDI 10), October 2010.
4. *Dissent: Accountable Anonymous Group Messaging*, Henry Corrigan-Gibbs and Bryan Ford. 17th ACM Conference on Computer and Communications Security (CCS), October 2010.
5. *Vx32: Lightweight User-level Sandboxing on the x86*, Bryan Ford and Russ Cox. USENIX Annual Technical Conference, June 2008. *Awarded Best Student Paper*.
6. *Alpaca: Extensible Authorization for Distributed Services*, Christopher Lesniewski-Laas, Bryan Ford, Jacob Strauss, M. Frans Kaashoek, and Robert Morris. 14th ACM Symposium on Computer and Communications Security (CCS), October 2007.
7. *Structured Streams: a New Transport Abstraction*, Bryan Ford. ACM SIGCOMM, August 2007.
8. *Persistent Personal Names for Globally Connected Mobile Devices*, Bryan Ford, Jacob Strauss, Chris Lesniewski-Laas, Sean Rhea, Frans Kaashoek, and Robert Morris. 7th USENIX Symposium on Operating Systems Design and Implementation (OSDI), November 2006.
9. *VXA: A Virtual Architecture for Durable Compressed Archives*, Bryan Ford. 4th USENIX Conference on File and Storage Technologies (FAST), December 2005.

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10. *Peer-to-Peer Communication Across Network Address Translators*, Bryan Ford, Pyda Srisuresh, and Dan Kegel. USENIX Annual Technical Conference, April 2005.
11. *Parsing Expression Grammars: A Recognition-Based Syntactic Foundation*, Bryan Ford. 31st ACM Symposium on Principles of Programming Languages (POPL), January 2004.
12. *Packrat Parsing: Simple, Powerful, Lazy, Linear Time*, Bryan Ford. International Conference on Functional Programming (ICFP), October 2002.
13. *Interface and Execution Models in the Fluke Kernel*, Bryan Ford, Mike Hibler, Jay Lepreau, Roland McGrath, and Patrick Tullmann. USENIX Symposium on Operating Systems Design and Implementation (OSDI), February 1999.
14. *The Flux OSKit: A Substrate for Kernel and Language Research*, Bryan Ford, Godmar Back, Greg Benson, Jay Lepreau, Albert Lin, and Olin Shivers. 16th ACM Symposium on Operating System Principles (SOSP), October 1997.
15. *Flick: A Flexible, Optimizing IDL Compiler*, Eric Eide, Kevin Frei, Bryan Ford, Jay Lepreau, Gary Lindstrom. ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), June 1997.
16. *Microkernels Meet Recursive Virtual Machines*, Bryan Ford, Mike Hibler, Jay Lepreau, Patrick Tullmann, Godmar Back, and Stephen Clawson. USENIX Symposium on Operating Systems Design and Implementation (OSDI), October 1996.
17. *CPU Inheritance Scheduling*, Bryan Ford and Sai R. Susarla. USENIX Symposium on Operating Systems Design and Implementation (OSDI), October 1996.
18. *Evolving Mach 3.0 to a Migrating Thread Model*, Bryan Ford and Jay Lepreau. USENIX Winter Technical Conference, January 1994.
19. *In-Kernel Servers on Mach 3.0: Implementation and Performance*, Jay Lepreau, Mike Hibler, Bryan Ford, and Jeffrey Law. 3rd USENIX Mach Symposium, April 1993.

Refereed Workshop Publications

20. *A Virtual Memory Foundation for Scalable Deterministic Parallelism*, Yu Zhang and Bryan Ford. 2nd ACM SIGOPS Asia-Pacific Workshop on Systems (APSys 2011), July 2011.
21. *CertiKOS: A Certified Kernel for Secure Cloud Computing*, Liang Gu, Alexander Vaynberg, Bryan Ford, Zhong Shao, and David Costanzo. 2nd ACM SIGOPS Asia-Pacific Workshop on Systems (APSys 2011), July 2011.
22. *Deterministic OpenMP for Race-Free Parallelism*, Amittai Aviram and Bryan Ford. 3rd USENIX Workshop on Hot Topics in Parallelism (HotPar), May 2011.
23. *Workspace Consistency: A Programming Model for Shared Memory Parallelism*, Amittai Aviram, Bryan Ford, and Yu Zhang. 2nd Workshop on Determinism and Correctness in Parallel Programming (WoDet), March 2011.
24. *Minion—an All-Terrain Packet Packhorse to Jump-Start Stalled Internet Transports*, Janardhan Iyengar, Bryan Ford, Dishant Ailawadi, Syed Obaid Amin, Michael Nowlan, Nabin Tiwari, and Jeff Wise. 8th International Workshop on Protocols for Future, Large-Scale & Diverse Network Transports (PFLDNeT), November 2010.
25. *Determinating Timing Channels in Compute Clouds*, Amittai Aviram, Sen Hu, Bryan Ford, and Ramakrishna Gummadi. ACM Cloud Computing Security Workshop (CCSW), October 2010.
26. *An Efficient Cross-Layer Negotiation Protocol*, Bryan Ford and Janardhan Iyengar. 8th Workshop on Hot Topics in Networks (HotNets-VIII), October 2009.
27. *Device Transparency: a New Model for Mobile Storage*, Jacob Strauss, Chris Lesniewski-Laas, Justin Mazzola Paluska, Bryan Ford, Robert Morris, and Frans Kaashoek. SOSP Workshop on Hot Topics in Storage and File Systems (HotStorage '09), October 2009.

