

# Hui Lu

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CONTACT INFORMATION	Department of Computer Science Binghamton University PO Box 6000 Binghamton, NY 13902-6000 <a href="http://www.cs.binghamton.edu/~huilu/">http://www.cs.binghamton.edu/~huilu/</a>	<i>Phone:</i> (765) 602-9423 <i>Email:</i> <a href="mailto:huilu@binghamton.edu">huilu@binghamton.edu</a>
RESEARCH INTERESTS	Cloud computing, system virtualization, computer networks, file and storage systems, serverless computing, microservices, cloud storage systems, operating systems	
EDUCATION	<b>Purdue University</b> Ph.D. in Computer Science <i>Advisors: Professor Dongyan Xu</i>	August 2012 - August 2017 West Lafayette, IN
	<b>Shanghai Jiao Tong University</b> M.E. in Electronic Engineering <i>Advisor: Professor Hongkai Xiong</i>	September 2006 - March 2009 Shanghai, China
	<b>Shanghai Jiao Tong University</b> B.E. in Electronic Engineering	September 2002 - July 2006 Shanghai, China
PROFESSIONAL EXPERIENCE	<b>Assistant Professor</b> Binghamton University State University of New York (SUNY)	August 2017 - Now Binghamton, New York, USA
	<b>Performance Engineer</b> Software and Solution Group Intel Asia-Pacific R&D Center	March 2009 - July 2012 Shanghai, China
PUBLICATIONS	<ol style="list-style-type: none"><li>1. Jiaxin Lei, Manish Munikar, <b>Hui Lu</b> and Jia Rao, “mFlow: Accelerating Packet Processing in Container Overlay Networks via Packet-level Parallelism”, 37th IEEE International Parallel &amp; Distributed Processing Symposium (IPDPS’ 23), St. Petersburg Florida, USA, MAY 2023.</li><li>2. Manish Munikar, Jiaxin Lei, <b>Hui Lu</b> and Jia Rao, “PRISM: Streamlined Packet Processing for Containers with Flow Prioritization”, 42nd IEEE International Conference on Distributed Computing Systems (ICDCS’ 22), Bologna, Italy, July 2022. Acceptance rate: 20%.</li><li>3. Zhen Lin, Kao-Feng Hsieh, Yu Sun, Seunghee Shin, and <b>Hui Lu</b>, “FlashCube: Fast Provisioning of Serverless Functions with Streamlined Container Runtimes”, 11th Workshop on Programming Languages and Operating Systems (PLOS 2021), online, 2021</li><li>4. Jiaxin Lei, Manish Munikar, Kun Suo, <b>Hui Lu</b>, Jia Rao, “Parallelizing Packet Processing in Container Overlay Networks”, In Proc. of 16th European Conference on Computer Systems (EuroSys’ 21), online, April 2021. Acceptance rate: 20%.</li><li>5. Yu Sun, Jiaxin Lei, Seunghee Shin, <b>Hui Lu</b>, “BAOVERLAY: A Block-Accessible Overlay File System for Fast and Efficient Container Storage”, In Proc. ACM Symposium on Cloud Computing 2020 (SoCC’ 20), Virtual Event, 2020. Acceptance rate: 24%.</li></ol>	

