HANI TALAL JAMJOOM, Ph.D.

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EDUCATION

2004 **UNIVERSITY OF MICHIGAN**, Ann Arbor MI
Computer Science and Engineering, Ph.D.
Thesis: "Network-Oriented Controls of Internet Services" (Advisor: Prof. Kang G. Shin)

1997 **CORNELL UNIVERSITY**, Ithaca NY
Electrical Engineering, M.Eng.

1995 **ROSE-HULMAN INSTITUTE OF TECHNOLOGY**, Terre Haute IN
Computer Engineering, B.S.

WORK EXPERIENCE

2018 – **IBM T.J. WATSON RESEARCH CENTER,** Yorktown Heights NY
Manager / Principal Research Staff Member / Member of IBM Academy of Technology

Leading the Cloud and System Security research group. Our research focuses on two broad themes: trusted execution environments and integrity management. Our projects are closely aligned with IBM's Cloud, Power, and System Z. We are also actively working with many open source communities. Projects in my group include the Integrity Measurement Architecture in the Linux Kernel, Protection Execution Facility in Power, Encrypted Containers (working with Docker), as well as a number of projects on leveraging trusted execution environments for deep learning workloads.

2015 – 2018 **IBM T.J. WATSON RESEARCH CENTER**, Yorktown Heights NY
Tech Lead / Research Staff Member / Member of IBM Academy of Technology

Led the research and development of a Software Defined Data Governance (SDDG) platform. SDDG initially targeted the Connected Health domain, primarily on the intersection of Internet of Things (IoT) and healthcare. Later, SDDG expanded in scope and became an integral component of the 2018 IBM Global Technology Outlook on data governance, in which I was a co-lead. Then, I led a large effort to productize the key concepts into the governance layer of IBM Watson Data Platform, which GA-ed March 2018.

2007 – 2015 **IBM T.J. WATSON RESEARCH CENTER,** Yorktown Heights NY
Manager / Research Staff Member

Managed the Next Generation Platforms group. Our research focused on network function virtualization and software defined networks (SDN), and their application in enabling microservice applications and DevOps in hybrid clouds. The work was foundational for creating amalgam8.io (Layer-7 SDN framework), Superclouds (Layering clouds on top of clouds), and Deep Cloud (HPC as a Service). It also had direct impact on a number of cloud optimization initiatives across IBM's business units. Consequently, it was awarded an "Outstanding Research Accomplishment" for demonstrating greater than combined $100M revenue/savings impact.

2004 - 2007 **IBM T.J. WATSON RESEARCH CENTER**, Hawthorne NY
Research Staff Member

Principle Investigator for a number of research projects, including i3 and Cyano. i3 is an analytics framework for managing disparate infrastructure components. i3 is used to monitor over 400,000 devices. We developed an inference algorithm that uses historical failure patterns for discovering hidden topologies, even in the presence of noisy and incomplete data. Cyano is a social networking-based IT process optimization. It is built on top of a scalable vector-based semantic engine and an adaptive recommendation system. With a user base of over 12,000 active IT practitioners, Cyano captured and optimized over 550 of IBM IT Best Practices. Both projects were awarded Research Accomplishments for demonstrating over $5M in cost savings.

AWARDS

ALL IBM AWARDS WERE GIVEN FOR DEMONSTRATING GREATER THAN $10M REVENUE IMPACT OR $5M COST SAVINGS

2016 **OUTSTANDING TECHNICAL ACHIEVEMENT AWARD**, IBM
Principle Investigator, Superclouds

2013 **OUTSTANDING TECHNICAL ACHIEVEMENT AWARD**, IBM
Technical Lead, Analytics for Logical Dependency Mapping

2012 **OUTSTANDING TECHNICAL ACHIEVEMENT AWARD**, IBM
Principle Investigator and Development Lead, IBM Center for Deep Computing Research

2011 FIRST PLACE, **IEEE SCALE CHALLENGE**
Contributor, "A Scalable Ensemble-based Oil-Reservoir Simulations using Blue Gene/P-as-a-Service"

2007 **OUTSTANDING INNOVATION AWARD**, IBM
Principle Investigator and Development Lead, Cyano

2006 **OUTSTANDING TECHNICAL ACHIEVEMENT AWARD**, IBM
Principle Investigator and Development Lead, Integrated Infrastructure Intelligence (i3)

