

**Timothy Wood, Ph.D**  
**Associate Professor**  
**Department of Computer Science**  
**The George Washington University**

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## Education

Ph.D. in Computer Science - September 2011  
University of Massachusetts, Amherst, MA  
Thesis: *Improving Data Center Resource Management, Deployment, and Availability with Virtualization*

M.S. in Computer Science - February 2009  
University of Massachusetts, Amherst, MA

B.S. in Electrical & Computer Engineering, Highest Honors - May 2005  
Rutgers University, Piscataway, NJ

## Experience

**Associate Professor, The George Washington University**, Fall 2017-Present  
Co-Director of GW Cloud Systems Lab

**Interim Department Chair of Computer Science**, January 2023 - August 2023  
George Washington University

**Assistant Professor, The George Washington University**, Fall 2011-2017

**Research Assistant, UMass Amherst**, Fall 2005-Summer 2011  
Advisor: Prashant Shenoy

**Research Intern, AT&T Research**, Florham Park, NJ, Winter 2008 and Summer 2010  
Mentors: Jacobus Van der Merwe and K. K. Ramakrishnan

**Research Intern, HP Labs**, Palo Alto, CA, Summer 2007 - Fall 2008  
Mentor: Lucy Cherkasova

## Research, Teaching, and Service Summary

Focus Areas: Distributed Systems, Cloud Computing, Virtualization, Programmable Networks

4 Best Paper Awards    Google Scholar Citations: 10,000+    H-index: 39

Research funded by ONR, NSF CAREER, NSF CNS/SaTC, NSA, SRC, Google, etc.

GW Total: \$5.03M, GW Total since tenure: \$3.95M

Graduated 6 PhD students. 5 current Ph.D. students

Advised 30+ undergraduate, 5 MS, and 5 high school students in research; 4 joined PhD programs

Recipient of 3 Teaching Awards    Avg. Instructor Rating: 4.6/5

14 Conference leadership roles, 50+ Conference PC memberships

GW CS Interim Department chair

## Refereed Conferences and Workshops

In my area of computer science, selective peer-reviewed conferences and workshops, typically run by ACM, USENIX, and IEEE, are the preferred venue for impactful publications. Conference acceptance rates are listed where known, and for top venues are typically in the 15-30% range. See "Evaluating Computer Scientists for Promotion and Tenure," from the Computing Research Association for more information. Student authors are typically listed first.

- 1. Attackers as Instructors: Using Container Isolation to Reduce Risk and Understand Vulnerabilities**, Y. Lei, J. P. Lanson, C. A. Shue, and T. W. Wood, in *Detection of Intrusions and Malware, and Vulnerability Assessment, DIMVA 23*, July 2023. (28% acceptance)
- 2. Sidecar-based Path-aware Security for Microservices**, C. Meadows, S. Hounsinou, T. Wood, and G. Bloom, in *Proceedings of the 28th ACM Symposium on Access Control Models and Technologies, SACMAT '23*. May 2023.
- 3. Towards a Scalable 5G RAN Central Unit**, C. Wei, A. Kak, N. Choi, and T. Wood, in *INFOCOM NGOPERA Workshop*, May 2023.
- 4. 5GPerf: profiling open source 5G RAN components under different architectural deployments**, C. Wei, A. Kak, N. Choi, and T. Wood, in *Proceedings of the ACM SIGCOMM Workshop on 5G and Beyond Network Measurements, Modeling, and Use Cases, 5G-MeMU '22*. Aug. 2022.
- 5. Poster: Toward Zero-Trust Path-Aware Access Control**, J. H. Seaton, S. Hounsinou, T. Wood, S. Xu, P. N. Brown, and G. Bloom, in *Proceedings of the 27th ACM Symposium on Access Control Models and Technologies, SACMAT '22*. Jun. 2022.
- 6. Towards efficient processing of latency-sensitive serverless DAGs at the edge**, X. Lyu, L. Cherkasova, R. Aitken, G. Parmer, and T. Wood, in *Proceedings of the 5th International Workshop on Edge Systems, Analytics and Networking, EdgeSys '22*. Apr. 2022.
- 7. BLOC: Balancing Load with Overload Control In the Microservices Architecture**, R. Bhattacharya and T. Wood, in *2022 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS), ACSOS '22*. Sep. 2022. (**Karsten Schwan Best Paper Award**)
- 8. Mu: An Efficient, Fair and Responsive Serverless Framework for Resource-Constrained Edge Clouds**. Viyom Mittal, Shixiong Qi, Ratnadeep Bhattacharya, Xiaosu Lyu, Junfeng Li, Sameer G Kulkarni, Dan Li, Jinho Hwang, K. K. Ramakrishnan, Timothy Wood. *ACM Symposium on Cloud Computing (SOCC 21)*, November 2021. (31% acceptance)
- 9. A SmartNIC-based Load Balancing and Auto Scaling Framework for Middlebox Edge Server**. Zhen Ni, Cuidi Wei, Timothy Wood, Nakjung Choi. *IEEE Conference on Network Functions Virtualization and Software-Defined Networking (IEEE NFV-SDN 2021)*, November 2021.
- 10. OFC: an opportunistic caching system for FaaS platforms**. Djob Mvondo, Mathieu Bacou, Kevin Nguetchouang, Lucien Ngale, Josiane Kouam, Renaud Lachaize, Jinho Hwang, Timothy Wood, Daniel Hagimont, Noel De Palma, Batchakui Bernabé, and Alain Tchana. *EuroSys 2021*, April 2021. (14% acceptance)
- 11. Fine-Grained Isolation for Scalable, Dynamic, Multi-Tenant Edge Clouds**. Yuxin Ren, Guyue Liu, Vlad Nitu, Wenyuan Shao, Riley Kennedy, Gabriel Parmer, Timothy Wood, and Alain Tchana. *Usenix Annual Technical Conference (Usenix ATC 20)*, July 2020. (19% acceptance)
- 12. Managing State for Failure Resiliency in Network Function Virtualization**. Sameer Kulkarni, K. K. Ramakrishnan, and Timothy Wood. *IEEE International Symposium on Local and Metropolitan Area Networks (IEEE LANMAN)*, July 2020.
- 13. EdgeBalance: Model-Based Load Balancing for Network Edge Data Planes**. Wei Zhang, Abhigyan Sharma, and Timothy Wood. *Usenix Workshop on Hot Topics in Edge Computing (HotEdge 20)*, June 2020.
- 14. Advancing Network Function Virtualization with Programmable NICs**. Zhen Ni, Guyue Liu, Dennis Afanasev, Timothy Wood, and Jinho Hwang. *IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN 19)*, July 2019.
- 15. Living on the Edge: Serverless Computing and the Cost of Failure Resiliency**. Sameer Kulkarni, Guyue Liu, K. K. Ramakrishnan, and Timothy Wood. *IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN 19)*, July 2019.

