Daehyeok Kim

Web: https://daehyeok.kim
Email: daehyeok.kim@microsoft.com
Phone: +1 (412) 500-3839
Bldg 99/2873, One Microsoft Way, Redmond, WA 98052

Research Interests

Computer networks, Distributed systems, Systems security

Education

Carnegie Mellon University — Pittsburgh, PA USA
Ph.D. in Computer Science — November 2021
Thesis: Towards Elastic and Resilient In-network Computing
Advisors: Srinivasan Seshan and Vyas Sekar

Pohang University of Science and Technology — Pohang, South Korea
M.S. in IT Convergence Engineering — Feburary 2012
B.S. in Computer Science and Engineering — Feburary 2010

Professional Experience

Microsoft Corporation — Redmond, WA USA
Senior Researcher — March 2021–Present
Researcher — June 2019–Feburary 2021
Research Intern — Summer 2012, 2017, 2018

Carnegie Mellon University — Pittsburgh, PA USA
Graduate Research Assistant — August 2016–November 2021

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, South Korea
Research Scientist (Fulfillment of military service obligation) — June 2013–July 2016

Honors and Awards

Microsoft Research PhD Fellowship	2019–2021
Facebook PhD Fellowship Finalist	2019
Bronze Award, the 24th Samsung HumanTech Paper Award	2018
Qualcomm Innovation Awards, Qualcomm	2016
The Award of Excellence, Microsoft Research Asia	2010, 2012
Best Undergraduate Research Award, POSTECH	2009
Academic Excellence Award, POSTECH	2007, 2008
National Scholarship for Science and Engineering, KOSAF	2006–2010

Peer-reviewed Conference Publications

[C1] **Daehyeok Kim**, Vyas Sekar, and Srinivasan Seshan. ExoPlane: An Operating System for On-Rack Switch Resource Augmentation. In *Proceedings of 20th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2023.

[C2] Hun Namkung, Zaoxing Liu, **Daehyeok Kim**, Vyas Sekar, and Peter Steenkiste. Sketchovsky: Enabling Ensembles of Sketches on Programmable Switches. In *Proceedings of 20th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2023.

[C3] Francisco Pereira, Gonçalo Matos, Hugo Sadok, **Daehyeok Kim**, Ruben Martins, Justine Sherry, Fernando Ramos, and Luis Pedrosa. Automatic Generation of Network Function Accelerators Using Component-Based Synthesis. In *Proceedings of ACM Symposium on SDN Research (SOSR)*, October 2022.

[C4] Hun Namkung, Zaoxing Liu, **Daehyeok Kim**, Vyas Sekar, and Peter Steenkiste. SketchLib: Enabling Efficient Sketch-based Monitoring on Programmable Switches. In *Proceedings of 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2022.

[C5] Lior Zeno, Dan R. K. Ports, Jacob Nelson, **Daehyeok Kim**, Shir Landau Feibish, Idit Keidar, Arik Rinberg, Alon Rashelbach, Igor De-Paula, and Mark Silberstein. SwiSh: Distributed Shared State Abstractions for Programmable Switches. In *Proceedings of 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2022.

[C6] **Daehyeok Kim**, Jacob Nelson, Dan Ports, Vyas Sekar, and Srinivasan Seshan. RedPlane: Enabling Fault-Tolerant Stateful In-Switch Applications. In *Proceedings of ACM SIGCOMM Conference (SIGCOMM)*, August 2021.

[C7] Hun Namkung, **Daehyeok Kim**, Zaoxing Liu, Vyas Sekar, and Peter Steenkiste. Telemetry Retrieval Inaccuracy in Programmable Switches: Analysis and Recommendations. In *Proceedings of ACM Symposium on SDN Research (SOSR)*, July 2021.

[C8] **Daehyeok Kim**, Zaoxing Liu, Yibo Zhu, Changhoon Kim, Jeongkeun Lee, Vyas Sekar, and Srinivasan Seshan. TEA: Enabling State-Intensive Network Functions on Programmable Switches. In *Proceedings of ACM SIGCOMM Conference (SIGCOMM)*, August 2020.

[C9] Matthew Mukerjee, Christopher Canel, Weiyang Wang, **Daehyeok Kim**, Srinivasan Seshan, and Alex C. Snoeren. Adapting TCP for Reconfigurable Datacenter Networks. In *Proceedings of 17th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, February 2020.