PROFESSIONAL ACTIVITIES

TPC Member	**CoNEXT** 2018**, ICDCS** 2018, **IEEE INFOCOM** 2017, **IEEE IC2E 2017, HotMiddlebox** 2016, **Usenix Annual Technical Confernece** 2016, **IEEE INFOCOM** 2016, **HotMiddlebox** 2015, **IEEE INFOCOM** 2015, **IEEE INFOCOM** 2014, **ACM SOCC** 2013, **GENI Solicitation 4** 2013, **IWQoS** 2013, **IEEE INFOCOM** 2013, **CNSM** 2012, **IEEE INFOCOM** 2012, **IEEE INFOCOM** 2011, **IEEE INFOCOM** 2010, **MobiCASE** 2010, **IEEE INFOCOM** 2009, **MobiCASE** 2009, **BroadNets** 2009, **IEEE INFOCOM** 2008, **IEEE E2EMON** 2008
Thesis Committee	Murad Kaplan, **University of Colorado** (Expected 2017); Xiaoen Ju, **The University of Michigan** (Graduated 2016); Daniel Williams, **Cornell University** (Graduated 2012); Yun Mao, **The University of Pennsylvania** (Graduated 2008)

SELECTED PUBLICATIONS & PATENTS

Ety Khaitzin, Julian Stephen, Maya Anderson, Hani Jamjoom, Ronen Kat, Arjun Natarajan, Roger Raphael, Roee Shlomo and Tomer Solomon, "*Deep Enforcement: Policy-based Data Transformations for Data in the Cloud,*" In the proceedings of **USENIX Workshop on Hot Topics in Cloud Computing (HotCloud)**, Renton, WA, July 2019

Zhongshu Gu, Hani Jamjoom, Dong Su, H. Huang, Jialong Zhang, Tengfei Ma, Dimitrios Pendarakis and Ian Molloy, "*Reaching Data Confidentiality and Model Accountability on the CalTrain*," In the proceeding of **IEEE DSN**, Portland, OR, June 2019.

Xiaoen Ju, Hani Jamjoom and Kang Shin, "*Hieroglyph: Locally-Sufficient Graph Processing via Compute-Sync-Merge*," In the proceedings of **ACM SIGMETRICS**, Urbana-Champaign, IL, June 2017.

Xiaoen Ju, Dan Williams, Hani Jamjoom and Kang Shin, "*Version Traveler: Fast and Memory-Efficient Version Switching in Graph Processing Systems*," In the proceedings of **USENIX Annual Technical Conference**, Denver, CO, June 2016.

Murad Kablan, Eric Keller and Hani Jamjoom, "*QoX: Quality of Service and Consumption in the Cloud*," In the proceedings of **USENIX HotCloud**, Denver, CO, June 2016.

Victor Heorhiadi, Shriram Rajagopalan, Hani Jamjoom, Michael K. Reiter and Vyas Sekar, "*Gremlin: Systematic Resilience Testing of Microservices,*" In the proceedings of **IEEE Conference on Distributed Computing Systems (ICDCS)**, Japan, June 2016.

Chris X. Cai, Franck Le, Xin Sun, Geoffrey G. Xie, Hani Jamjoom and Roy H. Campbell, "*CRONets: Cloud-Routed Overlay Networks,*" In the proceedings of **IEEE Conference on Distributed Computing Systems (ICDCS)**, Japan, June 2016.

Dan Williams, Yaohui Hu, Umesh Deshpande, Piush K Sinha, Nilton Bila, Kartik Gopalan and Hani Jamjoom, "*Enabling Efficient Hypervisor-as-a-Service Clouds with Ephemeral Virtualization,*" In the proceedings of **ACM VEE**, Atlanta, GA, April 2016.

Murad Kablan, Blake Caldwell, Richard Han, Hani Jamjoom and Eric Keller, "*Stateless Network Functions,*" In the **ACM SIGCOMM Workshop on Hot Topics in Middleboxes and Network Function Virtualization**, London, UK, August 2015.

Shriram Rajagopalan and Hani Jamjoom, "*App–Bisect: Autonomous Healing for Microservice-Based Apps*," In the proceedings of **USENIX Workshop on Hot Topics in Cloud Computing (HotCloud)**, Santa Clara, CA, June 2015.

Alex Van't Hof, Hani Jamjoom, Jason Neih, and Dan Williams, "*Flux: Multi-surface Computing in Android,*" In the proceedings of **ACM EuroSys**, Bordeaux, France, April 2015.

Hani Jamjoom, Dan Williams, and Upendra Sharma, "*Don't Call Them Middleboxes, Call Them Middlepipes,*" In the **ACM SIGCOMM Workshop on Hot Topics in Software Defined Networking** (**HotSDN**), Chicago, IL, August 2014.

