John Paul Rula

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Research Interests

Mobile Networking; Distributed Systems, Content Delivery Networks, Human factors in mobile systems.

Education

- **Ph.D. Candidate** (expected graduation Spring 2016)
  Northwestern University, Evanston, Illinois
- **B.S., Mechanical Engineering** (June 2009)
  Northwestern University, Evanston, Illinois

Professional Experience

- **Senior Software Engineer** Akamai; Cambridge, Massachusetts September 2016 to present
  - Leading the mapping effort for cellular networks within the Mapping division. Various other projects related to improving delivery performance over cellular networks.
- **Intern.** Akamai; Cambridge, Massachusetts June 2015 to September 2015
  - Developed systems for cooperatively exploring cellular network topology and policies, from both external vantage points and instrumented mobile clients. Currently working with Akamai to develop summer research for locating clients in cellular networks into a production system for dedicated cellular mapping (expected deployment Q2 2016).
- **Graduate Research Assistant**. AquaLab Group, EECS Dept., Northwestern September 2010 to October 2016
  - Research in the areas of Mobile Networked Systems, Crowdsourcing, Content Delivery Networks, and Mobile Network Performance.
- **Intern**. Microsoft Research India; Bangalore, India May 2013 - August 2013
  - Analyzed performance aspects of UHRS, Microsoft's internal system for human intelligence tasks. Worked with product team to find ways to improve system performance metrics, minimizing task completion time and increasing overall system throughput.
- **Intern**. Microsoft Research India; Bangalore, India June 2012 - September 2012
  - Developed framework for evaluating the effect of different incentive structures within mobility-based services (e.g. mobile crowdsourcing).
- **Consultant**. Redmane Technology; Chicago, IL June 2009 - August 2010
  - Lead developer for large enterprise system, involving the accounts receivable system for a large American university.
  - Duties included meeting with clients to determine requirements, draft enhancements specs, and implement into live code base.

- **Software Developer**. ePlanIt; Dallas, TX May 2007 - March 2008
  - Designed and implemented a real-time GPS tracking system for construction workers using their cellular phones. This information was then fed to each company's respective payroll system for invoices.
  - Designed mobile application in JavaME, and .NET webservice for detecting, processing, and analyzing GPS information for job analytics.
- **Teaching Assistant**. EECS Department, Northwestern 2011 to 2014
  - Operating Systems Fall 2012, 2013, 2014
  - Introduction to C++ Winter 2011
  - Distributed Systems Winter 2014
  - Responsible for grading assignments, and holding office hours to answer students' questions.
  - Teach weekly recitation sessions and (except for Intro. to C++) the full class 1-2 times per quarter.

Publications

Conference Publications

- "Cell Spotting: Studying the role of cellular networks in the Internet". John P. Rula, Fabián Bustamante, Moritz Steiner. To appear in Proc. IMC, November 2017.
- "When IPs Fly: A case for redefining airline communication". John P. Rula, Fabián Bustamante, David R. Choffnes. In Proc. HotMobile, February 2016.
- "eXploring Xfinity: A first look at provider-enabled community networks". Dipendra Jha, John P. Rula, Fabián Bustamante. In Proc. PAM, March 2016.
- "In and Out of Cuba: Characterizing Cuba's Connectivity". Zachary S. Bischof, John P. Rula, Fabián Bustamante. In Proc. IMC, October 2015.
- "Second Chance: Understanding diversity in broadband access network performance". John P. Rula, Zachary S. Bischof, Fabián Bustamante. In Proc. Sigcomm C2B(I)D Workshop, August 2015.
- "Mobile AD(D): Estimating Mobile Session Times for Better Ads". John P. Rula, Byungjin Jun, Fabián Bustamante. In Proc. HotMobile, February 2015.
- "Crowdsensing Under (Soft) Control". John P. Rula, Fabián Bustamante. In Proc. IEEE INFOCOM, April 2015.
- "Behind the Curtain: Cellular DNS and Content Replica Selection". John P. Rula, Fabián Bustamante. In Proc. IMC, November 2014.
- "No 'One-Size Fits All': Towards a principled approach for incentives in mobile crowdsourcing". John P. Rula, Vishnu Navda, Fabián Bustamante, Ranjita Bhagwan, Saikat Guha. In Proc. HotMobile, February 2014.
- "Content Delivery and the natural evolution of DNS - Remote DNS Trends, Performance Issues and Alternative Solutions". John S. Otto, Mario A. Sanchez, John P. Rula, Fabián Bustamante. In Proc. of IMC. November 2012.
- "Crowd Soft Control: Moving Beyond the Opportunistic." John P. Rula and Fabián Bustamante. In Proc. HotMobile, February 2012.
- "Crowdsourcing ISP Characterization to the Network Edge". Zachary S. Bischof, John S. Otto, Mario A. Sánchez, John P. Rula, David R. Choffnes, and Fabián E. Bustamante. In Proc. Sigcomm Workshop on Measurements Up the STack (W-MUST). 2011.

Posters & Demos

- "Behind the Curtain: The importance of replica selection in next generation cellular networks". John P. Rula, Fabián Bustamante. Poster at ACM Sigcomm, August 2014.
- "Characterizing Broadband Services with Dasu". Zachary S. Bischof, Mario A. Sánchez, John S. Otto, John P. Rula, Fabián Bustamante. Demonstration at USENIX NSDI, April 2013.
- "namehelp: Intelligent client-side DNS resolution". John S. Otto, Mario A. Sanchez, John P. Rula, Ted Stein, Fabián Bustamante. In Poster at ACM Sigcomm. August 2012.

Research Projects

Cellular Content Delivery

With total cellular traffic expected to increase by over an order of magnitude over the next few years, the performance of mobile content delivery is of the utmost importance. Cellular networks operate differently than traditional eyeball ASes, both through the infrastructure features such as cellular gateways, and policy issues such as routing and client IP assignment. Despite these fundamental changes, content delivery networks continue to operate the same for cellular clients as they do for their wired counterparts. My research explores the performance and operation of cellular networks in relation to content delivery networks through crowdsourced experiments from mobile end-hosts, as well as industry collaboration with a large content delivery network. Through the use of our mobile experiment engine, ALICE, we are investigating how to best deliver content to mobile clients while respecting the different, and dynamic, cellular infrastructure.

Incentive Structures in Human Distributed Systems.

Human distributed systems represent systems which combine human computation or participation with computational services. These encompass areas like crowdsourcing (fixed and mobile) as well as many mobile networked services such as participatory sensing. We are exploring the ways in which different incentive structures affect these participant characteristics. We attempt to bring a principled approach to the understanding of performance within these systems and use this to design efficient and high throughput systems around human computation. Our main focus is on characterizing system performance, and specifically how different incentive mechanisms affect each metric of system performance.

Skills and Expertise

- Large-scale data analysis: MapReduce, HDFS, Spark
- Cloud computing (Amazon EC2, Microsoft Azure), research testbeds (PlanetLab), and distributed systems development
- Programming Languages: Python, Java, C/C++, GO, bash, C#, Javascript, HTML, PHP
- Mobile Application Development: Android, iOS, Windows Phone

Awards

- Best TA – 2014-2015 academic year, Northwestern University
- ACM Student Research Competition Winner. *Behind the Curtain: The importance of replica selection in next generation cellular networks* - Sigcomm 2014