

# DAEHYEOK KIM

Computer Science PhD candidate

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## RESEARCH INTERESTS

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Computer networks, Distributed systems, Data centers, Cloud computing, Systems security

## EDUCATION

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### Carnegie Mellon University

Ph.D. in Computer Science

M.S. in Computer Science

Dissertation: Towards Elastic and Resilient In-Network Computing

Advisors: Vyas Sekar and Srinivasan Seshan

Pittsburgh, PA USA

In progress since August 2016

May 2019

### 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

## EMPLOYMENT HISTORY

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### Microsoft Corporation

Senior Researcher

Researcher

Research Intern

Redmond, WA USA

March 2021–Present

June 2019–February 2021

Summer 2012, 2017, 2018

### Korea Advanced Institute of Science and Technology (KAIST)

Research Scientist (Fulfillment of military service obligation)

Daejeon, South Korea

June 2013–July 2016

## HONORS AND AWARDS

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Microsoft Research PhD Fellowship

2019–2021

Facebook PhD Fellowship Finalist

2019

Bronze Award, the 24th Samsung HumanTech Paper Award

2018

Qualcomm Innovation Awards, Qualcomm Korea

2016

College of Natural Sciences Dean's Excellence Award, UT Austin

2012

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

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- [C1] 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)*, February 2022.
- [C2] **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.
- [C3] 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.
- [C4] **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.

- [C5] 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.
- [C6] **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.
- [C7] **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.
- [C8] 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.
- [C9] 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.
- [C10] 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.
- [C11] 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.
- [C12] 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.
- [C13] 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.
- [C14] **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.

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#### ISSUED PATENTS

- [P1] [Group-based data replication in multi-tenant storage systems](#). US Patent 10,642,779 (July 23, 2020).

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#### CONFERENCE AND INVITED TALKS

- |   |             |
|---|-------------|
| RedPlane: Enabling Fault-Tolerant Stateful In-Switch Applications       |             |
| - ACM SIGCOMM conference, Virtual Event ( <a href="#">talk video</a> ). | August 2021 |
| - Princeton University, Remote.   | July 2021   |
| - Rice University, Remote.  | July 2021   |
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| Unleashing the Potential of In-network Computing                        |             |
| - Seoul National University, Remote.                                    | August 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 ( <a href="#">talk</a> <a href="#">video</a> ).	August 2020
Generic External Memory for Switch Data Planes	
- P4 Workshop, Palo Alto, CA ( <a href="#">talk</a> <a href="#">video</a> ).	May 2019
- Dagstuhl Seminar on Programmable Network Data Planes, Wadern, Germany.	April 2019
- ACM HotNets, Redmond, WA ( <a href="#">talk</a> <a href="#">video</a> ).	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

## RESERACH EXPERIENCE

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Graduate Research Assistant, Computer Science Department, CMU	August 2016–Present
- Building high-performance datacenter networks and applications with programmable and reconfigurable networks [C1, C2, C4, C5, C6, C7][W1].	
Research Intern, Microsoft Research	May–August 2018
Mobility and Networking Research group	
- Designing external memory architecture for programmable switch data planes [W1].	
Research Intern, Microsoft Research	May–August 2017
Mobility and Networking Research group	
- Designing new network primitives for accelerating replicated storage transactions with RDMA NIC offloading with the support of non-volatile memory [C7][P1].	
- Building a software-based RDMA virtualization framework for containerized clouds [C6].	
Research Scientist, KAIST ( <i>Fulfillment of military service obligation</i> )	June 2013–June 2016
Cyber Security Research Center (Jun. 2013 - February 2015)	
Mobile Software Platform Research Center (March 2015 - Jun. 2016)	
- Work on in-app privilege separation for Android OS [C8].	
- Investigating privacy leakages from mobile advertising libraries [C9].	
- Discovering a new attack which can bypass hardware-based kernel integrity monitors [C12].	
Graduate Research Assistant, Department of Computer Sciences, UT Austin	August 2012–May 2013
- Work on wireless video multicast in MIMO environments [C11].	
- Work on efficient wireless spectrum utilization in WiFi networks [C13].	
Research Intern, Microsoft Research	May–August 2012
Mobility and Networking Research group	
- Work on evaluating benefits of SPDY protocol in mobile applications.	

Research Intern, Microsoft Research Asia Wireless and Networking group	September 2011–February 2012
- Work on a distributed MIMO system to improve wireless capacity.	
Research Intern, Microsoft Research Asia Wireless and Networking group	January 2010–March 2010
- Work on a collaborative relaying system to improve wireless capacity in multi-hop wireless networks.	
Research Assistant, POSTECH	March 2010–February 2012
- Work on network coding and opportunistic routing and their combination in multi-rate wireless network [C14].	

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#### 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 lectures on virtualization. Held weekly tutoring sessions for a group of students for better understanding of course materials. 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 materials and to get familiar with programming in Java. Held weekly office hours.	

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#### UNIVERSITY SERVICE

Computer Science Department Faculty Hiring Committee, CMU	2021
Computer Science Department PhD Admissions Committee, CMU	2019–2020
Research Experiences for Undergraduates (REU) Program Admissions Committee, CMU	2021

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#### COMPUTER SCIENCE OUTREACH

TEALS volunteer teacher, Intro to Computer Science, Moses Lake High School, WA USA	2021–Present
TEALS volunteer teacher, Intro to Computer Science, Selah High School, WA USA	2020–2021