Ahmed Alquraan

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EDUCATION

PhD, Computer Science, University of Waterloo — Jan. 2019 – Aug. 2024 (Expected)
- Part of Waterloo Advanced Systems Lab (WASL). Supervised by Prof. Samer Al-Kiswany.

MMath, Computer Science, University of Waterloo — Sep. 2017 – Dec. 2018
- Part of Waterloo Advanced Systems Lab (WASL). Supervised by Prof. Samer Al-Kiswany.
- Thesis Title: An Analysis of Network-Partitioning Failures in Cloud Systems.
- GPA: 90.5/100 (A+).

B.Sc, Computer Engineering, University of Jordan — Sep. 2010 – Jan. 2015
- Supervisor: Prof. Iyad Jafar
- Thesis Title: Design and Implementation of A RISC ISA for Modular Arithmetic on FPGA
- GPA: 3.81/4.0 (A+ with Honors, Top of the graduating class)

AWARDS AND HONORS

IBM PhD Fellowship Recipient	Apr. 2021	$40,000
Facebook Fellowship Finalist	Apr. 2021	-----
Huawei Prize for Best Research Paper	Apr. 2019	$4000
David R. Cheriton Graduate Scholarship - UWaterloo	Jan. 2019 – Jan. 2021	$20,000
University of Jordan Award for Academic Excellence	Sep. 2010 – Jan. 2015	-----

EXPERIENCE

Research Intern — May. 2019 – Aug. 2019
Oracle Labs, Burlington, MA, USA — Collaborators: Dr. Virendra Marathe & Dr. Alex Kogan
I joined the distributed systems group at Oracle Labs where I worked on designing a novel disaster recovery system for distributed data stores. This work was published in VLDB'20.

Research & Teaching Assistant — Sep. 2017 – Present
University of Waterloo, ON, Canada — Collaborators: Prof. Samer Al-Kiswany & WASL members
At the Waterloo Advanced Systems Lab (WASL), I am involved in multiple research projects focusing on improving the reliability and performance of distributed storage systems by leveraging new data center technologies (e.g., hardware disaggregation, RDMA, synchronized clocks). Also, I worked as a teaching assistant for several CS courses.

Software Developer — Jul. 2014 – Sep. 2017
JoVision, Amman, Jordan — Collaborator: Dr. Islam Shdaifat
Working on multiple projects that involves image processing, internet of things, and embedded systems.

PUPLICATIONS

[1] "LoLKV: The Logless Linearizable Key-Value Storage System", A. Alquraan, S. Udayashankar, V. Marathe, B. Wong, S. Al-Kiswany, Symposium on Networked Systems Design and Implementation (**NSDI**), 2024.

[2] "A Study of Orchestration Approaches for Scientific Workflows in Serverless Computing", A. Elshamy, A. Alquraan, S. Al-Kiswany, Workshop on Serverless Systems, Applications and Methodologies, 2023.

[3] "Accelerating Reads with In-Network Consistency-Aware Load Balancing", I. Kettaneh, A. Alquraan, H. Takruri, A. J. Mashtizadeh, S. Al-Kiswany, IEEE/ACM Transactions on Networking (**ToN**), 2021.

[4] "Toward a Generic Fault Tolerance Technique for Partial Network Partitioning", M. Alfatafta, B. Alkhatib, A. Alquraan, S. Al-Kiswany, USENIX Symposium on Operating Systems Design and Implementation (**OSDI**), 2020

[5] "Scalable, Near-Zero Loss Disaster Recovery for Distributed Data Stores", A. Alquraan, A. Kogan, V. Marathe, S. Al-Kiswany, Very Large Data Base Endowment (**VLDB**), 2020.

[6] "The Network-Integrated Storage System", I. Kettaneh, A. Alquraan, H. Takruri, S. Yang, A. C. Arpaci-Dusseau, R. H. Arpaci-Dusseau, S. Al-Kiswany, IEEE Transactions on Parallel and Distributed Systems (**TPDS**), 2019.

[7] "An Analysis of Network-Partitioning Failures in Cloud Systems", A. Alquraan, H. Takruri, M. Alfatafta, S. Al-Kiswany, Symposium on Operating Systems Design and Implementation (**OSDI**), 2018.

PROJECTS

A Linearizable Key-Value Store for Hardware Disaggregation Architecture

- Hardware disaggregation breaks monolithic hardware into separate components (i.e., CPU, memory, and disk) that communicate over the network.
- Traditional monolithic key-value stores deliver poor performance with disaggregated hardware.
- Investigates building a strongly consistent key-value store that overcomes the challenges of hardware disaggregation such as data transfer overhead and limited memory of CPU nodes.
- **Utilized**: Hardware disaggregation, RDMA, TLA+, C, Python.

A Study of Executing for Scientific Workflows in Serverless Computing (SESAME)

- Investigated the viability of using serverless computing to execute scientific workflows.
- Discussed, implemented, and evaluated three orchestration approaches for executing scientific workflows in serverful and serverless environments.
- Evaluated different approaches using different scientific applications with different execution patterns.
- **Utilized**: Knative, Kubernetes, Python.

LoLKV: The Logless Linearizable Key-Value Storage System (NSDI)

- Proposed a new strongly consistent RDMA-based key-value store.
- Designed a novel log-less replication protocol that combines commit and application phases.
- Leveraged RDMA to replicate operations directly to the state machine.
- Wrote a TLA+ specifications to ensure the correctness of the system.
- **Utilized**: RDMA, TLA+, C, Python.

Slogger: Scalable, Near-Zero Loss Disaster Recovery for Distributed Data Stores (VLDB)

- Designed a new disaster recovery mechanism for distributed data stores with tiny data loss window.
- Leveraged the synchronized clocks to guarantee the consistency of the backup site state.
- Integrated the new mechanism with LogCabin (a key-value store based on Raft).
- Wrote a TLA+ specifications to ensure the correctness of the mechanism.
- **Utilized**: Synchronized clocks, TLA+, C++, Socket programming, Protocol buffers.

FLAIR: Accelerating Reads with Consistency-Aware Network Routing (NSDI)

- Designed a new consensus protocol to allow followers to safely serve read operations.
- Leveraged the programmable switches to perform consistent in-network request routing.
- Integrated the protocol with LogCabin (a key-value store based on Raft).
- Wrote a TLA+ specifications to ensure the safety of the protocol.
- **Utilized**: Programmable switches (P4), TLA+, C++, Socket programming, Protocol buffers.

NEAT: Impact of Network Partitioning Failures on Distributed Systems (OSDI)

- A thorough analysis of more than 120 network-partitioning failures in 25 distributed systems.
- Dissected the fault-tolerance module of these systems to identify the root cause of failures.
- Built NEAT, a network partitioning testing framework that leverages OpenFlow and iptables.
- **Utilized**: Java, Socket programming, SDN, OpenFlow, iptables, JIRA.

SERVICES & VOLUNTEERING

- Program committee member for the several journals and conferences: **IEEE Transactions on Parallel and Distributed Systems** (2023), **Journal of Systems Research** (2021, 2022), **International Conference on Software Defined Systems** (SDS'19 and SDS'20), and **International Conference on Information and Communication Systems** (ICICS'19, ICICS'20, and ICICS'21).
- Maintaining WASL website.
- Coordinating WASL weekly seminar.