

MOUSTAFA ABDELBAKY

TECHNICAL LEAD/MANAGER, NASA AMES RESEARCH CENTER

CONTACT

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CURRENT POSITION

Technical Lead/Manager at NASA Ames Research Center. 13+ years of experience in distributed systems and high performance computing

EDUCATION

Postdoctoral Scholar, Computer Science
University of California, Berkeley
Advisor: David E. Culler
2017-2020

PhD, Electrical & Computer Engineering
Rutgers University
Dissertation: Programming and Managing Distributed Software-Defined Environments
Advisor: Manish Parashar
2012-2017

MS, Electrical & Computer Engineering
Rutgers University
Thesis: A Framework for Enabling High-end High Performance Computing Resources as a Service
2009-2012

BS, Electrical & Computer Engineering
Rutgers University
2004-2008

BS, Computer Science
Rutgers University
2004-2008

SUMMARY

- My current research is focused on creating a decentralized digital marketplace to support Unmanned Aerial Vehicle
- I am also developing a serverless framework to support the execution of real-time applications using hybrid multi-cloud-edge infrastructure
- I obtained my PhD from Rutgers University, where I was a three-time recipient of the IBM PhD Fellowship and the recipient of the Rutgers ECE Academic Achievement Award
- My dissertation focused on the dynamic on-demand aggregation of distributed infrastructure services to run distributed applications in hybrid multi-cloud environments
- I did my postdoc at the RISELab at UC Berkeley, where I worked on serverless computing, edge computing, and machine learning for smart buildings & IoT

SELECT PUBLICATIONS

Cloudless Computing: Serverless Across Hybrid Multi-Cloud-Edge Infrastructure

In prep for submission

Abdelbaky, M., Fierro, G.T., Sreekanti, V., Kolb, J., Gonzalez, J.E., Hellerstein, J.M., and Culler D.E.

Edge Computing for Aviation Autonomy

2021 KBR Technical Journal

Abdelbaky, M., Chen, J., Ishihara, A.K., Joe-Wong, C., and Shetye, S.D.

DRF: A Software Architecture for a Data Marketplace to Support Advanced Air Mobility

2021 American Institute of Aeronautics and Astronautics (AIAA) AVIATION

Abdelbaky, M., Chen, J., Fedin, A., Freeman, K., Gurrum, M., Ishihara, A.K., Joe-Wong, C., Knight, C., Krishnakumar, K.S., Reyes, I., Robinson, C., Shannon, P., Shetye, S.D., Tomljenovic, L., and Van Dalsem, W.R.

Core Concepts, Challenges, and Future Directions in Blockchain: A Centralized Tutorial

ACM Computing Surveys (ACM CSUR 2020)

Kolb, J., Abdelbaky, M., Katz, R.H., and Culler, D.E.

WAVE: A Decentralized Authorization Framework with Transitive Delegation

The 28TH USENIX Security Symposium (USENIX Security 2019)

Andersen, M.P., Kumar, S., Abdelbaky, M., Fierro, G.T., Kolb, J., Kim, H.S., Culler, D.E., and Popa, R.A.

Enabling Distributed Software-Defined Environments Using Dynamic Infrastructure Service Composition

The 17TH IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid 2017)

Abdelbaky, M., Diaz-Montes, J., Unuvar, M., Romanus, M., Steinder, M., Rodero, I. and Parashar, M.

Enabling High-performance Computing as a Service

IEEE Computer 2012

Abdelbaky, M., Parashar, M., Kim, H., Jordan, K.E., Sachdeva, V., Sexton, J., Jamjoom, H., Shae, Z.Y., Pencheva, G., Tavakoli, R. and Wheeler, M.F.

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PATENTS

Periodic Evaluation & Telerehabilitation Systems & Methods

U.S. Patent 8,758,020
Burdea, G., AbdelBaky, M., Rabin, B.
2014

Idle Datacenter Resource Donation

Provisional Patent Filed
Full Patent Pending

AWARDS & HONORS

Outstanding Achievement Award

KBR
2021

Dissertation nominated for ACM Doctoral Dissertation Award

2017

PhD Forum Award

IEEE IPDPS
2017

Academic Achievement Award

Electrical & Computer Engineering
Rutgers University
2017

Cloud Challenge Award

ACM UCC
2015

IBM PhD Fellowship Award

2014
2013
2012

Scale Challenge Award

ACM/IEEE CCGrid
2011

EXPERIENCE

Technical Lead/Manager

NASA Ames Research Center

- Technical Advisor & Technical Lead/Manager Jan. 2022 – Present
- Principal Software Engineer & Architect Apr. 2021 – Jan. 2022
- Senior Computer Scientist Aug. 2020 – Apr. 2021
- Leading the architecture design and project management for DRF – a digital marketplace to support aviation autonomy
- Lead an internal group at NASA to identify state of the art, research gaps, and directions relevant to DRF in edge computing, decentralized identity, and blockchains

Postdoctoral Researcher

RISELab, EECS, University of California, Berkeley

Aug. 2017 – July 2020

- Researched serverless computing across hybrid cloud-edge infrastructure
- Investigated using reinforcement learning for HVAC control
- Technical lead for the XBOS-DR project, which aimed to control smart buildings to react to demand response events in the electrical grid

Cloud Engineer Consultant

PingThings, Inc.

