Joshua Fried

Contact Information

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Research Interests

Datacenter efficiency and performance, operating system design, host networking, distributed systems

Education

Massachusetts Institute of Technology

Ph.D. in Electrical Engineering and Computer Science **Expected 2025**
Advisor: Adam Belay

MS in Electrical Engineering and Computer Science **2020**
Advisor: Adam Belay
Thesis: *Overcoming Scalability Bottlenecks in Shenango*

University of Pennsylvania

BSE in Computer Science, *Cum Laude* **2017**

Refereed Papers

Making Kernel Bypass Practical for the Cloud with Junction.
Joshua Fried, Gohar Irfan Chaudhry, Enrique Saurez, Esha Choukse, Inigo Goiri, Sameh Elnikety, Rodrigo Fonseca, Adam Belay. *Proceedings of the 21st USENIX Symposium on Networked Systems Design and Implementation* (NSDI '24).

Capybara: μSecond-Scale Live TCP Migration.
Inho Choi, Nimesh Wadekar, Raj Joshi, **Joshua Fried**, Irene Zhang, Dan R. K. Ports, Jialin Li. *Proceedings of the 14th ACM SIGOPS Asia-Pacific Workshop on Systems* (APSys '23).

Efficient Strong Scaling Through Burst Parallel Training.
Seo Jin Park, **Joshua Fried**, Sunghyun Kim, Mohammad Alizadeh, Adam Belay. *Proceedings of the 5th MLSys Conference* (MLSys '22).

When Idling is Ideal: Optimizing Tail-Latency for Heavy-Tailed Datacenter Workloads with Perséphone.
Henri Maxime Demoulin, **Joshua Fried**, Isaac Pedisich, Marios Kogias, Boon Thau Loo, Linh Thi Xuan Phan, Irene Zhang. *Proceedings of the ACM SIGOPS 28th Symposium on Operating Systems Principles* (SOSP '21).

Caladan: Mitigating Interference at Microsecond Timescales.
Joshua Fried, Zhenyuan Ruan, Amy Ousterhout, Adam Belay. *14th USENIX Symposium on Operating Systems Design and Implementation* (OSDI '20).

Overload Control for μs-scale RPCs with Breakwater.
Inho Cho, Ahmed Saeed, **Joshua Fried**, Seo Jin Park, Mohammad Alizadeh, Adam Belay. *14th USENIX Symposium on Operating Systems Design and Implementation* (OSDI '20).

Shenango: Achieving High CPU Efficiency for Latency-sensitive Datacenter Workloads.
Amy Ousterhout, **Joshua Fried**, Jonathan Behrens, Adam Belay, Hari Balakrishnan. *16th USENIX Symposium on Networked Systems Design and Implementation* (NSDI '19).

A kilobit hidden SNFS discrete logarithm computation.
Joshua Fried, Pierrick Gaudry, Nadia Heninger, and Emmanuel Thomé. *36th Annual International Conference on the Theory and Applications of Cryptographic Techniques* (Eurocrypt '17).

Measuring small subgroup attacks against Diffie-Hellman.
    Luke Valenta, David Adrian, Antonio Sanso, Shaanan Cohney, **Joshua Fried**, Marcella Hastings, J. Alex Halderman, Nadia Heninger. *Network and Distributed System Security Symposium 2017* (NDSS '17).

Weak keys remain widespread in network devices.
    Marcella Hastings, **Joshua Fried**, and Nadia Heninger. *ACM Internet Measurement Conference 2016* (IMC '16).

A Systematic Analysis of the Juniper Dual EC Incident.
    Stephen Checkoway, Shaanan Cohney, **Joshua Fried**, Christina Garman, Matthew Green, Nadia Heninger, Jacob Maskiewicz, Eric Rescorla, Hovav Shacham, Ralf-Philipp Weinmann. *23rd ACM Conference on Computer and Communications Security 2016* (CCS '16). **Best Paper Award**, **IRTF Applied Networking Research Prize**.

Factoring as a Service.
    Luke Valenta, Shaanan Cohney, Alex Liao, **Joshua Fried**, Satya Bodduluri, and Nadia Heninger. *20th International Conference on Financial Cryptography and Data Security* (FC '16).

