

Samuel C. Nelson

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Education

University of Illinois at Urbana-Champaign, Urbana, IL
Ph.D. in *Computer Science*, May 2011
Thesis: *Leveraging Structure for Communication in Human-Centric DTNs*
Advisor: Prof. Robin Kravets

University of Illinois at Urbana-Champaign, Urbana, IL
M.S. in *Computer Science*, December 2008
Thesis: *Encounter-based Routing in Disaster Recovery Networks*
Advisor: Prof. Robin Kravets

Bucknell University, Lewisburg, PA
B.S. in *Computer Science* with a minor in *Physics*, May 2006 (*magna cum laude*)
B.A. in *Mathematics*, May 2006
Honors Thesis: *A Simulation Study of Connectivity Metrics for Wireless Ad Hoc Networks*
GPA: 3.88/4.0 (cumulative) 4.0/4.0 (computer science major)

Research, Teaching, and Work Experience

WINLAB, Rutgers University (*Postdoctoral Research Associate*) *January 2011 to Present*
NSF Future Internet Architecture Project – MobilityFirst

- Leading role in the overall router design and prototyping for next generation storage-aware routing, which includes the development and implementation of a new hybrid routing protocol capable of handling both high and low levels of connectivity and mobility.
- Contributed to design of the global name resolution service, a key distributed service responsible for mapping long-lasting names to topologically dependent addresses.
- Advising 7 graduate students and summer interns working on aspects of MobilityFirst routing and the global name resolution service.
- Guest lecturer and external advisor for Rutgers University graduate class *Communication Networks 2*.

University of Illinois at Urbana-Champaign (*Research Asst.*) *August 2006 to December 2010*
On Real-time Capacity of Mobile Cyber-physical Disruption-tolerant Networks
Funded by ONR

- Analytically and experimentally investigated one-to-many group-based routing paradigms, such as multicast and multicast, in DTN environments.

The-Day-After Networks: A First-Response Edge-Network Architecture for Disaster Relief
Funded by NSF

- Designed and developed *Encounter-based Routing*, a DTN unicast routing protocol that leverages locally collected popularity information to enable highly efficient routing
- Designed and developed a transformation layer that enables unmodified DTN unicast routing protocols to run in an anycast mode, supporting practical group-based communication in DTNs.
- Designed and developed MembersOnly, a group-management system for DTNs that propagates and consolidates group information through the network, providing accurate information even in the presence of malicious nodes.
- Designed and developed a high-level, event-driven mobility model for disaster recovery networks.

Energy-Efficient Authenticated Communication in Wireless Sensor Networks
Funded by Boeing

- Designed a solution for cryptography in vehicular networks, with a focus on utilizing current infrastructure, through the use of ID-based cryptosystems.
- Researched the relationship between data aggregation and security in sensor networks

BBN Technologies (*Network Research Intern*) *Summer 2009*

- Team member on the SPINDLE project, aimed at reliably and securely delivering data under intermittently connected networks.
- Designed, implemented, and simulated DTN routing solutions in the ONE simulator, utilizing both geographic and delay-tolerant link state techniques.

BBN Technologies (*Network Research Intern*) *Summer 2008*

- Worked on the DARPA funded CORONET project aimed at developing architecture and protocols for multi-terabit global core optical networks.
- Designed and implemented path computation code geared at routing optical data on-the-fly, as well as visualization tools, in MATLAB.
- Implemented simulation code in OPNET as a framework for verification and validation.

Bucknell University (*Teaching Assistant for Operating System Design*) *Fall 2005*

- Instructed labs of around 20 students and graded coursework.

Rutgers University (*Undergraduate Research – DIMACS/DIMATIA REU*) *Summer 2005*

- Identified subclasses of claw-free graphs in which the 3-colorability problem is NP hard or solvable in polynomial time.
- Selected as one of five students to attend an international combinatorics conference and private lectures at Charles University in Prague, Czech Republic.

Bucknell University (*Undergraduate Research*) *Summer 2004*

- Instrumented a simulator for wireless ad hoc networks (SWAN) to allow for experiments with denial of service attack models, which included implementing network layers
- Used programming and mathematical skills to implement facilities in the simulator for collecting and recording graph theoretic metrics.

