

DAEHYEOK KIM

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RESEARCH INTERESTS

My research interests lie in the intersection of systems and networking with a current focus on making data centers faster and more efficient by designing novel network primitives with advanced networking hardware devices and features such as programmable switches/NICs and RDMA. I have also worked on identifying and solving security problems in various contexts including operating systems, mobile systems, and the Web.
Research area: computer networking, distributed systems, data centers, security

EDUCATION

Carnegie Mellon University, Pittsburgh, PA

In progress since August 2016

Ph.D. in Computer Science

Advisors: Prof. Srinivasan Seshan and Prof. Vyas Sekar

Pohang University of Science and Technology, Pohang, South Korea

M.S. in IT Convergence Engineering

February 2012

B.S. in Computer Science and Engineering

February 2010

PUBLICATIONS

- [1] **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.
- [2] **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.
- [3] **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.
- [4] Kilho Lee, **Daehyeok Kim**, and Insik Shin. *REboost: Improving Throughput in Wireless Networks using Redundancy Elimination*. IEEE Communications Letters, 21(1), January 2017.
- [5] 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.
- [6] 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.
- [7] 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.
- [8] 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.
- [9] 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.

- [10] 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.
- [11] **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.
- [12] **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.

AWARDS AND HONORS

Microsoft Research PhD Fellowship	<i>2019 – 2021</i>
Facebook PhD Fellowship Finalist	<i>2019</i>
Bronze Award, the 24th Samsung HumanTech Paper Award	<i>2018</i>
Qualcomm Innovation Awards, Qualcomm Korea	<i>2016</i>
College of Natural Sciences Dean’s Excellence Award, UT Austin	<i>2012</i>
The Award of Excellence, Microsoft Research Asia	<i>2010, 2012</i>
Excellent Senior Research Award, POSTECH	<i>2009</i>
Academic Excellence Award, POSTECH	<i>2007, 2008</i>
Undergraduate Research Program (research grant), POSTECH	<i>2009 – 2010</i>
National Scholarship for Science and Engineering, KOSAF	<i>2006 – 2010</i>

TALKS

Generic External Memory for Switch Data Planes	
- at ACM HotNets, Redmond, WA.	<i>November 2018</i>
- at Barefoot Networks Seminar Talk, Webinar.	<i>November 2018</i>
Group-Based NIC-Offloading to Accelerate Replicated Transactions in Multi-Tenant Storage Systems	
- at Microsoft Research, Redmond, WA.	<i>October 2018</i>
- at ACM SIGCOMM, Budapest, Hungary.	<i>August 2018</i>
Software-based Virtual RDMA Networking for Containerized Clouds	
- at Intel Labs Seminar Talk, Webinar.	<i>March 2018</i>
Multi-rate Combination of Opportunistic Routing and Network Coding	
- at IEEE WCNC, Paris, France.	<i>March 2012</i>

RESEARCH EXPERIENCE

Research Assistant , Computer Science Department, Carnegie Mellon University	<i>August 2016 - Present</i>
<i>Advisors:</i> Srinivasan Seshan and Vyas Sekar	
- Perform research with Srinivasan Seshan and Vyas Sekar on building high-performance datacenter networks and applications [1, 2, 3].	
Research Intern , Microsoft Research	<i>May - August 2018</i>
Mobility and Networking Research group	
- Worked with Yibo Zhu to design an external memory architecture for network switch data planes [2].	
Research Intern , Microsoft Research	<i>May - August 2017</i>
Mobility and Networking Research group	
- Worked with Anirudh Badam, Yibo Zhu, Hongqiang Liu, and Jitendra Padhye to develop new network primitives for accelerating replicated storage transactions with RDMA NIC offloading with the support of non-volatile memory [3].	
- Worked with Yibo Zhu, Hongqiang Liu, and Jitendra Padhye to develop a software-based RDMA virtualization framework for containerized clouds [1].	

Researcher, KAIST (*Alternative military service*) *June 2013 - June 2016*
Cyber Security Research Center (Jun. 2013 - Feb. 2015)
Mobile Software Platform Research Center (Mar. 2015 - Jun. 2016)

- Performed research on in-app privilege separation for Android OS [5].
- Performed research on investigating privacy leakages from mobile advertising libraries [6].
- Performed research on discovering a new attack which can bypass hardware-based kernel integrity monitors [9].
- Performed research on developing a protection mechanism for web-based device fingerprinting.

Research Assistant, Department of Computer Sciences, UT Austin *August 2012 - May 2013*
Advisor: Lili Qiu

- Performed research on wireless video multicast in MIMO environments [8].
- Performed research on efficient wireless spectrum utilization in WiFi networks [10].

Research Intern, Microsoft Research *May - August 2012*
Mobility and Networking Research group

- Worked with Jitendra Padhye and Sharad Agarwal to evaluate benefits of SPDY protocol in mobile applications.

Research Intern, Microsoft Research Asia *September 2011 - February 2012*
Wireless and Networking group

- Worked with Kun Tan and Wenjun Hu to develop a distributed MIMO system to improve wireless capacity.

Research Intern, Microsoft Research Asia *January 2010 - March 2010*
Wireless and Networking group

- Worked with Kun Tan to develop a collaborative relaying system to improve wireless capacity in multi-hop wireless networks.

Research Assistant, POSTECH *March 2010 - February 2012*
Advisor: Young-Joo Suh

- Performed research on network coding and opportunistic routing and their combination in multi-rate wireless network [11].

TEACHING EXPERIENCE

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

15-440/640: Distributed systems, *Teaching Assistant*, 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.

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

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

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

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

GRADUATE COURSEWORK

Carnegie Mellon University

- Programmable Networks (Instructor: Justine Sherry) *Fall 2018*
- Practical Information and Coding Theory for Computer Systems (Instructor: Rashmi K. Vinayak) *Fall 2018*
- Algorithms in the Real World (Instructor: Guy Blelloch) *Spring 2018*
- Computer Networks (Instructor: Srinivasan Seshan) *Spring 2017*
- Computer Architecture (Instructor: Nathan Beckmann) *Spring 2017*
- Advanced Operating Systems and Distributed Systems (Instructor: David G. Andersen) *Fall 2016*
- AI: Representation & Problem Solving (Instructors: Emma Brunskill, Ariel Procaccia) *Fall 2016*

University of Texas at Austin

- Advanced Networking Protocols (Instructor: Simon S. Lam) *Spring 2013*
- Formal Semantics and Verification (Instructor: E. Allen Emerson) *Spring 2013*
- Theory and Practice of Secure Systems (Instructor: Vitaly Shmatikov) *Fall 2012*

POSTECH

- Autonomic Traffic Monitoring and Analysis (Instructor: James W. Hong) *Spring 2011*
- Personal Area Networks (Instructor: Chansu Yu) *Spring 2010*
- Approximation Algorithms (Instructor: Hee-Kap Ahn) *Spring 2010*
- Network Evaluation (Instructor: Cheeha Kim) *Spring 2009*
- Mobile Networks (Instructor: Young-Joo Suh) *Fall 2008*

REFERENCES

Available upon request.