Khaldoon Al-Zoubi, PhD

Associate Professor

Email(work): ktalzoubi@just.edu.jo

PROFILE

Before joining the faculty of Computer Information Technology at the Jordan University of Science and Technology (JUST) in 2016, I worked for more than 20 years as a Senior Software Engineer, Developer, Researcher, and Inventor in leading hi-tech companies in Canada and USA.

During my industry experience, I had full hands-on involvement in generating patents (for real-world products) and in architecting, designing, and developing wide range of software solutions that have been used by hundreds of millions of people around the world. This industry research & experience have covered different fields mainly in networking, 5G based Data centers, Software Defined Networks (SDN), large-scale Cloud Computing, embedded software, Real-Time Systems, Graphical User Interface (GUI), Device Drivers, Client/Server communication, QNX/Linux, Explosives/Narcotics detections, and air-traffic communication systems.

In addition, my academic research has been involved in Fog & Cloud Computing, Cloud-based Simulation as service provisioning, Security, Artificial Intelligence (AI), Mobile Computing, Networking protocols, Web-services, Simulation & Modelling, and parallel & Distributed Simulation. As a result, several simulation and modelling tools have been developed that are still in full use by researchers in the Advanced Real-Time Simulation Lab (*https://arslab.sce.carleton.ca/*).

Finally, I have received both Ph.D. (2011) in Electrical and Computer Engineering (minor in Networking), and M.C.S (2006) from Carleton University (Ottawa, Ontario, Canada). I also received BS (1995) in Electrical & Computer Engineering from the University of Louisiana at Lafayette (Lafayette, Louisiana, USA).

It is worth mentioning that I have earned my Ph.D. and Master degrees while working on a full time basis in the hi-tech industry.

Multiple patents and publications have been generated based on the above research & industry experience.

INVENTIONS (PATENTS)

Note that these patents are currently used in Huawei Technologies products that are related to the 5G large-scale Data Centers infrastructure and networking.

Title (Details can be found on https://patents.justia.com/inventor/khaldoon-al-zoubi)	USPTO (United States Patent and Trademark Office) Number	Date of Patent	Type
Network virtualization for network infrastructure	10341188	July 2, 2019	Grant
Firewall authentication of controller-generated internet control message protocol (ICMP) echo requests	10015162	July 3, 2018	Grant
Devices, systems, and methods for service chains	9584415	February 28, 2017	Grant
Devices, systems, and methods for debugging network connectivity	9547570	January 17, 2017	Grant

EDUCATION

Bachelor of Science in Electrical Engineering (Computer Eng. option), University of Louisiana at Lafayette (*formally University of southwestern Louisiana*) (Lafayette, Louisiana, USA), 1995

Master of Computer Science, Carleton University (Ottawa, Ontario, Canada), 2006
Thesis Title: *Hierarchical Scheduling in Grid Systems*

PhD in Electrical and Computer Engineering, Carleton University (Ottawa, Ontario, Canada), 2011.
Thesis Title: *Enhanced Distributed Simulation Interoperability and Algorithms Using Web Services*

TEACHING EXPERIENCE

Associate Professor
Faculty of Computer Information Technology (Software Engineering)
Jordan University of Science and Technology (JUST)
February 2016 – Present

Taught Courses (for multiple times): Software Architecture & Design, Software Security, Software Testing, Software Modelling, Object-oriented Programming, and Fundamentals of Software Engineering.

INDUSTRY EXPERIENCE

Senior Electrical Engineer & Researcher
Huawei Technologies
Ottawa, Ontario, Canada
June 2014 – January 2016

Projects: Researching and architecting next generation products related to the 5G based Data Centers (DC) and Clouds. These systems are specifically related to the 5G networking, Software Defined Networks (SDN), Software fabric abstraction, logical Networks, Virtualization methods, OpenStack, Openflow Virtual Switches (OVS) and Network Topology.

Responsibilities:

- Participated in generating a number of patents.
- Contributed with many researched ideas and software patches to the open-source opendaylight (*https://www.opendaylight.org/*) project on behalf of Huawei Technologies. OpenDaylight (ODL) is a modular open platform for customizing and automating networks of any size and scale.
- Architected and Designed Service Profile architectures and mapping them to Logical Networks.
- Architected and Designed Logical Networks and mapping them to Fabric abstractions.
- Architected and Designed User Models and RESTful APIs.
- Developing the core parts of above defined architectures and designs.
- Tutor other developers in R&D to carry out some parts of products development.

