

# DAEHYEOK KIM

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## RESEARCH INTERESTS

Computer networks, Distributed systems, Systems security

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## EDUCATION

### Carnegie Mellon University

Ph.D. in Computer Science

Thesis: [Towards Elastic and Resilient In-network Computing](#)

Advisors: Srinivasan Seshan and Vyas Sekar

Pittsburgh, PA USA

November 2021

### Pohang University of Science and Technology

M.S. in IT Convergence Engineering

B.S. in Computer Science and Engineering

Pohang, South Korea

February 2012

February 2010

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## PROFESSIONAL EXPERIENCE

### Microsoft Corporation

Senior Researcher

Researcher

Research Intern

Redmond, WA USA

March 2021–Present

June 2019–February 2021

Summer 2012, 2017, 2018

### Carnegie Mellon University

Graduate Research Assistant

Pittsburgh, PA USA

August 2016–November 2021

### Korea Advanced Institute of Science and Technology

Research Scientist (Fulfillment of military service obligation)

Daejeon, South Korea

June 2013–July 2016

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## 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

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## 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] Soeul 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] Dahee 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.

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#### 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.

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#### 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

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- [T1] Anup Agrawal, **Daehyeok Kim**, and Srinivasan Seshan. [StaRRNIC: Enabling Runtime Reconfigurable FPGA NICs](#). *CMU SCS Technical Report (CMU-CS-23-100)*, March 2023.
- [T2] Nikita Lazarev, Tao Ji, Anuj Kalia, **Daehyeok Kim**, Ilias Marinos, Francis Y. Yan, Christina Delimitrou, Zhiru Zhang, and Aditya Akella. [Resilient Baseband Processing in Virtualized RANs with Slingshot](#). *Microsoft Research Technical Report (MSR-TR-2023-11)*, February 2023.
- [T3] **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*, November 2021.
- [T4] **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*, September 2020.

#### ISSUED PATENTS

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- [P1] [Migrating physical layer in virtualized radio access networks](#), December 20 2022. US Patent 11,533,376.
- [P2] [Group-based data replication in multi-tenant storage systems](#), June 22 2021. US Patent 11,042,501.

#### CONFERENCE AND INVITED TALKS

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- ExoPlane: An Operating System for On-Rack Switch Resource Augmentation  
 - USENIX NSDI, Boston, MA ([talk](#) [video](#)). April 2023
- Unleashing the Potential of In-network Computing  
 - Ulsan National Institute of Science and Technology, Remote. October 2022  
 - 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. February 2022  
 - Intel/VMware Crossroads 3D-FPGA Academic Research Center, Remote ([talk](#) [video](#)). 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. February 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 ( <a href="#">talk</a> <a href="#">video</a> ).	August 2018
FreeFlow: Software-based Virtual RDMA Networking for Containerized Clouds	
- USENIX NSDI, Boston, MA ( <a href="#">talk</a> <a href="#">video</a> ).	February 2019
- Intel Labs, Remote.	March 2018
Multi-rate Combination of Opportunistic Routing and Network Coding	
- IEEE WCNC, Paris, France.	March 2012

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## TEACHING EXPERIENCE

<b>Teaching Assistant</b> , 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.	
<b>Teaching Assistant</b> , 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.	

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## SERVICE AND OUTREACH

<b>Program Committee</b> , USENIX NSDI	2024
<b>Program Committee</b> , EuroSys	2024
<b>Panel</b> , National Science Foundation (NSF)	2022, 2023
<b>Student Committee</b> , Computer Science Department Faculty Hiring Committee, CMU	2021
<b>Student Committee</b> , Computer Science Department PhD Admissions Committee, CMU	2019–2020
<b>TEALS Volunteer Teacher</b> , Intro to Computer Science, Moses Lake High School, WA USA	2021–2022
<b>TEALS Volunteer Teacher</b> , Intro to Computer Science, Selah High School, WA USA	2020–2021

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## REFERENCES

Available upon request.