6. Haohang Xu, Jin Li, Hongkai Xiong, **Hui Lu**, “FedMax: Enabling a Highly-Efficient Federated Learning Framework”, In Proc. IEEE International Conference for Cloud Computing (Cloud’ 20), Beijing, China, 2020. Acceptance rate: 21%.
7. Bo Sang, Pierre-Louis Roman, Patrick Eugster, Hui Lu, Srivatsan Ravi, Gustavo Petri, “PLASMA: Programmable Elasticity for Stateful Cloud Computing Applications”, In Proc. 15th European Conference on Computer Systems, (EuroSys’ 20), Heraklion, Greece, online, 2020. Acceptance rate: 18%.
8. Dinuni Fernando, Ping Yang, **Hui Lu**, “SDN-based Order-aware Live Migration of Virtual Machines”, In Proc. IEEE International Conference on Computer Communications (INFOCOM’20) Beijing, China, 2020. Acceptance rate: 20%.
9. Jiaxin Lei, Kun Suo, **Hui Lu**, Jia Rao, “Tackling Parallelization Challenges of Kernel Network Stack for Container Overlay Networks”, In *Proceedings of 11th USENIX Workshop on Hot Topics in Cloud Computing (HotCloud’19)*, Renton, WA, July 2019. Acceptance rate: 37%.
10. Gourav Rattihalli, Madhusudhan Govindaraju, **Hui Lu**, Devesh Tiwari, “Exploring Potential for Non-Disruptive Vertical Auto Scaling and Resource Estimation in Kubernetes”, In *Proceedings of IEEE International Conference for Cloud Computing (Cloud 2019, Invited Track)*, Milan, Italy, July 2019.
11. **Hui Lu**, Abhinav Srivastava, Yu Sun, “ShadeNF: Testing Online Network Functions”, In *Proceedings of IEEE International Conference on Cloud Engineering (IC2E 2019)*, Prague, Czech Republic, June, 2019. Acceptance rate: 26%.
12. Spoorti Doddamani, Piush Sinha, **Hui Lu**, Kevin Cheng, Hardik Bagdi, and Kartik Gopalan, “Fast and Live Hypervisor Replacement”, In *Proceedings of the 15th ACM SIGPLAN/SIGOPS international conference on Virtual Execution Environments VEE 2019*, Providence, Rhode Island, April 2019.
13. Piush Kumar Sinha, Spoorti Doddamani, **Hui Lu**, Kartik Gopalan, “mWarp: Accelerating Intra-Host Live Container Migration via Memory Warping”, In *2019 IEEE INFOCOM WorkShops: DCPperf 2019: Big Data and Cloud Performance Workshop (DCPperf 2019 @ INFOCOM Workshops)*, Paris, France, April, 2019.
14. Yu Sun, **H. Lu**, A. Srivastava, and C. Xu, “ShadeNF: A Platform for Online Network Function Verification”, In *Proceedings of the ACM Symposium on Cloud Computing (SoCC ’18 posster)*, Carlsbad, CA, October, 2018.
15. **H. Lu**, “Rethinking Cloud Storage System Software under Multi-Tenancy”, Ph.D. Dissertation in *Purdue University Theses and Dissertations*, 2017.
16. **H. Lu**, B. Saltaformaggio, C. Xu, U. Bellur, D. Xu, “BASS: Improving I/O Performance for Cloud Block Storage via Byte-Addressable Storage Stack”, In *ACM Symposium on Cloud Computing (SOCC ’16)*, 2016. Acceptance rate: 25%.
17. **H. Lu**, A. Srivastava, B. Saltaformaggio, D. Xu, “StorM: Enabling Tenant-Defined Cloud Storage Middle-Box Services”, In *IEEE/IFIP International Conference on Dependable Systems and Networks (DSN ’16)*, 2016. Acceptance rate: 22.3%.
18. **H. Lu**, B. Saltaformaggio, R. Kompella, D. Xu, “vFair: Latency-Aware Fair Storage Scheduling via Per-IO Cost-Based Differentiation”, In *ACM Symposium on Cloud Com-*

puting (SOCC '15), 2015. Acceptance rate: 21.6%.

19. **H. Lu**, C. Xu, C. Cheng, R. Kompella, D. Xu, “vHaul: Towards Optimal Scheduling of Live Multi-VM Migration for Multi-tier Applications”, In *IEEE International Conference on Cloud Computing (CLOUD '15, Applications Track)*, 2015. Acceptance rate: 14%.

20. **H. Lu**, N. Arora, H. Zhang, C. Lumezanu, J. Rhee, G. Jiang, “Hybnet: Network Manager for a Hybrid Network Infrastructure”, In *ACM/IFIP/USENIX International Middleware Conference (Middleware '13, Industry Track)*, 2013. Acceptance rate: 22.7%.

21. C. Xu, S. Gamage, **H. Lu**, R. Kompella, D. Xu, “vTurbo: Accelerating Virtual Machine I/O Processing Using Designated Turbo-Sliced Core”, In *USENIX Annual Technical Conference (USENIX ATC '13)*, 2013. Acceptance rate: 14.2%.

22. **H. Lu**, Y. Dong, J. Duan, K. Tian, “Virtualization Challenges: a View from Server Consolidation Perspective”, In *ACM SIGPLAN/SIGOPS conference on Virtual Execution Environments (VEE '12)*, 2012. Acceptance rate: 37.7%.

23. **H. Lu**, X. Zheng, Z. Huang, J. Duan, “Tackling the Challenges of Server Consolidation on Multi-Core Systems”, In *IEEE International Symposium on Workload Characterization (IISWC '10)*, 2010. Acceptance rate: 37.5%.