Dan Williams, Hani Jamjoom, and Hakim Weatherspoon, "*Software Defining System Devices with the 'Banana' Double-Split Driver Model*," In the proceedings of **USENIX HotCloud**, Philadelphia, PA, June 2014.

Dan Williams, Shuai Zheng, Xiangliang Zhang, and Hani Jamjoom, "*TideWatch: Fingerprinting the Cyclicality of Big Data Workloads,*" In the proceedings of **IEEE INFOCOM**, Toronto, Canada, April 2014.

Shriram Rajagopalan, Dan Williams, and Hani Jamjoom, "*Pico Replication: A High Availability Framework for Middleboxes,*" In the **ACM Symposium on Cloud Computing (SoCC),** Santa Clara, California, Oct 2013.

Dan Williams and Hani Jamjoom, "*Cementing High Availability in OpenFlow with RuleBricks,*" In the **ACM SIGCOMM Workshop on Hot Topics in Software Defined Networking** (**HotSDN**), Hong Kong, China, August 2013.

Shriram Rajagopalan, Dan Williams, Hani Jamjoom, Andy Warfield, "*Escape Capsule: Explicit State is Robust and Scalable*," In the proceedings of **USENIX HotOS XIV**, Santa Ana Pueblo, New Mexico, May 2013.

Shriram Rajagopalan, Dan Williams, Hani Jamjoom, Andy Warfield, "*Split/Merge: System Support for Elastic Execution in Virtual Middleboxes*," In the proceedings of **USENIX NSDI**, Lombard, Illinois, April 2013.

Zuhair Khayyat, Karim Awara, Amani Alonazi, Hani Jamjoom, Dan Williams, Panos Kalnis, "*Mizan: A System for Dynamic Load Balancing in Large-scale Graph Processing,*" In the proceedings of **ACM EuroSys**, Prague, Czech Republic, April 2013.

Dan Williams, Hani Jamjoom, and Hakim Weatherspoon, "*Plug into the Supercloud*," In **IEEE Internet Computing Special Issue on Virtualization**, Mar/Apr 2013.

Dan Williams, Hani Jamjoom, and Hakim Weatherspoon. "*The Xen-Blanket: Virtualize Once, Run Everywhere*," In the proceedings of **ACM EuroSys**, Bern, Switzerland, April 2012.

Dan Williams, Hani Jamjoom, Yew-Huey Liu, and Hakim Weatherspoon, "*Overdriver: Handling Memory Overload in an Oversubscribed Cloud*," In the proceedings of **ACM Virtual Execution Environments**, Newport Beach, CA, March 2011.

Vivek Shrivastava, Petros Zerfos, Kang-won Lee, Hani Jamjoom, Yew-Huey Liu, Suman Banerjee, "*Application-aware Virtual Machine Migration in Data Centers*," In the proceedings of **IEEE INFOCOM Mini Conference**, Shanghai, China, 2011.

Hanghang Tong, Huiming Qu, Hani Jamjoom, Christos Faloutsos, "*iPoG: Fast Interactive Proximity Querying on Graphs*," In the proceedings of the **ACM Conference on Information and Knowledge Management (CIKM)**, Hong Kong, China, Nov 2009

Hanghang Tong, Huiming Qu, and Hani Jamjoom, "*Measuring Proximity on Graphs with Side Information*," In the proceedings of **IEEE International Conference on Data Mining (ICDM),** Pisa, Italy, December 2008.

Yun Mao, Hani Jamjoom, Shu Tao, and Jonathan Smith, "*NetworkMD: Topology Inference and Failure Diagnosis in the Last Mile*," In the proceedings of **Internet Measurement Conference (IMC),** San Diego, CA, October 2007.

Hani Jamjoom and Kang G. Shin, "*On the Role and Controllability of Persistent Clients in Traffic Aggregates*," In the proceedings of **IEEE/ACM Transactions on Networking**, Vol. 14, No. 2, April 2006.

Hani Jamjoom, Padmanbhan Pillai, and Kang G. Shin, "*Re-synchronization and Controllability of Bursty Service Requests*," In the proceedings of **IEEE/ACM Transactions on Networking**, Vol. 12, No. 4, August 2004.

Hani Jamjoom and Kang G. Shin, "*Persistent Dropping: An Efficient Control of Traffic Aggregates*," In the proceedings of **ACM SIGCOMM**, Karlsruhe, Germany, August 2003.

