

MUHAMMAD ASIM JAMSHED, Ph.D.

CONTACT INFORMATION	Intel Jones Farm 2 (JF2) Building, 2111 NE 25th Ave, Hillsboro, OR 97124 United States of America	Voice: +1 (971) 330 6282 E-mail: asim.jamshed@gmail.com WWW: ajamshed.github.io
EDUCATION	Korea Advanced Institute of Science & Technology (KAIST) , Republic of Korea Ph.D., Electrical Engineering (Feb 2017) <ul style="list-style-type: none">• Thesis title: Networking Stack Abstraction for High-performance Flow-processing Middleboxes• Advisor: KyoungSoo Park University of Pittsburgh , Pittsburgh, Pennsylvania, USA M.S., Computer Science (Apr 2010) <ul style="list-style-type: none">• Advisors: KyoungSoo Park & Daniel Mossé Lahore University of Management Sciences , Lahore, Pakistan BSc (Hons), Computer Science (May 2005) <ul style="list-style-type: none">• Minor in Mathematics	
RESEARCH INTEREST	Networked systems, distributed systems, network security and operating systems.	
EMPLOYMENT EXPERIENCE	Intel Labs, Infrastructure Research Group <ul style="list-style-type: none">• Research Scientist Korea Advanced Institute of Science & Technology (KAIST) <ul style="list-style-type: none">• Postdoctoral Researcher International Computer Science Institute, Berkeley, CA, US Summer '14 & Fall '15 <ul style="list-style-type: none">• Research Intern, Bro team: Developed a packet acquisition & filter framework for 10 Gbps network applications. Palmchip Corporation , Lahore, Pakistan <ul style="list-style-type: none">• Software Engineer, Embedded Systems Group: Optimized bootloader & filesystem performances for an in-house system-on-chip network-attached storage device series. Syed Murad Ali , Toronto, Canada <ul style="list-style-type: none">• Intern, Web development (PHP & HTML).	May2017-onwards Feb 2017-Apr 2017 May 2005-July 2006 Summer 2004
PROJECTS/ SOFTWARE	1. mOS STACK <p>The mOS networking stack provides elegant abstractions for stateful flow processing tailored for middlebox applications. Our API allows developers to focus on the core application logic while it relieves the burden of dealing with low-level packet/flow processing themselves. Under the hood, the stack implements an efficient event system derived from mTCP, a high-performance user-level TCP/IP stack. mOS won the NSDI Best Paper Award 2017. We plan to move the project to DPDK.org for broader impact. Discussion is on-going with Intel folks.</p> <p>Role: Lead author & maintainer Project homepage: http://mos.kaist.edu/ Source code: https://github.com/ndsl-kaist/mOS-networking-stack Related publication: Refer to our mOS paper at NSDI 2017</p> 2. PACKET BRICKS	May 2016- Sept 2014-

A netmap-based packet layer for distributing and filtering traffic

Role: Lead author & maintainer

Source code: <https://github.com/bro/packet-bricks>

3. mTCP

Sept 2013-

mTCP is a high-performance user-level TCP stack for multi-core systems that addresses the inefficiency from the ground up - from packet I/O and TCP connection management to the application interface. mTCP (1) allows efficient flow-level event aggregation, and (2) performs batch processing of RX/TX packets for high I/O efficiency. mTCP improves the performance of small message transactions by a factor 25 and 3 than that of the latest Linux TCP stack and the best-known research prototype. It also improves the performance of various popular applications by 33% to 320% compared with those on the Linux stack. mTCP won the **NSDI Community Award 2014** and was declared runner-up in the **Samsung HumanTech Paper Award 2014**. We plan to move the project to DPDK.org for broader impact. Discussion is on-going with Intel folks.

Role: Co-author & co-lead maintainer

Project homepage: <http://shader.kaist.edu/mtcp/>

Source code: <https://github.com/eunyoung14/mtcp/>

Related publication: Refer to our mTCP paper at NSDI 2014

4. KARGUS

Oct 2012

Kargus is a highly-scalable software-based network intrusion detection system (NIDS) that runs on commodity PCs and its performance is comparable to hardware-based NIDSes. It effectively exploits the potentials of modern hardware innovations such as multi-core CPUs, heterogeneous GPUs and multi-queue interface of NICs that drives its monitoring rate by up to 33 Gbps in real time. Kargus was mentioned in the **“10 Achievements of 2012 that put KAIST on the Spotlight.”**

Role: Lead author

Project homepage: <http://shader.kaist.edu/kargus/>

Related publication: Refer to our Kargus paper at CCS 2012

5. HUMANSIGN

Sept 2010

An input device framework in which keystroke events are securely coupled with text-based content that is typed by humans with the end goal of reliable network payload delivery. This scheme is based on trusted computing principles that places the root of trust on a customized input device running a trusted platform module (TPM) chip and a small attester daemon within it. Each input event generates a cryptographic hash that attests to human activity and the combined message attestation (derived from such events) gets a third-party verifiable digital signature. These human attestations are then attached to the actual messages which ultimately assist in reducing false positive rates in the recipients' filter modules.