Technical Environment: Technical Leading, Software Design and Architecting, Open-source Software, Networking, OpenDaylight (ODL), Data Centers (DC), Cloud Computing, Java, RESTful Web-services, Linux, Unit/Integration testing, Databases (Cassandra), Eclipse IDE, XML, JSON, etc.

Senior Software Designer (Cloud)
BlackBerry
Ottawa, Ontario, Canada
2012 – April 2014

Project: Olympia (Large scale Cloud Computing system), which consists of a complex of servers that are responsible for managing 100s of millions of blackberry devices and users' activities such as publishing files/images on blackberry channels, storing and backing up files/images, image processing like resizing and cropping, and Web-based devices tracking.

Responsibilities:

- Architecting and developing various new servers and services to the Cloud.

- I was the prime developer of developing the servers that responsible for queuing, aggregating users transmitted images as they arrive into zip files so that they can be organized and pushed into Net-Storage. These servers also calculate the published files URLs, allowing them to be downloaded at a later time by different BlackBerry applications and devices around the world.
- I was the prime developer of implementing the image transformation process, which includes image resizing into different resolution, image cropping, banned image filtration, and returning their download URLs as XML documents to BlackBerry devices and apps.
- I was the prime developer of several features such as the implementations of converting the user servers to operate in herds, allowing 0 down time in situations like upgrading servers to new software releases.
- Performed unit testing within Eclipse environment to all of implementations and code changes.
- Performed integration testing usually using rackspace environment and java bean shell scripts.
- Provided full support to functional and performance testers and production operators mainly to the features that I implemented.
- Alongside my team, we were able to release a number of successful software releases.

Technical Environment: Cloud Computing, Java, Java bean shell, Agile organized environment, RESTful Web-services, Networking, Linux, Unit/Integration testing, Databases (Mysql & Cassandra), Eclipse IDE, XML, JSON, etc.

Senior Software Engineer/Architect

Scintrex Trace Corporation
Ottawa, Ontario, Canada
2006 – 2012

Projects: worked on a range of the state-of-art Real-time Desktop and Embedded systems used for Explosive and Narcotics detections and X-Ray imaging process. They are mainly used by military and police around the world in areas similar to airports and border crossings.

Responsibilities:

- Fully in charge of architecting, planning, designing, implementing, and testing the required software according to military and security agencies requirements.
- Worked independently to design and implement the E5000 new generation system according to different governments requirements. E5000 is a Dual Mode (Explosive and Narcotic) Trace Detector. Product overview can be found at http://www.scintrextrace.com/brochures/current/E5000.pdf
- Implemented the E5000 (more than 100,000 lines of C/C++ code) as 16 Linux processes. Those processes provide different functions such as AtoD hardware control, data acquisition from hardware, GUI and data analysis and detections.
- Implemented the GUI as a Linux process using Qt. This GUI provides full-fledged engineering analysis tools, which allows users to configure and control the system. It further provides users of 2D plots, enhancing user analysis of different situations.
- Implemented E5000 inter-processes communications on top of Linux IPC, allowing both asynchronies and synchronies communications.
- Provided independently a full support of the previous E5000 generation, which was based QNX. This support included developing new features and fix issues as they appear.
- Successfully delivered many software builds and releases successfully on time; able to migrate the system software design and implementations from the QNX platform and Photon GUI programming to the Linux platform and Qt GUI Programming.
- Worked closely with the hardware engineers, chemists and technicians.

Technical Environment: C, C++, Qt GUI Programming, Photon microGUI Programming, Device Driver Programming, TCP/IP, Client/server, embedded programming, real-time software development, ARM7, Linux, QNX 4.25, and worked with the entire software cycle and organizing many employees/customers training sessions.

Senior Software Engineer

Xwave solutions (worked at NAV Canada site)
Ottawa, Ontario, Canada
2003 – 2006

Project: SAATS (Shanwick Automated Air Traffic System) is a system that is responsible for managing all air traffic heading from Europe to North America over the Atlantic Ocean. This system is capable of handling 1000s of different flights concurrently.

Responsibilities:

- Developed the software Functional Specifications of the coordination messaging protocol with systems.
- Further designed and implemented the software of all of the Data communication links protocols, which achieve the air traffic coordination with other air-traffic systems and aircrafts.
- Implemented the client/server required messaging dialog protocol, which allows clients (i.e. air traffic operators) to communicate with the back-end servers.

Technical Environment: Worked with the entire software cycle from developing specification and requirements until product release, Computer communication protocols, real-time software development & testing, TCP/IP, C, C++, Pascal VMS, UNIX operating system, OpenVMS operating system, and XML.