24. H. Xiong, **H. Lu**, Y. Zhang, L. Song, Z. He, T. Chen, “Subgraphs Matching-Based Side Information Generation for Distributed Multiview Video Coding”, In *EURASIP Journal on Advances in Signal Processing*, 2010.

25. X. Zhen, J. Duan, S. F. Akhter, Z. Yu, and **H. Lu**, “A Consolidation Workload Characterization Study on Modern Platform”, In *International Computer Measurement Group (CMG) Conference*, 2009.

26. **H. Lu**, H. Xiong, L. Song, Z. He, T. Chen, “Graph Matching Based Side Information Generation for Distributed Multi-View Video Coding”, In *IEEE International Conference on Communications (ICC '09)*, 2009.

27. **H. Lu**, “Side Information Generation for Distributed Multi-view Video Coding”, Master Thesis in *Shanghai Jiao Tong University Theses and Dissertations*, 2009.

28. **H. Lu**, H. Xiong, Y. Zhang, Z. He, “Side Information Generation with Constrained Relaxation for Distributed Multi-View Video Coding”, In *IEEE International Symposium on Circuits and System (ISCAS '08)*, 2008.

29. Y. Zhang, H. Xiong, S. Yu, **H. Lu**, “A Source-Driven Error Recovery Scheme using Wyner-Ziv Coding”, In *IEEE International Conference Multimedia and Expo (ICME '07)*, 2007.

## RESEARCH EXPERIENCE

**Assistant Professor**  
SUNY Binghamton University

August 2017 - Now  
Binghamton, NY, USA

**Visiting Faculty**  
Air Force Research Laboratory (AFRL) and Griffiss Institute

June 2019 - August 2019  
Rome, NY, USA

**Research Assistant**  
Lab For Research In Emerging Networked and  
Distributed Systems (FRIENDS), Purdue University

August 2012 - August 2017  
West Lafayette, IN, USA

<b>Research Intern</b> Microsoft Research	June 2016 - September 2016 Redmond, WA, USA
<b>Research Intern</b> AT&T Research Lab	May 2014 - August 2014 Bedminster, NJ, USA
<b>Research Intern</b> NEC Laboratories America, Inc.	May 2013- Aug 2013 Princeton, NJ, USA
<b>Performance Engineer</b> Software and Solution Group Intel Asia-Pacific R&D Center	March 2009 - July 2012 Shanghai, China
<b>Research Assistant</b> Image, Video and Multimedia Communications Lab Shanghai Jiao Tong University	September 2006 - March 2009 Shanghai, China

## TEACHING

<b>Teaching Experience</b> Instructor Computer Science 350: Operating Systems Binghamton University Enrolled students (40 undergraduate students)	Spring 2023   Binghamton, NY
Instructor Computer Science 452/552: Introduction to Cloud Computing (extra service) Binghamton University Enrolled students (21 undergraduate students and 65 graduate students)	Spring 2023   Binghamton, NY
Instructor Computer Science 350: Operating Systems Binghamton University Enrolled students (40 undergraduate students)	Fall 2022   Binghamton, NY
Instructor Computer Science 350: Operating Systems Binghamton University Enrolled students (77 undergraduate students)	Spring 2022   Binghamton, NY
Instructor Computer Science 552: Introduction to Cloud Computing (extra service) Binghamton University Enrolled students (40 graduate students)	Spring 2022   Binghamton, NY
Instructor Computer Science 552/452: Introduction to Cloud Computing Binghamton University Enrolled students (38 graduate students plus 15 undergraduate students)	Fall 2021   Binghamton, NY
Instructor Computer Science 350: Operating Systems Binghamton University Enrolled students (75 undergraduate students)	Spring 2021   Binghamton, NY
Instructor Computer Science 552/452: Introduction to Cloud Computing	Fall 2020

Binghamton University Binghamton, NY  
Enrolled students (38 graduate students plus 7 undergraduate students)

Instructor Spring 2020  
Computer Science 552/452: Introduction to Cloud Computing  
Binghamton University Binghamton, NY  
Enrolled students (30 graduate students plus 6 undergraduate students)

Instructor Fall 2019  
Computer Science 350: Operating Systems  
Binghamton University Binghamton, NY  
Enrolled students (38 undergraduate students)

Instructor Spring 2019  
Computer Science 550: Operating Systems  
Binghamton University Binghamton, NY  
Enrolled students (30 graduate students)

