

# Martin Suchara

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## RESEARCH INTERESTS

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Design of new network protocols to improve performance, security, and reliability of computer networks.  
Application of tools such as optimization theory or control theory to problems in networking.

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## EDUCATION

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- Princeton University**, Princeton, NJ *2006-2011*  
**Ph.D., Computer Science**, June 2011  
**M.A., Computer Science**, April 2008 (GPA: 3.9/4.0)  
• Thesis: “Reliable Internet Routing”.  
• Advisor: Jennifer Rexford.
- California Institute of Technology**, Pasadena, CA *2003-2006*  
**B.S. with Honor**, Computer Science, June 2006 (GPA: 3.9/4.0)  
• Thesis: “TCP MaxNet – Background, Algorithms, Implementation, and Experiments”.  
• Advisor: Steven Low.

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## WORK AND RESEARCH EXPERIENCE

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- IBM T. J. Watson Research Center – Research Intern** *Summer 2010*  
• Designed a quantum error correcting code that only requires two-qubit nearest-neighbor measurements for error correction.  
• Developed and evaluated a decoding algorithm that has a threshold against a depolarizing noise of 2%.
- AT&T Labs, Inc. – Research Intern** *Summer 2009*  
• Developed a new simple routing algorithm resilient to network failures. *Summer 2008*  
• Performed theoretical analysis as well as experimental evaluation of the algorithm.  
• Performed large-scale experiments with real topology, traffic, and failure data from AT&T.
- FastSoft, Inc. – Software Engineer Intern** *Summer 2006*  
• Implemented and tested key features of a proprietary WAN acceleration product in the Linux kernel. Conducted testing and benchmarking of the device.
- Caltech – Undergraduate Research Assistant** *2004-2006*  
• Demonstrated how TCP can achieve both max-min fairness and rapid convergence.  
• Implemented and optimized the new TCP protocol, TCP MaxNet, in the Linux kernel.  
• Evaluated and benchmarked performance of the protocol on a WAN testbed.

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## PUBLICATIONS

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### Physics and Physics of Information:

1. **M. Suchara**, S. Bravyi and B. Terhal, “Construction and Noise Threshold of Topological Subsystem Codes”. In *Journal of Physics A: Mathematical and Theoretical*, Volume 44, Issue 15, pp. 155301, 2011.
2. M. Grocky, **M. Suchara**, Z. Kluiber, V. Janovec and Z. Zikmund, “Structure of Ferroelastic Domain Walls and Antiphase Boundaries in Crystals of  $\beta$ -K<sub>2</sub>SO<sub>4</sub>”. *XV-Czech-Polish seminar: “Structural and Ferroelectric Phase Transitions”*, 2002.

### Optimizations of Multipath Routing:

3. **M. Suchara**, D. Xu, R. Doverspike, D. Johnson and J. Rexford, “Simple Failure Resilient Load Balancing”. In *Proceedings of ACM SIGMETRICS*, 2011.
4. W. Fisher, **M. Suchara** and J. Rexford, “Greening Backbone Networks: Reducing Energy Consumption by Shutting Off Cables in Bundled Links”. In *ACM SIGCOMM Workshop on Green Networking*, 2010.
5. J. He, **M. Suchara**, M. Bresler, J. Rexford and M. Chiang, “Rethinking Traffic Management: From Multiple Decompositions to a Practical Protocol”. In *Proceedings of CoNEXT*, 2007.
6. U. Javed, **M. Suchara**, J. He and J. Rexford, “Multipath Protocol for Delay-Sensitive Traffic”. *Invited paper in COMSNETS*, 2009.

### Routing Safety and Security:

7. **M. Suchara**, A. Fabrikant and J. Rexford, “BGP Safety with Spurious Updates”. In *Proceedings of IEEE INFOCOM*, 2011. Longer version also available as *Technical Report TR-881-10*, Dept. of Computer Science, Princeton University, July 2010.
8. I. Avramopoulos and **M. Suchara**, “Protecting DNS from Routing Attacks: A Comparison of Two Alternative Anycast Implementations”. In *IEEE Security & Privacy*, Issue on Securing the Domain Name System, September/October 2009.
9. I. Avramopoulos, **M. Suchara** and J. Rexford, “How Small Groups Can Secure Interdomain Routing”. *Technical Report TR-808-07*, Dept. of Computer Science, Princeton University, December 2007.
10. **M. Suchara**, I. Avramopoulos and J. Rexford, “Securing BGP Incrementally”. In *CoNEXT Student Workshop*, 2007.