Virtua Health (*Human Resources Information Systems Intern*) *Summer 2002,2003,2006*

- Worked with the IS team to help upgrade custom SQRs, queries, and objects to be compatible with PeopleSoft 8.9. (*Summer 2006*)
- Used SQL and SQR to program interfaces that automated the process of synchronizing the company's database with external companies' records and automated reporting tasks.

Papers and Presentations**Book Chapter Contributions**

- Contributor for Chapters 14 (*Gravity Mobility*) and 15 (*Mobility Vector Model*) in *Handbook of Mobile Ad Hoc Networks for Mobility Models*. Radhika Ranjan Roy. Springer Science+Business, LLC. December 2010. ISBN 978-1-4419-6048-1.

Conference and Workshop Papers

- **S. Nelson**, G. Bhanage, and D. Raychaudhuri. GSTAR: Generalized Storage-Aware Routing for MobilityFirst in the Future Mobile Internet. In *Proceedings of ACM MobiArch 2011*.
- **S. Nelson**, R. Kravets. Achieving Anycast in DTNs by Enhancing Existing Unicast Protocols. In *Proceedings of the ACM MobiCom Workshop on Challenged Networks (CHANTS 2010)*.
- **S. Nelson**, R. Kravets. For Members Only: Local and Robust Group Management in DTNs. In *Proceedings of the ACM MobiCom Workshop on Challenged Networks (CHANTS 2010)*.
- N. Thompson, **S. Nelson**, M. Bakht, T. Abdelzaher, and R. Kravets. Retiring Replicants: Congestion Control for Intermittently-Connected Networks. In *Proceedings of IEEE INFOCOM 2010*.
- **S. Nelson**, M. Bakht, and R. Kravets. Encounter-based Routing in DTNs. In *Proceedings of IEEE INFOCOM 2009*.
- **S. Nelson**, A. Harris III, and R. Kravets. Event-driven, Role-based Mobility in Disaster

Recovery Networks. In *Proceedings of the ACM MobiCom Workshop on Challenged Networks (CHANTS 2007)*.

- L.F. Perrone, **S. Nelson**. A Study of On-Off Attack Models for Wireless Ad Hoc Networks. In *Proceedings of First IEEE International Workshop on Operator-Assisted (Wireless Mesh) Community Networks (OpComm 2006)*.

Journal Articles and Technical Reports

- **S. Nelson**, Y. Hu, and R. Kravets. Anycast, Multicast and Beyond: The Role of Manycast in DTN Communication. UIUC Tech Report. Handle: <http://hdl.handle.net/2142/18709>. 2011
- **S. Nelson** and R. Kravets. Securing Vehicular Networks with VIBES. UIUC Tech Report. Handle: <http://hdl.handle.net/2142/18707>. 2011.
- **S. Nelson**, M. Bakht, R. Kravets, and A. Harris III. Encounter-based routing in DTNs (poster session). In *ACM SIGMOBILE Mobile Computing and Communications Review*. Volume 13, Issue 1. January 2009.

Short Papers and Posters - Refereed

- M. Bakht, **S. Nelson**, N. Thompson, R. Kravets. Mercury: Leveraging Clustering in Opportunistic Networks. Short paper/poster in *IFIP Wireless Days '11*. Oct 2011.
- **S. Nelson**, M. Bakht, R. Kravets, A. Harris III. Encounter-Based Routing in DTNs. Poster in *ACM MobiCom 2008*. Sept 2008
 - 2nd place winner of Student Research Competition at *ACM MobiCom 2008*.

Theses

- **Ph.D. Thesis - S. Nelson**. Leveraging Structure for Communication in Human-Centric DTNs. *University of Illinois at Urbana-Champaign, 2011*. Advisor: Prof. Robin Kravets.
- **Master's Thesis - S. Nelson**. Encounter-based Routing in Disaster Recovery Networks. *University of Illinois at Urbana-Champaign, 2008*. Advisor: Prof. Robin Kravets.
- **Undergraduate Honors Thesis - S. Nelson**. A Simulation Study of Connectivity Metrics for Wireless Ad Hoc Networks. *Bucknell University Undergraduate Honors Thesis, 2006*. Advisor: Prof. L. Felipe Perrone.

