Muhammad Asim Jamshed, Ph.D.

Contact Information

SEA42 - Corp Office - re:Invent Building,
2121 8th Ave, Seattle, WA 98121
United States of America

Voice: +1 (971) 330 6282
E-mail: asim.jamshed@gmail.com
WWW: ajamshed.github.io

Interests

Networked systems, distributed systems, network security and operating systems.

Employment Experience

AWS, EC2 Virtual Private Cloud (VPC) Dataplane Team **Aug 2020-onwards**

- Software Development Engineer II: Building next generation Virtual Private Cloud (VPC) features for Nitro-based droplets. Also closely collaborating with the reliability engineering team on CI/CD pipeline tasks.

Intel Labs, Telco Systems Research Group **May 2017-Aug 2020**

- Research Scientist: Member of the Open Mobile Evolved Core (OMEC) team that maintains Aether User Plane Function (UPF). Aether UPF is an open source 4G/5G control user plane separated (CUPS) 3GPP TS23501 based implementation making use of the PFCP protocol for the communication between SMF (5G) or SPGW-C (4G) and UPF.

Korea Advanced Institute of Science & Technology (KAIST) **Feb 2017-Apr 2017**

- Postdoctoral Researcher: Member of the research team that worked on the mOS project, a networking stack that provides abstractions for stateful flow processing for middlebox applications.

International Computer Science Institute, Berkeley, CA, US **Summer '14** & **Fall '15**

- Research Intern, Zeek team: Developed a packet acquisition & filter framework for 10+ Gbps network applications.

Palmchip Corporation, Lahore, Pakistan **May 2005-July 2006**

- 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 **Summer 2004**

- Intern, Web development (PHP & HTML development).

Projects/ Software

1. **Aether Project** Feb 2020-Aug 2020

   Aether is the first open source 5G Connected Edge platform for enabling enterprise digital transformation. It provides mobile connectivity and edge cloud services for distributed enterprise networks as a cloud managed offering. Aether is an open source platform optimized for multi-cloud deployments, and simultaneous support for wireless connectivity over licensed, unlicensed and lightly-licensed (CBRS) spectrum.
   Role: Lead author and maintainer of Aether UPF
   Project homepage: https://opennetworking.org/aether/
   Source code: https://github.com/omec-project/upf

2. **Omec Project** Feb 2019-Aug 2020

   The Open Mobile Evolved Core (OMEC) project is an initiative from the Open Networking Foundation (ONF) to create an open source virtualized evolved packet core for 4G/LTE networks. OMEC comprises of a number of VNFs including (i) OpenMME: a Mobility Management Entity function, (ii) C3PO: a suite packaging Home Subscription Service (HSS), Database, Charge Data Function (CDF), Charge Trigger Function (CTF), and Policy Control Rules Function (PCRF), and (iii) ngic-rtc: a control user plane separated (CUPS) 3GPP TS23501 based Service and Packet gateway functions. **OMEC won the Intel Division**

Recognition Award 2019.
Role: Co-maintainer of ngic-rtc
Project homepage: http://www.omecproject.org/
Source code: https://github.com/omec-project/ngic-rtc

3. mOS Stack May 2016-Mar 2019

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**
Role: Lead author & maintainer
Project homepage: https://tnet.snu.ac.kr/mos/
Source code: https://github.com/mos-stack/mOS-networking-stack
Related publication: Refer to our mOS paper at NSDI 2017

4. Packet Bricks Sept 2014-Jun 2016

A netmap-based packet layer for distributing and filtering traffic
Role: Lead author & maintainer
Source code: https://github.com/zeek/packet-bricks

5. mTCP Sept 2013-Nov 2019

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**
Role: Co-author & co-lead maintainer
Project homepage: https://tnet.snu.ac.kr/mtcp/
Source code: https://github.com/mtcp-stack/mtcp/
Related publication: Refer to our mTCP paper at NSDI 2014

6. 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: https://tnet.snu.ac.kr/kargus
Related publication: Refer to our Kargus paper at CCS 2012

7. 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

Education

Korea Advanced Institute of Science & Technology (KAIST), Republic of Korea

Ph.D., Electrical Engineering (Feb 2017)

- 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)

- Advisors: KyoungSoo Park & Daniel Mossé

Lahore University of Management Sciences, Lahore, Pakistan

BSc (Hons), Computer Science (May 2005)

- Minor in Mathematics

Selected Publications

[1] YoungGyoun Moon, SeungEon Lee, **Muhammad Asim Jamshed**, KyoungSoo Park, "AccelTCP: Accelerating Network Applications with Stateful TCP Offloading." In the 17th USENIX Symposium on Networked Systems Design and Implementation (NSDI '20), 2020.

[2] Hafiz Muhamamd Mohsin Bashir, Abdullah bin Faisal, **Muhammad Asim Jamshed**, Peter Vondras, Ali Musa Iftikhar, Ihsan Qazi, Fahad Dogar, "Reducing Tail Latency via Safe and Simple Duplication." In the 15th International Conference on emerging Networking EXperiments and Technologies (CoNEXT '19), 2019.

[3] **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.

[4] 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.

[5] 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.

[6] 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.

[7] **Muhammad Asim Jamshed**, Donghwi Kim, YoungGyoun 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.

[8] 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**.

[9] **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 19^{th} ACM Conference on Computer and Communications Security (CCS '12), 2012.

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

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

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

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

Professional Service

Program Committee Member: ACM CAN 2017, ACM APNET 2020, ACM/IEEE ANCS 2021
Journal Reviewer: Elsevier Computer Networks Journal, Computer Communication Review

PhD Thesis Reviewer

Syed Mohammad Irteza, "Resilient Network Load Balancing for Datacenters", November 2018

Honors

ONF OMEC/COMAC Community Award for OMEC
Intel Division Recognition Award for OMEC
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, Intel DPDK, LaTeX

References

Available on request