PROFESSIONAL EXPERIENCE
Microsoft Research, Seattle, WA, USA
PhD Intern   **May - August 2022**
Worked with team on development of new microsecond-scale serverless functions runtime.

Google, Madison, WI, USA (Remote)
PhD Software Engineering Intern   **June - September 2020**
Accelerated event notification and thread scheduling for end-host networking stack (Pony Express).

Facebook, New York, NY, USA
Software Engineering Intern   **May - August 2016**
Built out unified platform for storing performance metrics from recurring measurements/experiments. Created an interactive web UI, and on-boarded several internal services.

Facebook, Menlo Park, CA, USA
Software Engineering Intern   **May - August 2015**
Implemented BGP communication library for managing datacenter switches; revamped network visualization tool for monitoring inter-datacenter network traffic and physical network links.

Twine Health, Cambridge, MA, USA
Software Engineering Intern   **May - August 2014**
Full stack design and deployment of an analytics platform for the company's chronic condition management app.

SMR IT Consulting, Newton, MA, USA
Engineer   **January 2010 - August 2012**
IT consulting for small and medium-size companies, provided support for enterprise software solutions in both on-premise and cloud deployments.

TEACHING AND MENTORING
Research Mentoring. Mentored multiple graduate and undergraduate students while at MIT.

- *Anirudh Canumalla*, PhD student at UCSD   **since 2024**
  Ani is working the development of a microsecond-scale accelerator offload stack on top of Caladan.
- *Lana Honcharuk*, undergraduate student at Wellesley College   **since 2023**
  Lana worked on characterizing the working sets of serverless functions to better understand opportunities to accelerate snapshot loading and used this work for her honors thesis. She is now applying to PhD programs.
- *Ben Holmes* and *Baltasar Dinis*, PhD students at MIT   **since 2023**
  Ben and Baltasar are building a low-overhead process snapshot/restore system on top of Junction through a combination of new kernel interfaces and a novel file format for storing snapshots.

- *Inho Choi*, PhD student at NUS **since 2023**
  Inho has built a system that can live migrate TCP endpoints within a datacenter rack within microseconds, unlocking new flexibility in load balancing for cloud services.
- *Fabrício Barbosa de Carvalho*, PhD student at UFMS **since 2022**
  Fabrício is exploring how various strategies for deploying network stacks alongside application threads impact performance on multicore machines.
- *Noah Moroze* and *Aashish Welling*, undergraduate students at MIT **2019**
  Noah and Aashish extended Shenango to support kernel bypass for storage devices over SPDK.

Teaching Assistant. Seven cumulative semesters TAing which included holding office hours, grading, teaching recitation sections, and creating assignments.

- Introduction to Operating Systems (6.S081/6.828), MIT **Fall 2019**
- Introduction to Networks & Security (CIS 331), Penn **Spring 2016, 2017**
- Introduction to Computer Systems TA (CIS 240), Penn **Spring 2015**
- Programming Languages & Techniques I (CIS 120), Penn **Fall 2014 - Fall 2015**

SERVICE

NSDI Program Committee Support **Spring 2024**
Assisted in organizing and facilitating the Program Committee meeting, including coordinating logistics, managing paper discussions, and supporting the review process.
OSDI/ATC Artifact Evaluation Committee **2023**
OSDI/ATC Artifact Evaluation Committee **2022**

TALKS

UC Berkeley, seminar talk **November 2024**
Brown University, guest lecture - Datacenter and Cloud Operating Systems **October 2024**
Google, seminar talk **July 2024**
NSDI, conference talk **April 2024**
Northeastern, guest lecture - Operating Systems Implementation **November 2023**
MIT, guest lecture - Computer Networks **November 2023**
Boston University, seminar talk **November 2023**
Microsoft Research, seminar talk **July 2023**
University of Michigan, seminar talk **February 2023**
MIT, guest lecture - Operating Systems Research **September 2022**
OSDI, conference talk **November 2020**
Eurocrypt, conference talk **May 2017**

REFERENCES

Prof. Adam Belay
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