**16. Forecasting a Storm: Divining Optimal Configurations using Genetic Algorithms and Supervised Learning.** Michael Trotter, Timothy Wood, and Jinho Hwang. *IEEE International Conference on Autonomic Computing (ICAC 19)*, July 2019. (35% acceptance, **Runner-up for Best Paper Award**)

**17. REINFORCE: Achieving Efficient Failure Resiliency for Network Function Virtualization based Services.** Sameer Kulkarni, Guyue Liu, K.K. Ramakrishnan, Timothy Wood, Mayutan Arumaithurai, and Xiaoming Fu. *ACM CoNEXT*, December 2018. (17% acceptance)

**18. CRIMES: Using Evidence to Secure the Cloud.** Sundaresan Rajasekaran, Harpreet Singh Chawla, Zhen Ni, Neel Shah, Timothy Wood, Emery Berger. *ACM/USENIX/IFIP Middleware Conference*, December 2018. (23% acceptance)

**19. Microboxes: High Performance NFV with Customizable, Asynchronous TCP Stacks and Dynamic Subscriptions.** Guyue Liu, Yuxin Ren, Mykola Yurchenko, K.K. Ramakrishnan, and Timothy Wood. *ACM SIGCOMM*, August 2018. (18% acceptance)

**20. Hardware-assisted Isolation in a Multi-tenant Function-based Dataplane.** Wei Zhang, Abhishek Sharma, Kaustubh Joshi, and Timothy Wood. *Symposium on SDN Research*, March 2018. (short paper)

**21. Into the Storm: Descrying Optimal Configurations Using Genetic Algorithms and Bayesian Optimization.** Michael Trotter, Guyue Liu, and Timothy Wood. *IEEE Workshop on Foundations and Applications of Self\* Systems*, September 2017.

**22. NFVnice: Dynamic Backpressure and Scheduling for NFV Service Chains.** Sameer Kulkarni, Wei Zhang, Jinho Hwang, Shriram Rajagopalan, K.K. Ramakrishnan, Timothy Wood, Mayutan Arumaithurai, and Xiaoming Fu. *ACM SIGCOMM*, August 2017. (14% acceptance)

**23. Design Challenges for High Performance, Scalable NFV Interconnects.** Guyue Liu, K.K. Ramakrishnan, Mike Schlansker, Jean Tourrilhes, and Timothy Wood. *ACM SIGCOMM Workshop on Kernel-Bypass Networks (KBNets 17)*, August 2017. (40% acceptance)

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**Pre-Tenure Publications:**

**24. Flurries: Countless Fine-Grained NFs for Flexible Per-Flow Customization.** Wei Zhang, Jinho Hwang, Shriram Rajagopalan, K.K. Ramakrishnan, and Timothy Wood. *ACM CoNEXT*, December 2016. (18% acceptance)

**25. SDNFV: Flexible and Dynamic Software Defined Control of an Application- and Flow-Aware Data Plane.** Wei Zhang, Guyue Liu, Timothy Wood, K.K. Ramakrishnan, Jinho Hwang. *ACM/USENIX Middleware*, December 2016. (19% acceptance)

**26. Netalytics: Cloud-Scale Application Performance Monitoring with SDN and NFV.** Guyue Liu, Michael Trotter, Yuxin Ren, and Timothy Wood. *ACM/USENIX Middleware 2016*. (19% acceptance).

**27. OpenNetVM: A Platform for High Performance Network Service Chains.** Wei Zhang, Guyue Liu, Wenhui Zhang, Neel Shah, Phillip Lopreiato, Gregoire Todeschi, K.K. Ramakrishnan, and Timothy Wood. *ACM SIGCOMM Workshop on Hot Topics in Middleboxes and Network Function Virtualization (HotMiddlebox 16)*, August 2016. (34% acceptance)

**28. NetKV: Scalable, Self-Managing, Load Balancing as a Network Function.** Wei Zhang, Timothy Wood, and Jinho Hwang. *IEEE International Conference on Autonomic Computing (ICAC 16)*, July 2016. (27% acceptance rate, winner of the **Karsten Schwan Best Paper Award**)

**29. Toward Online Virtual Network Function Placement in Software Defined Networks.** Bowu Zhang, Jinho Hwang, Timothy Wood. *IEEE/ACM International Symposium on Quality of Service (IWQoS)*, June 2016. (short paper)