Senior Software Engineer/Team Leader

SigPro Wireless
Ottawa, Ontario, Canada
2000 – 2003

Project: FLEXIUM™ System-on-Chip (SoC) with accompanying software is a universal air-interface engine that enables the next generation of wireless personal communication devices (PCDs) to communicate with high-speed wireless networks around the world.

Responsibilities:

- Fully in charge of the software team to develop & test the specifications according to standards, as well as perform the software design, testing and implementation of those specifications.
- Lead a team of eight developers to implement the CDMA2000 Upper Layer (Layer 3) messages including Layer 2 interface.
- Worked with the System team to define the physical layer interfaces with CDMA2000 Layer 2.

Technical Environment: Rational Rose Real Time, UML, C, C++, ARM9 Processor, TCP/IP, x-kernel, Tornado & VxWorks, ADS (ARM Development suite), and CDMA2000 standards.

Senior Software Engineer

Xwave solutions (worked at NAV Canada site)
Ottawa, Ontario, Canada
1998 – 2000

Project: GAATS (Gander Automated Air Traffic System) system, owned by NAV Canada, controls the air traffic heading from North America to Europe. This system is capable of handling 1000s of different flights concurrently.

Responsibilities:

- Fully designed and implemented the required software for all of client-server communication between the GAATS server and workstations.
- Was the prime integration developer (out of twelve developers) to ensure a new software gold candidate build has met customer (NAV Canada) acceptance. This usually requires debugging and fixing new problems, delivering and installing new build at customer (NAV Canada) site, and may require working with developers from other companies to figure out the system side that needs to fix a problem.

Examples of Skills Used: Client/Server programming, TCP/IP, C, C++, Pascal VMS, UNIX operating system, OpenVMS operating system, and worked with the entire software cycle.

Electrical & Software Engineer

Texas Instrument
Dallas, TX, USA
1996 – 1997

Project: V-series is a Texas Instrument (TI) system used for testing all types of TI-based VLSI chips.

Responsibilities:

- Designed and coded the system level diagnostic and calibration programs for the V-series Test System.

Technical Environment: C, Pascal, ITP (i.e., TI-based device programming language), and UNIX operating system.

PUBLICATIONS

Journal Papers:

- “A grid-shaped cellular modeling approach for wireless sensor networks”. K. Al-Zoubi, G. Wainer. *SIMULATION*. SAGE. 2022. DOI: doi.org/10.1177/00375497221093379
- “Mobile experimentation using modelling and simulation in the Fog/Cloud”. K. Al-Zoubi, G. Wainer. *Journal of Simulation*. Taylor & Francis. 2021. DOI: doi.org/10.1080/17477778.2021.1964393
- “Fog and cloud collaboration to perform virtual simulation experiments”. K. Al-Zoubi, G. Wainer. *Simulation Modelling Practice and Theory*, Elsevier. Vol. 101. 2020. DOI: doi.org/10.1016/j.simpat.2019.102032
- “Quasi Real-Time Intermodulation Interference Method: Analysis and Performance”. M. Malkawi, K. Al-Zoubi, and A. Shatnawi. *International Journal of Communication Networks and Information Security (IJCNIS)*. Vol. 13. 2021. Access Link: ijcnis.org/index.php/ijcnis/article/view/4924
- “Improving Network Entry Procedure in Broadband WiFi Networks". M. Malkawi, A. Shatnawi, K. Al-Zoubi, and L. Alawneh. *International Journal on Communications Antenna and Propagation (IRECAP)*. Praise Worthy Prize. Vol 11, No 5. 2021. DOI: doi.org/10.15866/irecap.v11i5.20996
- “Distributed Simulation of DEVS and Cell-DEVS Models Using the RISE Middleware”. K. Al-Zoubi, G. Wainer. Simulation Modelling Practice and Theory, Elsevier. Vol. 55. 2015, Pages 27–45. DOI: doi.org/10.1016/j.simpat.2015.03.010
- “RISE: A general simulation interoperability middleware container”. K. Al-Zoubi, G. Wainer. Journal of Parallel and Distributed Computing, Elsevier. Vol. 73. Issue 5. 2013. Pages 580–594. DOI: doi.org/10.1016/j.jpdc.2013.01.014
- "Distributed simulation of DEVS and Cell-DEVS models in CD++ using Web-Services". G. Wainer, R. Madhoun, K. Al-Zoubi. Simulation Modelling Practice and Theory, Elsevier, Maryland Heights, MO, USA. Volume 16, Number 9, Pages: 1266—1292. 2008. DOI: doi.org/10.1016/j.simpat.2008.06.012
- “Hierarchical Scheduling in Heterogeneous Grid Systems”. K. Al-Zoubi. International Journal of Information Technology and Web Engineering, IGI Global, Hershey, PA, USA. Volume 2, Number 1, Pages: 1-16 pages. 2007. DOI: doi.org/10.4018/jitwe.2007010101