Instructor Fall 2018  
Computer Science 580K/480K: Adv. Topics in Cloud Computing  
Binghamton University Binghamton, NY  
Enrolled students (8 undergraduate students plus 30 graduate students)

Instructor Spring 2018  
Computer Science 550: Operating Systems  
Binghamton University Binghamton, NY  
Enrolled students (28 graduate students)

Instructor Fall 2017  
Computer Science 580K/480K: Adv. Topics in Cloud Computing  
Binghamton University Binghamton, NY  
Enrolled students (3 undergraduate students plus 34 graduate students)

#### MENTORING AND ADVISING

##### **Ph.D. students**

1. Piush Sinha (co-advised with Prof. Kartik Gopalan from 2017 to 2019)  
– Graduated August 2019  
Thesis: “Accelerating Intra-Host Live Process Migration via Memory Warping”

2. Yu Sun  
– Joined Fall 2018  
Thesis topic: “Revealing the cost of containerization”

3. Jiaxin Lei  
– Joined Spring 2019  
Thesis topic: “Accelerating container overlay networks”

4. Zhen Lin  
– Joined Spring 2021  
Thesis topic: “System support for persistent memory”

##### **Serving on committees for other Ph.D./Master students**

1. Zhan Shu (Ph.D.)  
– Graduated Nov. 2022

Thesis: “Improving Proactive Defenses For Network-Based Services”

2. Pradyumna Kaushik (Ph.D.)

– Graduated May 2022

Thesis topic: “Towards Workload-agnostic Solutions to Make Smarter Peak Power, Performance and Energy Trade-offs when Scheduling Workloads on Heterogeneous Clusters”

3. Joseph Raskind (Master)

– Graduated May 2022

Thesis: “Adaptive Online Graph Processing”

4. Angel Beltre (Ph.D.)

– Graduate Nov. 2021

Thesis: “Design and Framework Analysis to Study Fairness in Policy-driven Multi-tenant Kubernetes Environments”

5. Qi Pei (Master)

– Graduated July 2020

Thesis: “Re-designing Counter Mode Encryption for Encrypted Non-volatile Main Memory” July 2020

6. Spoorti S Doddamani (Ph.D.)

– Graduated May 2020

Thesis: “Hyperfresh: Live Replacement of Hypervisors using Lightweight Nested Virtualization”

7. Gourav Rattihall (Ph.D.)

– Graduated August, 2019

Thesis: “Towards Dynamic Resource Estimation and Correction for Improving Utilization in an Apache Mesos and Kubernetes Cloud Environments”

8. Dinuni K Fernando (Ph.D.)

– Graduated May 2019

Thesis: “Fast and Robust Live Virtual Machine Migration”

9. Tianlin Li (Ph.D.)

– Graduated Nov. 2018

Thesis: “Limiting the Lifetime of Confidential Data in Virtualized Platforms”

10. Bedri Sendir (Ph.D.)

– Graduated July 2018

Thesis: “Optimizing NoSQL Databases through Coherently Attached Flash”

11. Pankaj Saha (Ph.D.)

– Graduated Nov 2018

Thesis: “Exploring Resource Fairness and Container Orchestration in a Cloud Environment for Scientific Computing Infrastructure”

12. Harsh Sanjay Pacherkar (Ph.D. candidate)

Thesis topic: “Provenance Graphs for 5G network Security”

13. Bo Yan (Ph.D. candidate)

Thesis topic: “Apollo: Scalable and Coordinated Scheduling for Cloud-Scale Computing”

14. Emir C Marangoz (Ph.D. candidate)  
Thesis topic: “Extending the GPU Memory Architecture for Efficient Bandwidth Reservation”

### **Others**

Advising 10+ master students and 7 undergraduate students in research projects.

### **GRANT PROPOSALS**

#### **Pending:**

1. NSF: CAREER: Rethinking Virtualization in Cloud-Native Systems, Sole PI (\$500,000, submitted on July 28, 2022 and pending as of Dec. 31, 2022)
2. Collaborative Research: CCF Core: Medium: Operating System Support for Persistence and Crash-consistency in Non-volatile Memories, Lead PI (\$400,000, submitted on Dec. 22, 2022)

#### **Awarded:**

1. NSF: “CNS Core: Small: Collaborative: Salvaging Commodity Operating Systems to Support Emerging Networking Technologies”, Lead PI. (\$250,000 October, 2019 ~ September, 2023)
2. AFRL: “Enabling a Secure Embedded Cloud Infrastructure via seL4”, Sole PI (\$10,000 February, 2019 ~ September, 2019.).
3. AFRL: Visiting Faculty Research Program (VFRP-EG), Sole PI (\$14,568 June, 2019 ~ August, 2019.).
4. AFRL: Visiting Faculty Research Program (VFRP-EG) Extension Grant, Sole PI (\$9,480 September, 2019 ~ November, 2019.).