Invited Papers, Posters, and Guest Talks – Non-refereed

- **S. Nelson**. Leveraging Structure for Communication in Human-Centric DTNs. *Invited talk at the University of Pennsylvania*. December 2011.
- I. Seskar, K. Nagaraja, **S. Nelson** and Dipankar Raychaudhuri. In *proceedings of ACM AINTEC 2011* (Invited talk/paper). November 2011.
- **S. Nelson**. Overview of Mobile Networking. *Rutgers University Communication Networks 2 Guest Lecture*, taught by Prof. Dipankar Raychaudhuri. April 2011.
- **S. Nelson**. MobilityFirst Routing. *NSF FIA Advisory Board research talk*. February 2011
- **S. Nelson**, Exploring DTN Routing with the ONE Simulator. *BBN Tech Talk*, August 2009.
- **S. Nelson**, Path Computation in Next-Generation Core Optical Networks. *BBN Tech Talk*, August 2008.
- **S. Nelson**, A. Harris III, R. Kravets. Event- & Role-based Mobility in Disaster Recovery Networks. In *Illinois Wireless Systems Symposium*, Sept 2007 (poster presentation).
- **S. Nelson**, Y.C. Hu, R. Kravets. Secure Data Aggregation in Sensor Networks. In *Third ITI Workshop on Dependability and Security at UIUC*, Dec 2006 (poster presentation).
- **S. Nelson**, L.F. Perrone. Simulating Denial of Service Attacks on Wireless Ad Hoc Networks. *Bucknell University, 2005 & 2006* (two different poster presentations).
- Two research talks on *The Complexity of 3-Coloring Claw-free Graphs* during the DIMACS/DIMATIA REU program at Rutgers University. 2005.

Academic Service

Technical Program Committee (TPC) for:

- *ACM MobiHoc 2012*

Journal Article Reviewer for:

- *IEEE Transactions on Mobile Computing* journal. 2011.
- *IEEE/ACM Transactions on Networking* journal. 2011.
- *IEEE Transactions on Vehicular Technology* journal. 2011.
- *Ad Hoc Networks* journal. 2009, 2010, 2011.

Conference Paper Reviewer for:

- *IEEE Pervasive Computing and Communication (PerCom)*. 2012.
- *IEEE Wireless Communications and Networking Conference (WCNC)*. 2010, 2011.

Conference Panelist for:

- Future Internet session of *Wireless and Optical Communications Conference (WoCC)* 2011.
Panel Moderator: Wade Trappe.

Awards and Honors

- MobiCom/MobiHoc Student Travel Grant award for *ACM MobiCom/MobiHoc 2010* conference in Chicago, IL.
- National Science Foundation (NSF) Student Travel Grant award to the *IEEE INFOCOM 2009* conference in Rio de Janeiro, Brazil.
- 2nd place in *ACM MobiCom 2008* Student Research Competition.
- DIMACS/DIMATIA REU participant at Rutgers University and selected as one of five students to attend an international combinatorics conference and private lectures at Charles University in Prague, Czech Republic.
- Accepted into honor society Phi Beta Kappa and scientific research society Sigma Xi.
- 2006 Bucknell Computer Science Departmental Award, given to one student per year
- Goldwater Scholarship nominee at Bucknell University.
- Awarded first ever funding from Accenture Discovery Undergraduate Research Fund, 2004.

Relevant Classes

University of Illinois: Advanced Networking, Advanced Wireless Networks, Advanced Security, Cryptography, Advanced Distributed Systems, Algorithms, Embedded Systems

Bucknell University: Independent Study in Cryptography, Computer Networks, Operating System Design, Web Search Design, Statistics, Probability, Number Theory, Linear Algebra

Computer Experience

- Concepts of delay-tolerant networking, network/routing protocols, security and cryptography, discrete event simulation, automated web crawling, and overlay design.
- Applications/Operating Systems including *Microsoft Office, Vi, Emacs, LaTeX, GNUPLOT, PeopleSoft, VirtualBox, and Matlab*, as well as *Windows, Linux, and Unix*.
- Programming languages including *C++, C, Java, SQL, SQR, PHP, and PERL*.
- Network simulators including *ONE, ns2* (and *nam*), some *ns3*, and *OPNET*.
- Android OS development and publishing: created an Android game called “Lightning Letters”, which currently has 700+ downloads on the Android Market.

References

Available upon request.