Role: Lead author

Related publication: Refer to our HumanSign paper at APSYS 2010

SELECTED PUBLICATIONS

[1] **Muhammad Asim Jamshed**, YoungGyoun Moon, Donghwi Kim, Dongsu Han, KyoungSoo Park, “mOS: A Reusable Networking Stack for Flow Monitoring Middleboxes,” In the 14th USENIX Symposium on Networked Systems Design and Implementation (NSDI '17), 2017.

[2] Younghwan Go, **Muhammad Asim Jamshed**, YoungGyoun Moon, Changho Hwang, KyoungSoo Park, “APUNet: Revitalizing GPU as Packet Processing Accelerator,” In the 14th USENIX Symposium on Networked Systems Design and Implementation (NSDI '17), 2017.

[3] Byungkwon Choi, Jongwook Chae, **Muhammad Asim Jamshed**, KyoungSoo Park, Dongsu Han, “DFC: Accelerating String Pattern Matching for Network Applications,” In Proceedings

of the 13th USENIX Symposium on Networked Systems Design and Implementation (NSDI '16), 2016.

[4] Jaehyun Nam, **Muhammad Asim Jamshed**, Byungkwon Choi, Dongsu Han, KyoungSoo Park, “Haetae: Scaling the Performance of Network Intrusion Detection with Many-core Processors,” In Proceedings of the 18th International Symposium on Research in Attacks, Intrusions and Defenses (RAID '15), 2015.

[5] **Muhammad Asim Jamshed**, Donghwi Kim, YoungGyou Moon, Dongsu Han, KyoungSoo Park, “A Case for a Stateful Middlebox Networking Stack,” In SIGCOMM Computer Communication Review, Rev. 45, Pg 355-356, August, 2015.

[6] Eunyoung Jeong, Shinae Woo, **Muhammad Asim Jamshed**, Haewon Jeong, Sunghwan Ihm, Dongsu Han, KyoungSoo Park, “mTCP: a Highly Scalable User-level TCP Stack for Multicore Systems,” In Proceedings of the 11th USENIX Symposium on Networked Systems Design and Implementation (NSDI '14), 2014 - **NSDI Community Award**.

[7] **Muhammad Asim Jamshed**, Jihyung Lee, Sangwoo Moon, Insu Yun, Deokjin Kim, Sungryoul Lee, Yung Yi, KyoungSoo Park, “Kargus: a Highly-scalable Software-based Intrusion Detection System,” In Proceedings of the 19th ACM Conference on Computer and Communications Security (CCS '12), 2012.

[8] **Muhammad Asim Jamshed**, Younghwan Go, KyoungSoo Park, “Suppressing Malicious Bot Traffic using an Accurate Human Attester,” In Proceedings of the 8th USENIX Symposium on Networked Systems Design and Implementation (NSDI '11), 2011 (Poster).

[9] **Muhammad Asim Jamshed**, Wonho Kim, KyoungSoo Park, “Suppressing Bot Traffic with Accurate Human Attestations,” In Proceedings of the 1st ACM Asia-Pacific Workshop on Systems (ApSys '10) held in conjunction with SIGCOMM '10, 2010.

[10] Peter Djalaliev, **Muhammad Asim Jamshed**, Nicholas Farnan, Jose Brustoloni, “Sentinel: Hardware-Accelerated Mitigation of Bot-Based DDoS Attacks,” In Proceedings of the 17th IEEE International Conference on Computer Communications and Networks (ICCCN '08) Network Security Track, 2008.

[11] **Muhammad Asim Jamshed**, Jose Brustoloni, “In-Network Server-Directed Client Authentication and Packet Classification,” In Proceedings of the 35th Annual IEEE Conference on Local Computer Networks (LCN '10), 2010.

PROFESSIONAL SERVICE	Journal Reviewer: Elsevier Computer Networks Journal, Computer Communication Review
HONORS	NSDI Best Paper Award 2017 for mOS 2 nd Runner-up Samsung Humantech Paper Award 2016 for DFC NSDI Community Award 2014 for mTCP Runner-up Samsung Humantech Paper Award 2014 for mTCP “10 Achievements of 2012 that put KAIST on the Spotlight” for Kargus ACM SIGCOMM Travel Grant 2010 Graduate Fellowship Spring 2006 Undergraduate Dean’s Honor List 2001-03
SKILLS	C/C++, Java, C#, Python, CUDA, Lua, Awk, Javascript, Linux shell scripting, HTML, XML, Unix/GNU Linux, x86 Assembly, TILE-Gx programming, L ^A T _E X
REFERENCES	Available on request