- 30. Scalable Cloud Security via Asynchronous Virtual Machine Introspection.**  
Sundaresan Rajasekaran, Zhen Ni, Harpreet Singh Chawla, Neel Shah, Timothy Wood, Emery Berger. *USENIX Workshop on Hot Topics in Cloud Computing (HotCloud 16)*, June 2016. (30% acceptance)
- 31. Performance Management Challenges for Virtual Network Functions.**  
Wei Zhang, Timothy Wood, Jinho Hwang, Shriram Rajagopalan, and K.K. Ramakrishnan. *IEEE Conference on Network Softwarization (NetSoft 16)*, June 2016. (short paper)
- 32. Teaching Design Thinking, Writing, and Oral Presentation: Lessons Learned from the Computer Science Senior Design Course at GW.** Gabriel Parmer, Rahul Simha, Chris Toombs, Poorvi Vora, and Timothy Wood. *ASEE Middle Atlantic Section Spring 2016 Conference*, April 2016.
- 33. Multi-Cache: Dynamic, Efficient Partitioning for Multi-Tier Caches in Consolidated VM Environments.** Sundaresan Rajasekaran, Shaohua Duan, Wei Zhang, and Timothy Wood. *IEEE International Conference on Cloud Engineering (IC2E)*, April 2016. (23% acceptance)
- 34. IOchestra: Supporting High-performance Data-intensive Applications in the Cloud via Collaborative Virtualization.** Ron C. Chiang, H. Howie Huang, Timothy Wood, Changbin Liu, Oliver Spatscheck. *International Conference for High Performance Computing, Networking, Storage and Analysis (SC 15)*, November 2015. (22% acceptance)
- 35. Protocols to support autonomy and control for NFV in software defined networks.**  
A. Mohammadkhan, Guyue Liu, Wei Zhang, K.K. Ramakrishnan, T. Wood. *IEEE Conference on Network Function Virtualization and Software Defined Network (NFV-SDN)*, November 2015.
- 36. Towards Security-Aware Virtual Server Migration Optimization to the Cloud.**  
Bowu Zhang, Jinho Hwang, Liran Ma, Timothy Wood. *IEEE International Conference on Autonomic Computing (ICAC 15)*, July 2015. (27% acceptance)
- 37. Virtual Function Placement and Traffic Steering in Flexible and Dynamic SDNs.**  
Ali Mohammadkhan, Sheida Ghapani, Guyue Liu, Wei Zhang, K. K. Ramakrishnan, Timothy Wood. *IEEE International Workshop on Local and Metropolitan Area Networks (LANMAN 15)*, April 2015.
- 38. Cloud-Scale Application Performance Monitoring with SDN and NFV.**  
Guyue Liu, Timothy Wood. *IEEE International Workshop on Cloud Analytics (IWCA15)*, March 2015.
- 39. SmartSwitch: Blurring the Line Between Network Infrastructure & Cloud Applications.**  
Wei Zhang, Timothy Wood, K.K. Ramakrishnan, Jinho Hwang. *Usenix Workshop on Hot Topics in Cloud Computing (HotCloud)*, June 2014. (30% acceptance)
- 40. Load Balancing of Heterogeneous Workloads in Memcached Clusters.**  
Wei Zhang, Timothy Wood, H. Howie Huang, Jinho Hwang, K.K. Ramakrishnan. *Usenix International Workshop on Feedback Computing*, June 2014.
- 41. Matrix: Achieving Predictable Virtual Machine Performance in the Clouds.**  
Ron C. Chiang, Jinho Hwang, Howie Huang, Timothy Wood. *USENIX International Conference on Autonomic Computing (ICAC 2014)*, June 2014. (22% acceptance)
- 42. UniCache: Hypervisor Managed Data Storage in RAM and Flash.**  
Jinho Hwang, Wei Zhang, Ron C. Chiang, Timothy Wood, Howie Huang. *IEEE International Conference on Cloud Computing (CLOUD)*, June 2014. (20% acceptance)
- 43. MIMP: Deadline and Interference Aware Scheduling of Hadoop Virtual Machines.**  
Wei Zhang, Sundaresan Rajasekaran, Timothy Wood, and Mingfa Zhu, *IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid)*, May 2014. (19% acceptance)
- 44. NetVM: High Performance and Flexible Networking using Virtualization on Commodity Platforms.** Jinho Hwang, K.K. Ramakrishnan, and Timothy Wood, *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2014. (18% acceptance)

**45. Topology Discovery & Service Classification for Distributed-Aware Clouds.**

Jinho Hwang, Guyue Liu, Sai Zeng, Frederick y Wu, Timothy Wood, *IEEE International Workshop on Cloud Analytics (IWCA)*, March 2014.

**46. Mortar: Filling the Gaps in Data Center Memory.**

Jinho Hwang, Ashen Uppal, Timothy Wood, Howie Huang, *ACM International Conference on Virtual Execution Environments (VEE)*, March 2014. (36% acceptance)

**47. HybridMR: A Hierarchical MapReduce Scheduler for Hybrid Data Centers.**

Bikash Sharma, Timothy Wood, and Chita R. Das, *IEEE International Conference on Distributed Computing Systems (ICDCS 2013)*, July 2013. (13% acceptance)

**48. Firewall Performance Optimization using Data Mining Techniques.**

Umniya Mustafa, Mohammad M. Masud, Zouheir Travelsi, Timothy Wood, and Zainab Al Harthi, *IEEE International Wireless Communications and Mobile Computing Conference - Security, Trust and Privacy Symposium (IWCMC'13)*, July 2013.

**49. Big Data in the Background: Maximizing Productivity while Minimizing VM Interference.**

Wei Zhang, Sundaresan Rajasekaran, Timothy Wood, *Workshop on Architectures and Systems for Big Data (co-located with ISCA 2013)*, June 2013.