#### **Others:**

1. Google Cloud Research Innovators Credits: \$5,000. (2018)
2. Google Cloud Teaching Credits: \$16,000. (2018 - 2022)
2. Travel grant to attend SoCC conference: \$1,100.
3. Travel grant to attend NSF PI meeting: \$400.
4. Travel grant to attend NSF Panel: \$1,280 x 2.
5. Travel grant to attend Google Faculty Institute: \$1,375.

### **PATENT**

1. Kartik Gopalan, Hui Lu, “Systems and methods for live update of operating systems and hypervisors within virtualization systems”, US Patent App. 17/229,996, 2021
2. Nipun Arora, Hui Zhang, Cristian Lumezanu, Junghwan Rhee, Guofei Jiang, Hui Lu, “Hybrid Network Management”, US Patent Application, 14/453,054.

### **RECENT TALKS**

#### **Invited Speaker**

1. “Achieving both security of vms and speed of containers in cloud native”, Trusted Computing Center of Excellence (TCCoE), online, 2022.
2. “Securing cloud serverless infrastructure with sel4”, seL4 summit, online, 2020.
3. “Enabling seL4 Containers to Support Legacy Applications”, 2019 seL4 summit, Herndon, VA, September, 2019.

#### **Keynote Speaker**

1. “An interdisciplinary perspective on fake news detection”, 2019 CISS NTNU International Conference-AI and the New Interdisciplinary Frontiers: In Dialogue with the

Humanities and Social Sciences, National Taiwan Normal University, Taiwan, Oct. 2019.

### Conference Presenter

1. “mWarp: Accelerating Intra-Host Live Container Migration via Memory Warping”, 2019 IEEE INFOCOM WorkShops, Paris, France, April, 2019.
2. “ShadeNF: Testing Online Network Functions”, 2019 IEEE International Conference on Cloud Engineering (IC2E), Prague, Czech Republic, June 2019.

### SERVICE

#### Panel

Serving on the NSF proposal review panel 2018, 2019, 2020, and 2021

#### PC Member

IEEE International Parallel & Distributed Processing Symposium (IPDPS) 2023  
IEEE International Conference on Distributed Computing Systems (ICDCS) 2022, 2023  
The Eleventh International Conference on Cloud Computing, GRIDs, and Virtualization (CLOUD COMPUTING) 2020 - 2022  
IEEE International Conference on Cloud Computing (Cloud) 2018 - 2021  
Programming Languages and Operating Systems (PLOS) 2021  
International Conference on Networking, Architecture, and Storage (NAS) 2018  
The 5th International Conference on Big Data Computing and Communications (BIG-COM 2019) 2019  
International Conference on Computer Communications and Networks 2018, 2019

#### Journal Reviewer

IEEE Transactions on Cloud Computing 2018 - 2022  
IEEE Transactions on Computers 2018, 2019  
IEEE Access 2019 - 2022  
IEEE Transactions on Parallel and Distributed Systems 2018, 2022  
IEEE Transactions on Dependable and Secure Computing 2016  
IEEE Internet Computing 2015  
ACM Transactions on Autonomous and Adaptive Systems 2015

#### External Reviewer

IEEE International Conference on Cloud Engineering (IC2E) 2017  
Network and Distributed System Security Symposium (NDSS) 2017  
ACM Conference on Computer and Communications Security (CCS) 2016  
International Symposium on Research in Attacks, Intrusions, and Defenses (RAID) 2016  
ACM Symposium on High-Performance Parallel and Distributed Computing (HPDC) 2013, 2015, 2016  
IEEE/IFIP International Conference on Dependable Systems and Networks (DSN) 2016  
International Conference on Parallel Processing (ICPP) 2016  
IEEE International Conference on Autonomic Computing (ICAC) 2016  
International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD) 2015  
Workshop on Hot Topics in Cloud Computing (HotCloud) 2013, 2014  
ACM Symposium on Cloud Computing (SOCC) 2014  
The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) 2013  
Annual International Conference on Virtual Execution (VEE) 2013