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28. *Breaking Up the Transport Logjam*, Bryan Ford and Janardhan Iyengar. 7th Workshop on Hot Topics in Networks (HotNets-VII), October 2008.
29. *An Offline Foundation for Online Accountable Pseudonyms*, Bryan Ford and Jacob Strauss. First International Workshop on Social Network Systems, April 2008.
30. *User-Relative Names for Globally Connected Personal Devices*, Bryan Ford, Jacob Strauss, Chris Lesniewski-Laas, Sean Rhea, Frans Kaashoek, and Robert Morris. 5th International Workshop on Peer-to-Peer Systems (IPTPS), February 2006.
31. *Unmanaged Internet Protocol: Taming the Edge Network Management Crisis*, Bryan Ford. 2nd Workshop on Hot Topics in Networks (HotNets-II), November 2003.
32. *The Flux OS Toolkit: Reusable Components for OS Implementation*, Bryan Ford, Jay Lepreau, Steve Clawson, Kevin Van Maren, Bart Robinson, and Jeff Turner. 6th IEEE Workshop on Hot Topics in Operating Systems (HotOS-VI), May 1997.
33. *User-level Checkpointing through Exportable Kernel State*, Patrick Tullmann, Jay Lepreau, Bryan Ford, and Mike Hibler. 5th IEEE International Workshop on Object-Oriented in Operating Systems (IWOOS), October 1996.
34. *The Persistent Relevance of the Local Operating System to Global Applications*, Jay Lepreau, Bryan Ford, and Mike Hibler. 7th ACM SIGOPS European Workshop, September 1996.
35. *Microkernels Should Support Passive Objects*, Bryan Ford and Jay Lepreau. 3rd IEEE International Workshop on Object-Oriented in Operating Systems (IWOOS), December 1993.
36. *FLEX: A Tool for Building Efficient and Flexible Systems*, John B. Carter, Bryan Ford, Mike Hibler, Ravindra Kuramkote, Jeffrey Law, Jay Lepreau, Douglas B. Orr, Leigh Stoller, and Mark Swanson. 4th Workshop on Workstation Operating Systems (WWOS), October 1993.

Internet RFCs

37. *Unintended Consequences of NAT Deployments with Overlapping Address Space*, P. Srisuresh and B. Ford. RFC 5684, February 2010.
38. *NAT Behavioral Requirements for ICMP*, P. Srisuresh, B. Ford, S. Sivakumar, S. Guha. RFC 5508, April 2009.
39. *NAT Behavioral Requirements for TCP*, S. Guha, K. Biswas, B. Ford, S. Sivakumar, and P. Srisuresh. RFC 5382, October 2008.
40. *State of Peer-to-Peer (P2P) Communication across Network Address Translators (NATs)*, Pyda Srisuresh, Bryan Ford, and Dan Kegel. RFC 5128, March 2008.

Technical Reports and Other Publications

41. *Directions in Internet Transport Evolution*, Bryan Ford. IETF Journal, Volume 3 Issue 3, December 2007.
42. *Scalable Internet Routing on Topology-Independent Node Identities*, Bryan Ford. Technical Report MIT-LCS-TR-926, October 31, 2003.
43. *Using Annotated Interface Definitions to Optimize RPC*, Bryan Ford, Mike Hibler, and Jay Lepreau. Technical Report UUCS-95-014, March 1995.
44. *Separating Presentation from Interface in RPC and IDLs*, Bryan Ford, Mike Hibler, and Jay Lepreau. Technical Report UUCS-95-018, December 1994.
45. *Notes on Thread Models in Mach 3.0*, Bryan Ford, Mike Hibler, and Jay Lepreau. Technical Report UUCS-93-012, April 1993.

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Industry Experience

Nuvoiz Inc. Consultant Provided design assistance on NAT traversal technology for voice-over-IP communication.	Mountain View, CA 2006
Phobos Inc. (acquired by SonicWALL in 2000) Systems architect Designed high-speed traffic management hardware/software systems in a networking startup.	Salt Lake City, UT 1998–2000
Sleepless Software Founder Developed and marketed entertainment products for MS-DOS, Windows, and Java platforms.	Salt Lake City, UT 1993–1998
Open Software Foundation Consultant Advised on integration of fast RPC and migrating threads into the OSF Mach kernel.	Cambridge, MA 1993
Hewlett-Packard Software engineer Cardiology Business Unit: wrote database tools for an ECG management system.	McMinnville, OR summer 1992
Designing Minds Consultant Designed and wrote drivers for high-speed data compression hardware.	Logan, UT 1991–1992
Waterford Institute Software engineer Created educational curricula and software with a team of teachers and programmers,	Provo, UT summers 1989–1991
Designing Minds Consultant Developed a painting program for bitmapped graphics and animation on the Amiga, titled <i>Chroma Paint</i> , published 1988.	Logan, UT 1987–1988

Software Artifacts

- 2010 Determinator/PIOS: an experimental research/instructional operating system. Open source release.
- 2007 SST: an experimental transport protocol implemented as a C++ library. Open source release.
- 2005 UIA: a naming and routing protocol suite for personal mobile devices. Open source release.
- 2005 vx32: an application-level virtual machine/sandbox for x86. Open source release.
- 2002 Pappy: a packrat parser generator for Haskell. Open source release.
- 1999 Fluke: an experimental microkernel operating system. Open source release.
- 1998 Flux OSKit: a component library for operating system construction. Open source release.
- 1997 Flick: an optimizing Interface Definition Language (IDL) compiler. Open source release.
- 1995 Inner Worlds: a side-scrolling action/adventure game. Released as Shareware by Sleepless Software.
- 1993 Migrating Threads: an enhancement to Mach 3.0, later incorporated in OSF Mach and Mac OS X.
- 1989 MultiPlayer: a multi-format music player for Amiga computers. Released as Shareware by author.
- 1988 Chroma Paint: a bitmapped graphics tool for Amiga. Commercially published by Designing Minds.