**50. Adaptive Performance-Aware Distributed Memory Caching.**

Jinho Hwang and Timothy Wood, *USENIX International Conference on Autonomic Computing (ICAC 2013)*, June 2013. (22% acceptance)

**51. A Component Based Performance Comparison of Four Hypervisors.**

Jinho Hwang, Sai Zeng, Frederick y Wu, Timothy Wood, *IFIP/IEEE Integrated Network Management Symposium (IM 2013)*, May 2013. (27% acceptance)

**52. Benefits and Challenges of Managing Heterogeneous Data Centers.**

Jinho Hwang, Sai Zeng, Frederick y Wu, Timothy Wood, *IFIP/IEEE Integrated Network Management Symposium - Experience Sessions (IM 2013)*, May 2013.

**53. An Empirical Study of Memory Sharing in Virtual Machines.**

Sean Barker, Timothy Wood, Prashant Shenoy, and Ramesh Sitaraman. *USENIX Annual Technical Conference*, June 2012. (14% acceptance)

**54. Seagull: Intelligent Cloud Bursting for Enterprise Applications.**

Tian Guo, Upendra Sharma, Timothy Wood, Sambit Sahu, and Prashant Shenoy. *USENIX Annual Technical Conference (short paper)*, June 2012.

**55. Adaptive Dynamic Priority Scheduling for Virtual Desktop Infrastructures.**

Jinho Hwang, and Timothy Wood, *IEEE International Workshop on Quality of Service (IWQoS)*, June 2012. (22% acceptance, **Best Student Paper Award**)

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***Pre-GW Publications:***

**56. PipeCloud: Using Causality to Overcome Speed-of-Light Delays in Cloud-Based Disaster Recovery.**

Timothy Wood, Andres Lagar-Cavilla, K. K. Ramakrishnan, Prashant Shenoy, and Jacobus Van der Merwe. *ACM Symposium on Cloud Computing (SOCC)*, October 2011. (17% acceptance)

**57. BenchLab: An Open Testbed for Realistic Benchmarking of Web Applications.**

Emmanuel Cecchet, Veena Udayabhanu, Timothy Wood, and Prashant Shenoy. *USENIX Conference on Web Application Development (WebApps)*, June 2011.

**58. ZZ and the Art of Practical BFT Execution.**

Timothy Wood, Rahul Singh, Arun Venkataramani, Prashant Shenoy, and Emmanuel Cecchet. *The European Systems Conference (EuroSys)*, April 2011. (15% acceptance)

**59. CloudNet: Dynamic Pooling of Cloud Resources by Live WAN Migration of Virtual Machines.** Timothy Wood, K.K. Ramakrishnan, Jacobus van der Merwe, and Prashant Shenoy. *ACM International Conference on Virtual Execution Environments (VEE)*, March 2011. (29% acceptance)

**60. Disaster Recovery as a Cloud Service: Economic Benefits & Deployment Challenges.** Timothy Wood, Emmanuel Cecchet, K.K. Ramakrishnan, Prashant Shenoy, Jacobus van der Merwe, and Arun Venkataramani. *Workshop on Hot Topics in Cloud Computing (HotCloud)*, June 2010. (24% acceptance)

**61. The Case for Enterprise Ready Virtual Private Clouds.** Timothy Wood, Alexandre Gerber, K.K. Ramakrishnan, Jacobus van der Merwe, and Prashant Shenoy. *Workshop on Hot Topics in Cloud Computing (HotCloud)*, June 2009. (32% acceptance)

**62. Memory Buddies: Exploiting Page Sharing for Smart Colocation in Virtualized Data Centers.** Timothy Wood, Gabriel Tarasuk-Levin, Prashant Shenoy, Peter Desnoyers, Emmanuel Cecchet, and Mark Corner. *International Conference on Virtual Execution Environments (VEE)*, March 2009. (35% acceptance. Best Paper Award)

**63. Profiling and Modeling Resource Usage of Virtualized Applications.** Timothy Wood, Ludmila Cherkasova, Kivanc Ozonat, and Prashant Shenoy. *ACM International Middleware Conference*, December 2008. (17% acceptance)

**64. Black-box and Gray-box Strategies for Virtual Machine Migration.** Timothy Wood, Prashant Shenoy, Arun Venkataramani, and Mazin Yousif. *Unix Symposium on Networked Systems Design and Implementation (NSDI)*, April 2007. (24% acceptance)

**65. Efficient Data Migration in Self-managing Storage Systems.** Vijay Sundaram, Timothy Wood, and Prashant Shenoy. *Third International Conference on Autonomic Computing, Dublin (ICAC)*, June 2006. (short paper)

**66. The Feasibility of Launching and Detecting Jamming Attacks in Wireless Networks.** Wenyan Xu, Wade Trappe, Yanyong Zhang, and Timothy Wood. *ACM MobiHoc*, May 2005. (14% acceptance)

**67. Channel Surfing and Spatial Retreats: Defenses Against Wireless Denial of Service.** Wenyan Xu, Timothy Wood, Wade Trappe, and Yanyong Zhang. *Workshop on Wireless Security*, 2004.

## Journal Articles

**1. REINFORCE: Achieving Efficient Failure Resiliency for Network Function Virtualization based Services.** Sameer Kulkarni, Guyue Liu, K.K. Ramakrishnan, Timothy Wood, Mayutan Arumathurai, and Xiaoming Fu. *ACM/IEEE Transactions on Networking*, April 2020.

**2. NFVnice: Dynamic Backpressure and Scheduling for NFV Service Chains.** Sameer Kulkarni, Wei Zhang, Jinho Hwang, Shriram Rajagopalan, K.K. Ramakrishnan, Timothy Wood, Mayutan Arumathurai, and Xiaoming Fu. *ACM/IEEE Transactions on Networking*, April 2020.