Conference Papers:

- "Modelling Fog & Cloud Collaboration Methods on Large Scale" K. Al-Zoubi, G. Wainer. Proceedings of the IEEE Winter Simulation Conference (WSC). 2020. DOI: doi.org/10.1109/WSC48552.2020.9384058
- "Simulation in the Cloud Using Handheld Devices," E. Mancini, G. Wainer, K. Al-Zoubi and O. Dalle, Proceedings of 12th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (ccgrid 2012), 2012, pp. 867-872, DOI: doi.org/10.1109/CCGrid.2012.65
- “Managing Simulation Workflow Patterns using Dynamic Service-Oriented”. K. Al-Zoubi, G. Wainer. Proceedings of the Winter Simulation Conference (WSC 2010). Baltimore, Maryland, USA. 2010.
- “RISE: REST-ing Heterogeneous Simulation Interoperability”. K. Al-Zoubi, G. Wainer. Proceedings of the Winter Simulation Conference (WSC 2010). Baltimore, Maryland, USA. 2010.
- “Performing Distributed Simulation with RESTful Web-Services Approach”. K. Al-Zoubi, G. Wainer. Proceedings of the Winter Simulation Conference (WSC 2009). Austin, TX – 2009.
- “Using REST Web-Services Architecture for Distributed Simulation”. K. Al-Zoubi, G. Wainer. Proceedings of the 23rd of the IEEE Principles of Advanced and Distributed Simulation (PADS 2009), pp. 114-121. Lake Placid, NY – 2009.
- "Interfacing and Coordination for a DEVS Simulation Protocol Standard". K. Al-Zoubi, G. Wainer. Proceedings of the 12th IEEE/ACM International Symposium on Distributed Simulation and Real-Time Applications (DS-RT 2008), pp. 300-307. Vancouver, BC – 2008.
- "Hierarchal scheduling in Grid Systems". K. Al-Zoubi, S. Dandamudi. Proceedings of the 4th International Multiconference on Computer Science and Information Technology, CSIT 2006, Volume 1, pp. 289 – 299. Amman, Jordan.

Book Chapters:

- “Distributed Simulation Using RESTful Interoperability Simulation Environment (RISE) Middleware”. K. Al-Zoubi, G. Wainer. Chapter 6 in “Handbook on Intelligence-based Systems Engineering”. Andreas Tolk and Lakhmi Jain Editors. Springer-Verlag, 2011.
- "An Introduction to Distributed Simulation". K. Al-Zoubi, G. Wainer. Chapter 11, Modeling and Simulation Fundamentals: Theoretical Underpinnings and Practical Domains. Catherine Banks, John Sokolowski, Editors. Wiley. New Jersey, USA, 2010.

- “DEVS Standardization: Foundations and Trends”. G. Wainer, K. Al-Zoubi, et al. Chapter 15, “Discrete-Event Modeling and Simulation: Theory and Applications.” G. Wainer, P. Mosterman (Editors). CRC Press. Taylor and Francis. December 2010.
- “An Introduction to DEVS Standardization”. G. Wainer, K. Al-Zoubi, et al. Chapter 16, “Discrete-Event Modeling and Simulation: Theory and Applications.” G. Wainer, P. Mosterman (Editors). CRC Press. Taylor and Francis. December 2010.
- “Standardizing DEVS Model Representation”. G. Wainer, K. Al-Zoubi, et al. Chapter 17, “Discrete-Event Modeling and Simulation: Theory and Applications.” G. Wainer, P. Mosterman (Editors). CRC Press. Taylor and Francis. December 2010.
- “Standardizing DEVS Simulation Middleware”. G. Wainer, K. Al-Zoubi, et al. Chapter 18, “Discrete-Event Modeling and Simulation: Theory and Applications.” G. Wainer, P. Mosterman (Editors). CRC Press. Taylor and Francis. December 2010.
- “Hierarchical Scheduling in Heterogeneous Grid Systems”. K. Al-Zoubi. Chapter X, Integrated Approaches in Information Technology and Web Engineering: Advancing Organizational Knowledge Sharing. Ghazi Alkhatib, David Rine, Editors. IGI Global, Hershey, PA, USA, 2009.