[C10] **Daehyeok Kim**, Tianlong Yu, Hongqiang Harry Liu, Yibo Zhu, Jitu Padhye, Shachar Raindel, Chuanxiong Guo, Vyas Sekar, and Srinivasan Seshan. FreeFlow: Software-based Virtual RDMA Networking for Containerized Clouds. In *Proceedings of 16th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, February 2019.

[C11] **Daehyeok Kim**, Amirsaman Memaripour, Anirudh Badam, Yibo Zhu, Hongqiang Harry Liu, Jitu Padhye, Shachar Raindel, Steven Swanson, Vyas Sekar, and Srinivasan Seshan. HyperLoop: Group-Based NIC-Offloading to Accelerate Replicated Transactions in Multi-Tenant Storage Systems. In *Proceedings of ACM SIGCOMM Conference (SIGCOMM)*, August 2018.

[C12] Jaebaek Seo, **Daehyeok Kim**, Donghyun Cho, Taesoo Kim, and Insik Shin. FlexDroid: Enforcing In-App Privilege Separation in Android. In *Proceedings of 23rd Network and Distributed System Security Symposium (NDSS)*, February 2016.

[C13] Sooel Son, **Daehyeok Kim**, and Vitaly Shmatikov. What Mobile Ads Know About Mobile Users. In *Proceedings of 23rd Network and Distributed System Security Symposium (NDSS)*, February 2016.

[C14] Hyosu Kim, SangJeong Lee, Wookhyun Han, **Daehyeok Kim**, and Insik Shin. SounDroid: Supporting Real-Time Sound Application on Commodity Mobile Devices. In *Proceedings of 36th IEEE Real-Time Systems Symposium (RTSS)*, December 2015.

[C15] Sangki Yun, **Daehyeok Kim**, Xiaofan Lu, and Lili Qiu. Optimized Layered Integrated Video Encoding. In *Proceedings of 34th IEEE International Conference on Computer Communications (INFOCOM)*, April 2015.

[C16] Daehee Jang, Hojoon Lee, Minsu Kim, **Daehyeok Kim**, Daegyeong Kim, and Brent B. Kang. ATRA: Address Translation Redirection Attack against Hardware-based External Monitors. In *Proceedings of 21st ACM Conference on Computer and Communications Security (CCS)*, November 2014.

[C17] Sangki Yun, **Daehyeok Kim**, and Lili Qiu. Fine-grained Spectrum Adaptation in WiFi Networks. In *Proceedings of 20th ACM International Conference on Mobile Computing and Networking (MobiCom)*, September 2013.

[C18] **Daehyeok Kim** and Young-Joo Suh. Multi-rate Combination of Opportunistic Routing and Network Coding. In *Proceedings of 9th IEEE Wireless Communications and Networking Conference (WCNC)*, April 2012.

Peer-reviewed Workshop Publications

[W1] **Daehyeok Kim**, Yibo Zhu, Changhoon Kim, Jeongkeun Lee, and Srinivasan Seshan. Generic External Memory for Switch Data Planes. In *Proceedings of the 17th ACM Workshop on Hot Topics in Networks (HotNets)*, November 2018.

Peer-reviewed Journal Publications

[J1] Kilho Lee, **Daehyeok Kim**, and Insik Shin. REboost: Improving Throughput in Wireless Networks using Redundancy Elimination. *IEEE Communications Letters*, 21(1), January 2017.

[J2] **Daehyeok Kim**, Wan-Seon Lim, and Young-Joo Suh. Multicast Extension to Proxy Mobile IPv6 for Mobile Multicast Services. *Journal of Computing Science and Engineering*, 5(4), December 2011.

Technical Reports

[T1] **Daehyeok Kim**, Nikita Lazarev, Tommy Tracy, Farzana Siddique, Hun Namkung, James C Hoe, Vyas Sekar, Kevin Skadron, Zhiru Zhang, and Srinivasan Seshan. A Roadmap for Enabling a Future-Proof In-Network Computing Data Plane Ecosystem. *arXiv preprint arXiv:2111.04563*, 2021.