_____patents *(patent inventors are listed in alphabetical order)*

Hani T. Jamjoom, Mark E. Podlaseck, Huiming Qu, Yaoping Ruan, Denis R. Saure, Zon-Yin Shae and Anshul Sheopuri, "*High performance computing as a service*," US 10,089,147B2 (**Issued** Oct 2018)

Hani T. Jamjoom, Yew-Huey Liu and Daniel J. Williams, "*Dynamic extensibility of application programming interfaces*," US 10,073,694B2 (**Issued** Sep 2018)

Xiao Cai, Hani T. Jamjoom, Thai Franck Le and Daniel J. Williams, "*Multipathing using flow tunneling through bound overlay virtual machines*," US 9,942,131B2 (**Issued** April 2018)

Viktor Heorhiadi, Hani T. Jamjoom and Shriram Rajagopalan, "*Failure recovery testing framework for microservice-based applications*," US 9,842,045 B2 (**Issued** Dec 2017)

Hani T. Jamjoom, Dinesh Kumar and Zon-Yin Shae, "*Scheduling homogeneous and heterogeneous workloads with runtime elasticity in a parallel processing environment*," US 9,645,848B2 (**Issued** May 2017)

Kamal K. Bhattacharya, Hua Chen Feng, Yun-Wu Huang, Ying Huang, Hani Jamjoom, Pu Jin, Fan Jing Meng, Michael Montinarelli, Mark E. Podlaseck, Zon-yin Shae and Daniel J. Williams, "*Coordinating application migration processes*," US 9,602,599 (**Issued** March 2017)

Gennaro A. Cuomo, Hani T. Jamjoom, Jim A. Laredo, Arjun Natarajan, Shriram Rajagopalan, Daniel J. Williams and John E. Wittern, "*Supporting software application developers to iteratively refine requirements for web application programming interfaces*," US 9,588,739 (**Issued** March 2017)

Katherine Barabash, Yaniv Ben-Itzhak, Hani Jamjoom, Anna Levin, Eran Raichstein and Shriram Rajagopalan, "*Service delivery controller for learning network security services,*" US 9,578,050 (**Issued** Feb 2017)

Hani Jamjoom and Daniel J. Williams, "*Method and apparatus to replicate stateful virtual machines between clouds,*" US 9,256,463 (**Issued** Feb 9, 2016).

Kun Bai, David L. Cohn, Hani T. Jamjoom and Liangzhao Zeng, "*Metadata-driven version management service in pervasive environment,*" US 9,244,960 (**Issued** Jan 26, 2016).

Hani Jamjoom, Shriram Rajagopalan and Dan Williams, "*Fault Tolerance Solution for Stateful Applications,*" US 9,110,864 (**Issued** Aug 18, 2015).

Monther Abdullah Al-Dawsari, Hani Jamjoom, Mark E. Podlaseck, Huiming Qu, Yaoping Ruan, Denis R. Saure, Zon-Yin Shae, and Anshul Sheopuri, "*Dynamic pricing of a resource,*" 8,458,011 (**Issued** Jun 4, 2013).

Hani Jamjoom, Kang-won Lee, Vivek Shrivastava, and Petros Zerfos, "*A Method for Network-aware Virtual Machine Migration in Datacenters,*" US20120011254 (**Issued** Apr 14, 2013).

Hani Jamjoom, Sambit Sahu, Debanjan Saha, "*Method & System for Micro-locking Web Content,*" US20110296177 (**Issued** April 30, 2013).

Hani Jamjoom, Huiming Qu, and Hanghang Tong, "*Efficient Calculation of Node Proximity on Graphs with Side Information,*" US8346766 (**Issued** Jan 1, 2013).

Nikolaos Anerousis, Hani Jamjoom, Debanjan Saha, Shu Tao, and Jin Zhou, "*System and Method for Monitoring Large-scale Distribution Networks by Data Sampling,*" China ZL200810002695.1 (**Issued** May 23, 2012).

Nikolaos Anerousis, Hani Jamjoom, Debanjan Saha, Ramendra Sahoo, and Zon-Yin Shae, "*System and Method for Constructing Flexible Ordering to Improve Productivity and Efficiency in Process Flows,*" US8036865 (**Issued** Oct 11, 2011).

Nikolaos Anerousis, Hani Jamjoom, Yun Mao, and Shu Tao, "*Method and Apparatus for Component Association Inference, Failure Diagnosis and Misconfiguration Detection Based on Historical Failure Data,*" US7937347 (**Issued** May 3, 2011).

Hani Jamjoom, Raymond Jennings, Parviz Kermani, and Debanjan Saha, "*Apparatus & Method for Identifying Process Elements Using Request-Response Pairs, a Process Graph and Noise Reduction in the Graph,*" US7761398 (**Issued** Jul 20, 2010).