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### *Pre-Tenure Publications:*

**3. Towards a Software-Based Network: Integrating Software Defined Networking and Network Function Virtualization.** Timothy Wood, K.K. Ramakrishnan, Jinho Hwang, Guyue Liu, Wei Zhang. *IEEE Network*, June 2015.

**4. NetVM: High Performance and Flexible Networking Using Virtualization on Commodity Platforms.** Jinho Hwang, K.K. Ramakrishnan, Timothy Wood. *IEEE Transactions on Network and Service Management (TNSM)*, March 2015.

**5. CloudNet: Dynamic Pooling of Cloud Resources by Live WAN Migration of Virtual Machines.** Timothy Wood, K.K. Ramakrishnan, Prashant Shenoy, Jacobus van der Merwe, Jinho Hwang, Guyue Liu, and Lucas Chaufournier. *ACM/IEEE Transactions on Networking*, October 2015.

## **6. Minimizing Interference and Maximizing Progress for Hadoop Virtual Machines.**

Wei Zhang, Sundaresan Rajasekaran, Shaohua Duan, Timothy Wood, Mingfa Zhu. *ACM SIGMETRICS Performance Evaluation Review*, March 2015.

## **7. Cost-aware Cloud Bursting for Enterprise Applications.**

Tian Guo, Upendra Sharma, Prashant Shenoy, Timothy Wood, and Sambit Sahu. *ACM Transactions on Internet Technology*, May, 2014.

## **8. Enterprise-Ready Virtual Cloud Pools: Vision, Opportunities, and Challenges.**

Timothy Wood, K. K. Ramakrishnan, Prashant Shenoy, and Jacobus Van der Merwe, *Oxford Computer Journal*, June, 2012.

## **9. Modellus: Automated Modeling of Complex Data Center Applications.**

Peter Desnoyers, Timothy Wood, Prashant Shenoy, Rahul Singh, Sangameshwar Patil, and Harrick Vin. *ACM Transactions on the Web*, May, 2012.

## **10. Sandpiper: Black-box and Gray-box Resource Management for Virtual Machines.**

Timothy Wood, Prashant Shenoy, Arun Venkataramani, and Mazin Yousif. *Elsevier Computer Networks: Special Issue on Resource Management in Virtualized Data Centers (53)*, 2009.

## **11. Memory Buddies: Exploiting Page Sharing for Smart Colocation in Virtualized Data Centers.**

Timothy Wood, Gabriel Tarasuk-Levin, Prashant Shenoy, Peter Desnoyers, Emmanuel Cecchet, and Mark Corner. *ACM SIGOPS Operating Systems Review (43)*, July 2009.

## **12. Agile Dynamic Provisioning of Multi-tier Internet Applications.**

Bhuvan Uргаonkar, Prashant J. Shenoy, Abhishek Chandra, Pawan Goyal, and Timothy Wood. *ACM Transactions on Autonomous and Adaptive Systems (3)*, 2008.

## **Patents**

### **Model-based load balancing for network data plane**

Abhigyan Sharma, Wei Zhang, Timothy Wood, US Patent #US11463511B2. Issued October 4, 2022.

### **Pipelined data replication for disaster recovery**

Kadangode K. Ramakrishnan, Horacio Andres Lagar-Cavilla, Prashant Shenoy, Jacobus Van Der Merwe, and Timothy Wood, US Patent US10152398B2. Issued December 11, 2018.

### **Methods and apparatus to migrate virtual machines between distributive computing networks across a wide area network**

Kadangode K. Ramakrishnan, Jacobus Van Der Merwe, Prashant Shenoy, and Timothy Wood, US Patent #8,473,557. Issued June 25, 2013

### **Optimizing a prediction of resource usage of multiple applications in a virtual environment**

Timothy Wood and Ludmila Cherkasova, US Patent #8,180,604. Issued May 15, 2012

### **Optimizing a prediction of resource usage of an application in a virtual environment**

Ludmila Cherkasova and Timothy Wood, US Patent #8,145,456. Issued March 27, 2012

### **Predicting resource usage of an application in a virtual environment**

Ludmila Cherkasova and Timothy Wood, US Patent #8,145,455. Issued March 27, 2012

### **Accuracy in a prediction of resource usage of an application in a virtual environment**

Timothy Wood and Ludmila Cherkasova, US Patent #8,131,519. Issued March 6, 2012

### **Detecting an error in a prediction of resource usage of an application in a virtual environment**

Timothy Wood and Ludmila Cherkasova, US Patent #7,818,145. Issued Oct 19, 2010

## **Honors and Awards**

Karsten Schwan Best Paper Award, IEEE ACSOS 2022.

Best Paper Award Runner Up, IEEE International Conference on Autonomic Computing, 2019

GW SEAS Outstanding Junior Researcher Award, 2017

GW SEAS Faculty Recognition Award, 2016  
Karsten Schwan Best Paper Award, IEEE International Conference on Autonomic Computing, 2016  
Runner-up, GW SEAS Faculty Recognition Award, 2015  
GW ACM Professor of the Year Award, 2015  
GW SEAS Outstanding Teacher Award for an Assistant Professor, 2014  
NSF CAREER Award, 2013  
GW Excellence in Safety & Security Award, 2013  
GW Engineer's Council CS Professor of the Year, 2013  
Best Student Paper Award, IEEE International Workshop on Quality of Service, 2012  
Outstanding Dissertation Award, University of Massachusetts Amherst CS Department, 2011  
Ph.D Thesis nominated for the ACM's Doctoral Dissertation Award, 2011  
Best Paper Award, ACM Virtual Execution Environments Conference, 2009  
Passed Ph.D Candidacy Exam with Distinction, 2008 (one of two per year in U.Mass CS)

