

# Mugahed Izzeldin

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## PROFESSIONAL SUMMARY

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PhD Candidate in Computer Science conducting systems research in cloud computing, mobile core networks, and reproducible infrastructure. Author of peer-reviewed and under-review publications spanning 5G core performance, reproducible systems, mobile roaming, and trusted execution. Owner and maintainer of NixCore, an open-source reproducible mobile network core framework. Experienced designing and evaluating systems end-to-end: from implementation and experimentation through publication, documentation, and cross-layer debugging. Strong foundation in Linux, Nix/NixOS, Kubernetes, distributed systems, and production networking across 2G through 5G.

## SKILLS

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**Systems:** Linux, Nix/NixOS, distributed systems, Raft consensus, key-value stores, reproducible infrastructure

**Cloud & Infrastructure:** Docker, Kubernetes, Helm, Ansible, multi-tenant cloud operations

**Networking:** TCP/IP, BGP, OSPF, MPLS, QoS, IPsec, VPNs, L2/L3 switching and routing, 2G/3G/4G/5G packet core

**Programming:** C, Go, Python, JavaScript

**Databases:** PostgreSQL, MySQL, MongoDB

**Tools & Operations:** Git, CI/CD, monitoring, production troubleshooting, technical documentation

## EXPERIENCE

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### Graduate Research Assistant

Aug 2021 – Present

*School of Computing, University of Utah*

- Conduct systems research in the Flux Research Group under Prof. Robert Ricci, focused on cloud computing, mobile networks, reproducible infrastructure, and networked systems.
- Design and evaluate software infrastructure for mobile core research, including reproducible deployment workflows using Linux, Nix/NixOS, Kubernetes, and containerized network components.
- Own research software across design, implementation, experiment execution, debugging, documentation, and publication.
- Support CloudLab-related research and infrastructure activities in a large-scale experimental cloud environment used by distributed systems and networking researchers.
- Communicate research through technical writing, papers, experiments, and collaboration with academic and industry partners.

### 5G Core Network Research Engineer

May 2022 – Aug 2022

*Celona Inc.*

- Investigated commercial 5G core behavior in private-network deployments, contributing to performance evaluation and a peer-reviewed publication.
- Analyzed system behavior and deployment tradeoffs across mobile core, networking, and cloud deployment layers.
- Contributed to research and engineering work supporting Celona's private 5G network solutions.

### Core Network Engineer

Mar 2021 – Aug 2021

*Atlas Telecommunication*

- Managed LTE core, IP networking, and transmission operations for a private LTE network, with end-to-end responsibility across core, transport, and access-network interfaces.
- Diagnosed and resolved production issues across packet core, routing, and transmission layers, coordinating fixes across technical teams.

### Core & MPBN Back-Office Engineer

Oct 2017 – Mar 2021

*Huawei Technologies Sudan*

- Operated and supported mobile packet core and IP backbone systems for service-provider networks, including core nodes, routing infrastructure, firewalls, and customer-facing services.
- Configured, tested, launched, and debugged GPRS roaming and integrations between core network elements and 2G/3G/4G radio access networks.
- Generated and analyzed packet-core and IP backbone KPI reports to identify, troubleshoot, and resolve service-impacting issues.
- Implemented new network solutions, handled production emergencies, and expanded customer resources to improve capacity and service availability.
- Designed and developed internal tools for packet-core documentation, reporting, and analysis.

### Core Network Planning and Optimization Engineer

Feb 2017 – Oct 2017

*MTN Sudan*

- Designed, dimensioned, and documented packet-core and IP-core network changes for a mobile service-provider environment.
- Monitored service KPIs and coordinated optimization work to maintain network quality and reliability.

- Integrated new marketing services and data bundles into packet-core systems, documenting change requests and operational procedures.

## PROJECTS

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### **NixCore Framework [nixcore.org](https://nixcore.org)**

#### *Project Owner*

- Designed and maintain NixCore, a reproducible mobile network core framework for deploying, configuring, and evaluating 4G/5G core network components using Nix/NixOS, Kubernetes, and declarative infrastructure.
- Built the framework to support repeatable research environments, reduce deployment drift, and make mobile-core experimentation easier to reproduce and debug.
- Own project direction, implementation, documentation, and ongoing maintenance as an open-source research framework.
- Developed NixCore as the foundation for an ongoing research paper, "NixCore: Toward a Reproducible Mobile Network Core."

### **pomo Nix Package**

**[search.nixos.org/packages?channel=unstable&query=pomo#show=pomo](https://search.nixos.org/packages?channel=unstable&query=pomo#show=pomo)**

#### *Maintainer*

- Maintain the pomo package in Nixpkgs, contributing to open-source packaging, reproducible builds, version updates, and package quality for NixOS users.

### **Missing Semester Arabic Website [missing-semester-ar.github.io](https://missing-semester-ar.github.io)**

#### *Maintainer*

- Maintain the Arabic version of MIT's Missing Semester course website, supporting accessible technical education for Arabic-speaking students and engineers.

### **Raft-Based Key-Value Store**

- Implemented a distributed key-value store based on the Raft consensus algorithm, covering replicated state, leader-based coordination, and fault-tolerant system behavior.

### **Production Network Infrastructure Projects**

- Designed and implemented production network services including DNS, RADIUS authentication, internet filtering, IPv6 pilot design, and GRX design for ISP/mobile-core environments.
- Participated in MTN Sudan's IP core swap and CloudEdge integration, including hardware expansion and VNF scale-out for packet-core infrastructure.

## EDUCATION

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### **University of Utah**

*PhD in Computer Science.*

*Expected Jun 2027*

Relevant Coursework: Systems, Cloud Computing, Reproducible Infrastructure, Mobile Networks

### **Sudan University of Science and Technology**

*BSc. Hon Electronics Engineering (Honors).*

## SELECTED PUBLICATIONS

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- "RaaS: How to Fix Mobile Roaming" Mugahed Izzeldin, Ryan W. West, Mary Ogunmola, and Robert Ricci. Manuscript under review, 2026.
- "NixCore: Toward a Reproducible Mobile Network Core" Mugahed Izzeldin and Robert Ricci. Manuscript under review, 2026.
- "Confidential5G: Trusted Execution of the 5G Core on Untrusted Clouds" Mary Ogunmola, Mugahed Izzeldin, Robert Ricci. Manuscript under review, 2026.
- "Analysing the performance of commercial 5GC in private network deployment" Mugahed Izzeldin, Lyutianyang Zhang, Vanlin Sathya, Mohit Goyal, and Mehmet Yavuz. International Journal of Mobile Network Design and Innovation, 2024.
- "Approaches for SMS encryption and user accounts verification" M. I. O. Hajahmed, K. E. M. Osman, and O. T. M. Ali. ICCCEEE20 Conference, 2021.
- "Implementation of SDN in a Campus NAC Use Case" M. I. O. Hajahmed, M. Adil, M. Omar, M. Khalid. B.Sc. (Honors) degree project.

## PROFESSIONAL DEVELOPMENT & SERVICE

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- Conference attendance: ACM CCS 2024; KubeCon + CloudNativeCon North America 2024.
- Certifications: Huawei HCIA Routing and Switching, CCNP ROUTE, CCNA, IPv6 Workshop by AFRINIC.
- Coursework: SQL, Python, data analysis, and web development.
- Volunteer service: IEEE Sudan Subsection Media Coordinator, IEEEEXTreme proctor, IEEE SUST branch election organizer, technical seminar presenter.