Sep. 2019 – July 2020

- Developed benchmarks for AWS cloud storage and an icli for a timeseries database

Affiliate Postdoctoral Fellow

Lawrence Berkeley National Lab

May 2019 – Mar. 2020

- Lead the development of a communication platform for the ENERGISE project

Research Intern

IBM T.J. Watson Research Center

Summers 2010 – 2015

Cloud Computing, Systems and Technology Group (2015)

- Developed a novel method for deploying Docker containers across multiple clouds and data-centers. The resulting framework received an international award and was featured in multiple media outlets

Deep Computing, Systems and Technology Group (2010 – 2014)

- Researched providing scientific software as a service
- Investigated providing supercomputers as a service. The resulting framework received an international award and was featured in multiple media outlets

Research Assistant

Rutgers University

Aug. 2007 – July 2017

Rutgers Discovery Informatics Institute (August 2009 – July 2017)

- Researched autonomic computing, software-defined environments, and federated computing for science and engineering applications
- Investigated the use of cloud computing to enable high performance computing as a service

Center for Advanced Information Processing (August 2007 – August 2008)

- Researched using the PlayStation 3 and cell phones for physical rehabilitation
- Investigated Nano-Technology (Single Electron Transistors)

Software Developer

Princeton Plasma Physics Laboratory, Princeton University

Jan. 2009 – Oct. 2009

- Contributed to the development of ELVis, a scientific graphics software

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SKILLS

Programming Languages & Frameworks

Java, Go, C/C++, Objective C, Python, JavaScript, Perl, PHP, Fortran, Shell scripting, Verilog, VHDL, MPI, OpenMP, RDMA, XHTML, CSS, MySQL, NoSQL, Android and iOS programming, Tensorflow, MATLAB

Clouds & Platforms

Amazon AWS, Google Compute Engine, Microsoft Azure, IBM Bluemix, Docker, Kubernetes, HPC clusters, XSEDE, FutureGrid, OpenStack, IBM Blue Gene, Open Science Grid

Network Protocols

TCP/IP, DHCP, DNS, SNMP, SMTP

REFERENCES

David E. Culler (Postdoc Advisor)

Professor Emeritus of Computer Science
University of California, Berkeley

Manish Parashar (PhD Advisor)

Director Computational Science and Engineering
Professor at the School of Computing
The University of Utah

Randy H. Katz

Distinguished Professor of Computer Science
Vice Chancellor for Research
University of California, Berkeley

Ion Stoica

Professor of Computer Science
Director, RISELab
University of California, Berkeley

Joseph Gonzalez

Associate Professor of Computer Science
Co-Director, RISELab
University of California, Berkeley

Joseph M. Hellerstein

Professor of Computer Science
Co-Director, RISELab
University of California, Berkeley

Deborah Silver

Professor of Electrical and Computer Engineering
Rutgers, The State University of New Jersey

Malgorzata Steinder

IBM Fellow
Container Cloud Platform Research
IBM Thomas J. Watson Research Center

CONTRIBUTIONS TO SOFTWARE PROJECTS & SCIENTIFIC APPLICATIONS

- DRF: a decentralized digital marketplace for aviation autonomy
- XBOS: an open-source large-scale distributed operating system for smart buildings
- WAVE: a decentralized authentication verification engine
- C-Ports: a framework for deploying Docker containers across multiple clouds and data-centers
- CometCloud: an autonomic framework for enabling real-world applications on dynamically federated, hybrid infrastructure integrating (public & private) clouds, data-centers and grids
- Discover: a framework that enables geographically distributed scientists to collaboratively monitor and control high performance applications using web-based portals
- iCode: a framework that integrates CometCloud & Discover and leverages Deep Cloud to enable on-demand deployment and elastic abstractions on top of supercomputers
- ELVis: a scientific graphics application for visualization and monitoring
- Medical image registration and histopathology image analysis with Rutgers Cancer Institute
- Kepler scientific workflow and the rapid analysis of multiple metagenomes with a clustering and annotation pipeline (RAMMCAP) application with San Diego Supercomputer Center
- Asynchronous replica exchange using IMPACT and AMBER with Rutgers CBMB
- Implicit parallel accurate reservoir simulator (IPARS) using an Ensemble Kalman Filter (EnKF) with University of Texas at Austin
- Uncertainty-aware resource provisioning in mobile computing grids for real-time in-situ data processing
- MATLAB-BGP a framework to offload complex computation to the IBM Blue Gene/P supercomputer from a MATLAB front-end running on a personal computer
- Real-time value at risk (VaR) simulation mobile application with Bloomberg