## Funding

(Funding amounts are GW portion)

**NSF JUNO3: Leveraging Heterogeneous Programmable Data Planes for Security and Privacy of Cellular Networks, 5G and Beyond**, PI: Timothy Wood, PI: K. K. Ramakrishnan (UC Riverside)  
(\$225,000 Oct 2022 - Sept 2025)

**ONR: Caisson: A System for Secure, Adaptive Network Processing and Introspection**, PI: Gabriel Parmer, Co-PI: Timothy Wood (\$994,100 - 2022 - 2026)

**NSA NCAE: SDN/NFV VACUUM: Value-based Access Control Using Untrusted Media**, PI: Timothy Wood, Subaward from UCCS (\$49,867 - Sept 2021-August 2022)

**SRC/ARM: High-density, Latency Sensitive, Serverless Runtime for the Edge**, PI: Timothy Wood, Co-PI: Gabriel Parmer (\$99,429 - May 2021-August 2022)

**SRC/ARM: Multi-Tenant Fog: Fine-Grained Isolation for Efficient, Low-latency Processing from Microcontroller to the Edge**, PI: Gabriel Parmer, Co-PI: Timothy Wood (\$225,000 - Sept 2019-2022)

**NSF SaTC: CORE: Small: Collaborative: Fine Grained Protection for Scalable Single-use Services**, PI: Timothy Wood, PI: Craig Shue (WPI) (\$266,000 - Sept 2018-2021).

**NSF CRI: CI-EN: Collaborative Research: OpenNetVM: A Software Platform Enabling Network Function Virtualization Research**, PI: Timothy Wood, PI: K.K. Ramakrishnan (UC Riverside)  
(\$325,273 - Oct 2018-2023).

**NSF CSR: SMALL: Toward a Scalable, Multi-Tenant, Edge-Cloud Infrastructure for Real-Time Computation**, PI: Gabriel Parmer, Co-PI: Timothy Wood (\$532,000 - Oct 2018-2022).

**NSF CPS: Medium: Edge-Cloud Support for Predictable, Global Situational-Awareness and Control for Autonomous Vehicles**, PI: Gabriel Parmer, Co-PI: Timothy Wood, Co-PI: Taeyoung Lee (\$1M - Oct 2018-2023).

**NSF CSR:NeTS:Collaborative Research: Mobile Elastic Edge Clouds for Scalable, Low-Latency Services**, PI: Timothy Wood, PI: K. K. Ramakrishnan (UC Riverside), PI: Prashant Shenoy (UMass Amherst) (\$145,318 - Oct 2018-2019).

**NSF CNS: Student Travel Support for the 2019 SIGCOMM Conference**, PI: Timothy Wood (\$30,000 - June 2019-2020).

**NSF CNS: Student Travel Support for the 2018 Middleware Conference**, PI: Timothy Wood (\$25,000 - Oct 2018-2019).



**NSF CNS: Student Travel Support for the 2017 Middleware Conference,**  
PI: Timothy Wood (\$15,000 - Sept 2017-2018).

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*Pre-Tenure Funding:*

**NSF SaTC: EVADE: Evidence Assisted Detection and Elimination of Security Vulnerabilities,**  
PI: Timothy Wood (GW), PI: Emery Berger (UMass Amherst) (\$266,000 - Aug 2015-2017).

**Comcast Technology Research and Development Fund: Automated Management of Flexible Resource Pools in Cloud Data Centers,** PI: Howie Huang, Co-PI: Timothy Wood (\$40,000 - Fall 2015)

**GW-KU: International Big Data Collaboration,** PI: Hanseok Ko (Korea University), Co-PI: Timothy Wood, Co-PI: Claire Monteleoni, Co-PI: Murray Loew (\$20,000 - Summer 2015)

**NSF NeTS: SDNFV - Flexible, High Performance Network and Data Center Virtualization,** PI: Timothy Wood (GW), PI: KK Ramakrishnan (UC Riverside) (\$295,899 - October 2014-2017).

**Google Research Award,** PI: Haris Gavranovic (Univ. of Sarajevo), Co-PI: Timothy Wood (\$48,000 - February 2014-2015)

**Yahoo! Servers To Academic Researchers (STAR),** PI: Timothy Wood (Donation of 30 servers, valued at \$13,950 - 2013)

**DC I-Corps: Cloud Advisor,** PI: Howie Huang, Co-PI: Timothy Wood (\$5,000 - October 2013)

**NSF CAREER: Application-agnostic, Distributed-Aware Cloud Platforms,** PI: Timothy Wood (\$426,487 - June 2013-May 2018).

**GW UFF: Maximizing the Performance and Energy Efficiency of Many-Core Servers in Cloud Data Centers,** PI: Timothy Wood (\$20,316 - July 2013-June 2014)

**Amazon AWS in Education Coursework Grants,** PI: Timothy Wood (\$7,600 in AWS credits - 2012-2014)

## **Professional Service**

Member of ACM, IEEE, and USENIX professional associations.