### Congestion Control:

11. **M. Suchara**, L. Andrew, R. Witt, K. Jacobsson, B. Wydrowski and S. Low, “Implementation of Provably Stable MaxNet”. In *Proceedings of BROADNETS*, 2008.
12. B. Wydrowski, S. Hegde, **M. Suchara**, R. Witt and S. Low, “Grid networks and TCP services, protocols, and technologies”. In *Grid Networks: Enabling Grids with Advanced Communication Technology*, F. Travostino, J. Mambretti, G. Karmous-Edwards (Eds.), John Wiley & Sons, Ltd., 2006, ISBN: 0-470-01748-1.
13. **M. Suchara**, R. Witt and B. Wydrowski, “TCP MaxNet – An Implementation and Experiments on the WAN in Lab”. In *Proceedings of IEEE International Conference on Networks*, 2005.

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## SELECTED TALKS

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- **Constructions and Noise Threshold of Topological Subsystem Quantum Error Correcting Codes**  
IQC at the University of Waterloo (02/2011), NEC Laboratories of America, Princeton, NJ (02/2011), UC Berkeley (12/2010), IQI at Caltech (12/2010), IBM T. J. Watson Research Center (08/2010)
- **BGP Safety with Spurious Updates: The Conditions of BGP Convergence**  
IEEE INFOCOM (Shanghai, China, 04/2011), Harvard University (01/2011), Stanford University (01/2011), Yale University (10/2010), Columbia University (05/2010)
- **Simple Failure Resilient Load Balancing**  
ACM SIGMETRICS (San Jose, CA, 06/2011), AT&T Labs Research, Florham Park, NJ (09/2008)
- **Greening Backbone Networks**  
ACM SIGCOMM Workshop on Green Networking (New Delhi, India, 09/2010)
- **Rethinking Internet Traffic Management: From Multiple Decompositions to a Practical Protocol**  
Cambridge University (09/2008), Stanford University (04/2008), UC Berkeley (04/2008)
- **How Small Groups can Secure Interdomain Routing**  
Princeton University (01/2008), CoNEXT Student Workshop (New York, NY, 12/2007)
- **TCP MaxNet: Implementation and Experiments on the WAN in Lab**  
BROADNETS 2008 (London, UK, 09/2008), IEEE ICON (Kuala Lumpur, Malaysia, 11/2005), Stanford University (08/2005)

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## TEACHING ASSISTANTSHIPS

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COS226 – Algorithms and Data Structures, Princeton	<i>Spring 2009</i>
COS424 – Interacting with Data – Machine Learning, Princeton	<i>Spring 2008</i>
COS126 – General Computer Science, Princeton	<i>Fall 2007</i>
CS21 – Decidability and Tractability, Caltech	<i>Winter 2006</i> <i>Winter 2005</i>
CS38 – Introduction to Algorithms, Caltech	<i>Spring 2005</i>

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## HONORS AND AWARDS

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- Best Student Paper Award at ACM Sigmetrics, 2011.
  - Gordon Wu Fellowship, awarded to 15 students in the School of Engineering at Princeton, 2006-2010.
  - Upper Class Merit Award for academic achievement and research, Caltech, 2005-2006.
  - Patricia B. Conklin Scholarship for academic achievement, Caltech, 2004-2005 and 2005-2006.
  - Marcella and Joel Bonsall Technical Writing Prize, 2005.
  - Arthur Rock SURF Fellowship, undergraduate research award, 2005.
  - Fulbright Travel Grant to U.S.A., 2003.
  - Bronze Medal, 15<sup>th</sup> International Young Physicists' Tournament, 2002.
  - Various travel grants (Travel Grant for Scholarly Travel, IEEE Infocom Travel Grant, ACM Sigcomm Travel Grant, etc.)
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**PROFESSIONAL ACTIVITIES**

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- Program Committee Member, ICSNC 2011
- External reviewer: IEEE/ACM Transactions on Networking, IEEE Transactions on Parallel and Distributed Systems, ACM SIGCOMM CCR, Communications of the ACM, Computer Networks, Software: Practice and Experience, ACM SIGCOMM 2011, NSDI 2011, 2010, 2009, IEEE ICFIN 2009, etc.

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**TECHNICAL SKILLS**

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- Programming and scripting: C, C++, Java, Perl, Linux kernel programming, bash
- Simulation and optimization environments: Matlab, AMPL, ns-2
- Network protocol design: TCP, BGP, MPLS
- Web programming: HTML, JavaScript

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**LANGUAGES**

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- French – intermediate, German – intermediate