[T2] **Daehyeok Kim**, Ankush Jain, Zaoxing Liu, George Amvrosiadis, Damian Hazen, Bradley Settlemyer, and Vyas Sekar. Unleashing In-network Computing on Scientific Workloads. *arXiv preprint arXiv:2009.02457*, 2020.

Issued Patents

[P1] Group-based Data Replication in Multi-tenant Storage Systems. US Patent 10,642,779 (July 23, 2020).

Conference and Invited Talks

Unleashing the Potential of In-network Computing
- Pohang University of Science and Technology, Remote. May 2022
- University of Michigan, Ann Arbor, MI. April 2022
- University of Wisconsin-Madison, Madison, WI. March 2022
- University of Pennsylvania, Philadelphia, PA. March 2022
- Stanford University, Stanford, CA. March 2022
- University of Texas-Austin, Austin, TX. March 2022
- Brown University, Remote. Feburary 2022
- Intel/VMware Crossroads 3D-FPGA Academic Research Center, Remote. January 2022
- Seoul National University, Remote. August 2021

RedPlane: Enabling Fault-Tolerant Stateful In-Switch Applications
- ACM SIGCOMM conference, Virtual Event (talk video). August 2021
- Princeton University, Remote. July 2021
- Rice University, Remote. July 2021

TEA: Enabling State-Intensive Network Functions on Programmable Switches
- Princeton University, Remote. April 2021
- University of Wisconsin-Madison, Remote. April 2021
- Duke University, Remote. Feburary 2021
- University of Pennsylvania, Remote. November 2020
- Open Networking Korea, Remote. November 2020
- ACM SIGCOMM conference, Virtual Event (talk video). August 2020

Generic External Memory for Switch Data Planes
- P4 Workshop, Palo Alto, CA (talk video). May 2019
- Dagstuhl Seminar on Programmable Network Data Planes, Wadern, Germany. April 2019
- ACM HotNets, Redmond, WA (talk video). November 2018
- Barefoot Networks, Remote. November 2018

Programmable Data Planes and Its Applications
- Semiconductor Research Corporation E-Workshop, Remote. January 2020

HyperLoop: Group-Based NIC-Offloading to Accelerate Replicated Transactions in Multi-Tenant Storage Systems
- Annual Non-Volatile Memories Workshop, San Diego, CA. March 2019
- Microsoft Research, Redmond, WA. October 2018
- ACM SIGCOMM conference, Budapest, Hungary (talk video). August 2018

FreeFlow: Software-based Virtual RDMA Networking for Containerized Clouds
- USENIX NSDI, Boston, MA (talk video). Feburary 2019
- Intel Labs, Remote. March 2018

Multi-rate Combination of Opportunistic Routing and Network Coding

- IEEE WCNC, Paris, France. March 2012

Teaching Experience

Teaching Assistant, 15-441/641 Computer networks, CMU Spring 2019

Taught about 30 students in weekly recitation sessions. Made homework assignment and exam problems. Held weekly office hours.

Teaching Assistant, 15-440/640 Distributed systems, CMU Fall 2017

Gave two full lectures on virtualization techniques including virtual machines and containerization. Made homework assignment and exam problems. Held weekly tutoring sessions for a group of students for better understanding of the course material. Held recitation sessions for course projects. Held weekly office hours.

Teaching Assistant, CS 302 Computer fluency, UT Austin Spring 2013

Taught about 100 students for better understanding of basics of computer science and Python programming. Held weekly office hours.

Teaching Assistant, CS 312 Introduction to programming, UT Austin Fall 2012

Taught about 100 students in weekly recitation sessions. Helped students for better understanding of the course material and to get familiar with programming in Java. Held weekly office hours.

Service and Outreach

Student Committee, Computer Science Department Faculty Hiring Committee, CMU 2021

Student Committee, Computer Science Department PhD Admissions Committee, CMU 2019–2020

Student Committee, Research Experiences for Undergraduates (REU) Admissions Committee, CMU 2021

External Reviewer, SIGCOMM 2018, 2021, NSDI 2021, USENIX Security 2021, and APNET 2019

TEALS Volunteer Teacher, Intro to Computer Science, Moses Lake High School, WA USA 2021–2022

TEALS Volunteer Teacher, Intro to Computer Science, Selah High School, WA USA 2020–2021

References

Available upon request.