### *Conference Leadership Roles:*

**Steering Committee,** IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS) 2022-2023

**Workshops Chair,** ACM Special Interest Group on Data Communication (SIGCOMM 2023)

**Track Co-chair,** IEEE International Conference on Distributed Computing Systems (ICDCS 2021)

**TPC Co-Chair,** IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS 2020 - first edition of conference merging ICAC and SASO communities)

**Travel Grants Chair,** ACM Special Interest Group on Data Communication (SIGCOMM 2019)

**General Chair,** IEEE Int. Symposium On Local And Metropolitan Area Networks (LANMAN 2018)

**TPC Co-Chair,** IEEE Int. Symposium On Local And Metropolitan Area Networks (LANMAN 2017)

**Student Activities Chair,** ACM/IFIP/USENIX Middleware Conference (2017)

**Local Arrangements Chair,** Privacy-Aware Computing Conference (PAC 2017)

**Proceedings Chair,** IEEE International Conference on Autonomic Computing (ICAC 2017)

**Co-chair,** ACM Cloud-Assisted Networking Workshop, co-located with CoNEXT (CAN 2016)

**Co-Chair,** IEEE International Workshop on Cloud Analytics (IWCA 2015)

**Publicity Chair,** ACM/IFIP/USENIX Middleware (2014)

**Poster Session Chair**, ACM/IEEE International Symposium on Quality of Service (IWQoS 2013)

*Program Committees:*

PC, IEEE International Conference on Cloud Networking (CLOUDNET 2013, 2023)  
PC, ACM Workshop on Edge Systems, Analytics, and Networking (EdgeSys 2023)  
PC, ACM/IEEE Symposium on Cluster, Cloud, and Grid Computing (CCGrid 2013, 2014, 2015, 2023)  
PC, IEEE Symposium On Local And Metropolitan Area Networks (LANMAN 2015, 2016, 2019-2023)  
PC, Usenix Symposium on Operating Systems Design and Implementation (OSDI'22)  
PC, ACM/IEEE Symposium on Architectures for Networking and Communication Systems (ANCS 2018, 2019, 2021)  
PC, IEEE International Conference on Network Protocols (ICNP 2016, 2021)  
PC, ACM SIGCOMM SPIN'21 Workshop (SPIN 2021)  
PC, ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT 2018, 2020)  
PC, ACM/IFIP/USENIX Middleware Conference (Middleware 2014, 2015, 2016, 2020)  
PC, IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing Doctoral Symposium (CCGRID 2020)  
PC, IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2020)  
PC, ACM/IEEE Symposium on Architectures for Networking and Communication Systems (ANCS 2018, 2019)  
PC, International Conference on Autonomic Computing (ICAC 2014, 2015, 2018, 2019)  
PC, ACM The Web Conference (WWW 2019)  
PC, SIGCOMM Kernel Bypass Networks Workshop (NetKB 2018)  
PC, SIGCOMM NetAI Workshop (NetAI 2018)  
PC, USENIX Network Systems Design and Implementation (NSDI 2018)  
PC, IEEE International Conference on Distributed Computing Systems (ICDCS 2015, 2016, 2017, 2018)  
PC, ACM Asia-Pacific Workshop on Systems (APSys 2017)  
PC, USENIX Annual Technical Conference (USENIX ATC 2017)  
PC, International Teletraffic Congress (ITC 2017)  
PC, IEEE International Conference on Cloud Computing (CLOUD 2016)  
PC, IEEE International Conference on Parallel Processing (ICPP 2016)  
PC, IEEE Workshop on Container Technologies and Container Clouds (WoC 2016)  
Publicity Co-Chair, IEEE International Conference on Performance Engineering (ICPE 2016)  
PC, IEEE International Conference on Cloud Engineering (IC2E 2016)  
PC, Student Workshop co-located with ACM CoNEXT 2015  
PC, IEEE International Conference on Cloud and Autonomic Computing (CAC 2015)  
PC, IEEE Conf. on Network Function Virtualization and Software Defined Networks (NFV-SDN 2015)  
Poster Session PC, ACM/IEEE Supercomputing Conference (SC 2015)  
PC, IEEE International Conference on Computer Communications and Networks (ICCN 2015)  
PC, International Conference on Autonomic Computing (ICAC 2014, 2015)  
PC, ACM International Conference on Virtual Execution Environments (VEE 2015)  
PC, Distributed Storage Systems and Coding for Big Data (2014)  
PC, Distributed Cloud Computing Workshop at SIGCOMM (DCC 2014)  
PC, IEEE GLOBECOM SAC Cloud Networks track (2014)  
PC, IEEE International Conference on Networking, Architecture, and Storage (NAS 2014)  
PC, IEEE International Workshop on Cloud Analytics (IWCA 2014)

PC, IEEE International Conference on Big Data (BigData 2013)  
 PC, ACM/IEEE International Conference on Utility and Cloud Computing (UCC 2010, 2011, 2012, 2013)  
 PC, International Workshop on Analytics Services on the Cloud (ASC 2012)  
 PC, Symposium on Computer Architecture & High Performance Computing (SBAC-PAD 2012, 2013)  
 PC, IEEE International Conference on Cloud and Green Computing (CGC 2011, 2012)  
*Grant Panelist:* NSF NeTS, NSF CSR, NSF SaTC, NSF CAREER

## Teaching and Mentoring

### Courses Taught

Semester	Course	* denotes co-taught courses, † denotes new course prep or redesign	Students	Rating
Fall 2023	CSCI 4243: Capstone Senior Design Projects I*		46	--
Spring 2023	CSCI 8901: Research and Evaluation Methods* †		13	5
Fall 2022	CSCI 3411: Operating Systems		40	4.9
Spring 2022	CSCI 2541: Database Systems and Team Projects		47	4.9
Fall 2021	CSCI 8901: Research and Evaluation Methods		11	5
Spring 2021	CSCI 2541: Database Systems and Team Projects* †		65	4.6
Fall 2020	CSCI 6421: Distributed Systems* †		40	4.4
Spring 2020	CSCI 6907: Advanced Networking and Distributed Systems* †		27	5
Spring 2019	CSCI 8901: Research and Evaluation Methods †		16	5
Fall 2018	CSCI 6421: Distributed Systems		50	4.7
Fall 2018	CSCI 2113: Software Engineering		50	4.7
AY2017-2018	<i>Sabbatical</i>			
Spring 2017	CSCI 4244: Capstone Senior Design Projects II*		26	3.6
Fall 2016	CSCI 4243: Capstone Senior Design Projects I*		26	3.6
Fall 2016	CSCI 2113: Software Engineering		40	4.6
Spring 2016	CSCI 4244: Capstone Senior Design Projects II*		26	4.1
Fall 2015	CSCI 4243: Capstone Senior Design Projects I*		28	4.1
Fall 2015	CSCI 6421: Distributed Systems †		42	4.7
Spring 2015	CSCI 6907: Advanced Systems Network Programming †		12	5
Spring 2015	CSCI 4244: Capstone Senior Design Projects II		11	5
Fall 2014	CSCI 4243: Capstone Senior Design Projects I		11	5
Spring 2014	CSCI 4244: Capstone Senior Design Projects II* †		18	4.3
Fall 2013	CSCI 4243: Capstone Senior Design Projects I* †		18	4.3
Fall 2013	CSCI 2113: Software Engineering		37	4.2
Spring 2013	CSCI 3907/6907.83: Advanced Operating and Distributed Systems* †		22	4.8
Fall 2012	CSCI 2113: Software Engineering		34	4.7
Fall 2012	CSCI 3411: Operating Systems* †		32	4.6
Spring 2012	CSCI 3907/6907.83 Cloud Computing & Data Centers Seminar †		25	4.6
Fall 2011	CSCI 2113: Software Engineering †		27	4.5

### Current Ph.D. Students (5)

Ratnadeep Bhattacharya, Ph.D. Advisor. *Entered program in 2018.*  
 Xiaosu Lyu, Ph.D. Advisor. *Entered program in 2019.*  
 Cuidi Wei, Ph.D. Advisor. *Entered program in 2019.*  
 Deng Pan, Ph.D. Advisor, Co-advised with Samer Hamdar. *Entered program in 2021.*  
 Yuan Gao, Ph.D. Advisor. *Entered program in 2023.*

### Graduated Research Advisees (6 PhD, 3+ MS)

Zhen Ni, Ph.D. Advisor. *Defended Ph.D. Thesis, "A SmartNIC-based Load Balancer and Autoscaling Framework for Middlebox Edge Servers" in July 2022, now at VMware*

Michael Trotter, Ph.D. Advisor. *Defended Ph.D. Thesis, "Go for Broke: Maximizing Performance in Clustered and GPU Environments" in December 2019, now Research Scientist at Metron Inc.*

Guyue Liu, Ph.D. Advisor. *Defended Ph.D. Thesis, "Novel Abstractions for High Performance Network Functions" in May 2019, Post Doc at Carnegie Mellon University, now at NYU Shanghai.*

Wei Zhang, Ph.D. Advisor. *Defended Ph.D. Thesis, "Towards an Efficient, Scalable, Dynamic and Flexible NFV-based Data Plane" in May 2018, Microsoft Azure Cloud Networking Group; now at University of Connecticut.*

Sundaresan Rajasekaran, Ph.D. Advisor. *Defended Ph.D. Thesis, "Resource Management and Security in the Cloud" in April 2018, joined Barkly security startup; now at Intel.*

Jinho Hwang, Ph.D. advisor. *Defended Ph.D. Thesis, "Improving and Repurposing Data Center Resource Usage with Virtualization" in November 2013, joined IBM Research, TJ Watson; now at Meta.*

Harpreet Singh Chawla, M.S. research advisor. *Graduated 2017, joined Stony Brook Ph.D. program.*

Shaohua Duan, M.S. research advisor. *Graduated 2015, joined Rutgers Ph.D. program.*

Chenghu He, M.S. research advisor. *Graduated 2015, joined EMC Cloud Storage group.*

### **Undergraduate (37), High School (5), and Visiting (4) Research Student History**

2022-2023: Noah Chinitz, Lauren Hahn, Alex Coleman, Benjamin Marasco, Jett Jacobs, Jiyan Ayhan, Owen Andraeson, Sarah Jagerdeo, Dania Abdalla, Amanda Scoville, Jacob Roedel, Justin Park, Talia Novack, Yves Kone (visitor)

2021-2022: Catherine Meadows, Noah Chinitz, Lauren Hahn, Alex Coleman, Benjamin Marasco, Jett Jacobs

2020-2021: Kevin Deems, Catherine Meadows, Benjamin De Vierno, Mingyu Ma, Noah Chinitz, Elliott Henne, Sarah Stevens, Lauren Hahn, Alex Coleman, Benjamin Marasco

2019-2020: Pat Cody, Kevin Deems, Dennis Afanasev, Catherine Meadows, Sreya Nalla, Ethan Baron, Benjamin De Vierno, Mingyu Ma, Srujan (HS), Shreyas (HS)

2018-2019: Aaron Coplan, Mykola Yurchenko, Pat Cody, Riley Kennedy, Kevin Deems, Dennis Afanasev, Arjun Vijay

2017-2018: Chris Quion, Aaron Coplan, Mykola Yurchenko, Pat Cody, Riley Kennedy

2016-2017: Neel Shah, Philip Lopreiato, Chris Quion, Aaron Coplan, Mykola Yurchenko, Pat Cody, Riley Kennedy, Vlad Nitu (visitor)

2015-2016: Neel Shah, Philip Lopreiato, Grace Huang, Adam Shimi (visitor), Zoe (HS)

2014-2015: Lucas Chaufournier, Eli Katz, Abigail Shriver, Warren Smith, Ashley (HS), Abhishek (HS), Gregoire Todeschi (visitor), Neel Shah, Philip Lopreiato

2013-2014: Rian Shambaugh, Ben Carleton, Lucas Chaufournier

2012-2013: Anthony Korzan, Saurabh Singh, Aaron Pollon