

## Curriculum Vitae

# Prof. Roger Wattenhofer



Professor, Head of Distributed Computing Group  
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### Professional Career

2008–present	Full Professor, Distributed Computing Group, Computer Engineering and Networks Laboratory, D-ITET, ETH Zurich
2004–2008	Associate Professor, Distributed Computing Group, Computer Engineering and Networks Laboratory, D-ITET, ETH Zurich
2001–2004	Assistant Professor, Distributed Computing Group, Institute for Pervasive Computing, D-INFK, ETH Zurich
2000–2001	Postdoc Research Position, Systems and Networking Group, Microsoft Research, Redmond, WA
1999–2000	Postdoc Research Position, CS Department, Brown University, Providence, RI
1995–1999	Research and Teaching Assistant, D-INFK, ETH Zurich, PhD in Computer Science
1990–1995	Studies in Computer Science, ETH Zurich

### Summary

Roger Wattenhofer's research interests are a variety of algorithmic and systems aspects in computer science and information technology, currently in particular physical algorithms, wireless networks, multi-core systems, mobile systems, and social networking. He publishes in different communities: distributed computing, networking, and theory.

### Teaching

Ad Hoc and Sensor Networks (advanced graduate level course)  
Distributed Systems (undergraduate CS 3rd year core course)  
Discrete Event Systems (undergraduate selective course)  
Laboratory Distributed Computing (advanced CS group project)  
Principles of Distributed Computing (advanced graduate level course)  
Seminar Distributed Computing (graduate-level research seminar)

### Publications

About 200 peer-reviewed publications in different areas: Distributed Computing (e.g. PODC, SPAA, DISC, ICDCS), Systems & Networking (e.g. OSDI, MobiCom, MobiHoc, SenSys, IPSN, HotNets, IPTPS, Ubicomp, Multimedia, Infocom), or Theory of Computer Science (e.g. STOC, FOCS, SODA, ICALP, EC). Members of the group have won several best paper awards, e.g. at PODC, SPAA, DISC, or MobiCom. According to Google Scholar, combined these publications generate almost 10,000 citations.

In addition, three edited books, several book chapters, and half a dozen patents have been published.

### Services

- Program committee chair or co-chair of various conferences, e.g. ICALP 2012, SSS 2011, ICDCN 2009, Dijkstra Prize 2007, PODC 2007, IPTPS 2007, MobiHoc 2005
- Organizer of several summer schools, workshops, or conferences, e.g. PODC 2010.
- Member of steering committee of several conferences, e.g. PODC, DISC
- Member of more than 50 technical program committees, more than once at DISC, MobiCom, MobiHoc, ICALP, ICDCN, ICDCS, Infocom, IPSN, IPTPS, IZS, PODC, and SPAA.
- Member of examination board of about 20 PhD theses (Switzerland, EU, USA).
- Member of a dozen professorial election committees in Switzerland and Europe.
- Invited keynote talks, at e.g. CWSN 2011, ICALP 2010, WRAWN 2010, SOFSEM 2010, ALGOTEL 2010, SSS 2009, DIALM-POMC 2008, ALGOSENSORS 2008, RAWNET 2008, ICDCN 2008, WISARD 2008, SIROCCO 2006, FAWN 2006, P2P 2005, WG 2004, TAWN 2004.
- Teaching at half a dozen lectures at summer schools, mostly in Europe. In addition, short lectures in developing countries such as the Philippines.

### Graduates

The distributed computing group produced 16 PhD graduates, three of which (Fabian Kuhn, Thomas Moscibroda, Thomas Locher) won an ETH medal for their theses. About half of the PhD graduates joined a university or a research lab after their PhD: Microsoft Research (2), IBM Research (2), ABB Research, CSIRO Australia, Hebrew University, TU Munich; three PhD graduates founded a startup company called StreamForge GmbH, and some joined various companies: Google (3), AppTornado, Ergon. In addition, the group supervised almost 100 Masters theses, and more than 100 term theses and minor student projects.

### Impact

Some applied projects turned into startup companies, e.g. Wuala ([www.wuala.com](http://www.wuala.com)), reMail ([www.remail.com](http://www.remail.com)), or StreamForge ([www.streamforge.org](http://www.streamforge.org)); all three companies basically developed from student theses. Wuala was acquired by the French technology company LaCie in 2009, reMail was acquired by Google in 2010. These startup companies won numerous awards. In 2009, Wuala has won Best Websites, Red Herring Europe 100, and the CTI Start-up Label award. In 2010 StreamForge has won the VentureKick finals, the main award for new startup companies in Switzerland. Several software projects have been covered by popular media such as Neue Zürcher Zeitung (NZZ), Technology Review, Gizmodo, or LifeHacker. The collaborative spam filter project Spamato was listed as one of the best 101 free software projects by PC World magazine in 2007. The game-theoretic BitTorrent client BitThief is still highly popular. According to web statistics provider Alexa, BitThief is the search keyword that brings ETH Zurich substantial web traffic; the keyword "bitthief" is currently ranked fourth, after "eth", "eth zürich", "eth zürich", and before "ethz". Our software JukeFox is one of the most popular music apps on the Android smartphone platform.

For more information visit [www.disco.ethz.ch](http://www.disco.ethz.ch)

## Prof. Roger Wattenhofer - Research Highlights

# Distributed Computing

Let us describe our research in a bit more detail. Generally speaking, we are interested in both theory and practice of computer science and information technology. In our group we cultivate a large breadth of areas, reflecting our different backgrounds computer science, mathematics, and electrical engineering.

Our main interest is algorithmic theory that does not follow the traditional input/output model of computing. We call this “physical algorithms”, algorithms that live in networked systems of active agents. As many physical systems (cars, financial agents, animals, brain cells, you name it) show “algorithmic” behavior, we would like to understand the fundamentals of such networked systems. In the following, we give a few examples, followed by a list of papers for further reading.

### Locality

What can be computed, and how efficiently, are probably the core questions of computer science. Not surprisingly, in distributed systems and networking research, a core question is what can be computed in a distributed fashion. More precisely, if nodes of a network must base their decision on their local neighborhood only, how well can they compute or approximate a global optimization problem? Throughout the years, we published dozens of papers that partially answer this question, starting with the basic example of how to compute a dominating set in a distributed fashion (PODC 2003). Later we developed a general framework to solve a family of problems in combinatorial optimization (SODA 2006), and gave the first substantial lower bounds for different covering and packing optimization problems (PODC 2004). We also studied several optimal algorithms for important families of graphs such as bounded-growth graphs (PODC 2008), or explored restricted computational models. These days, the top conferences in the area (PODC, SPAA, DISC) always have sessions on locality.

### Clock Synchronization

Networks often need a common notion of time; consequently clock synchronization in networks seems to be such a fundamental and practically important question that it should have been solved a long time ago. Surprisingly, this is not the case. In a series of papers (FOCS 2008, PODC 2009, JACM 2010) we studied the theory of clock synchronization, proving the surprising result that two neighboring nodes cannot synchronize their clocks arbitrarily well; indeed one can show that even the best possible protocol will produce a clock skew between neighbors that scales with the logarithm of the network size. This result is tight, as we discovered an algorithm that achieves this lower bound. We also looked into the practical side of clock synchronization, being able to present good practical protocols, beating the state of the art considerably, even for small networks (IPSN 2009, SenSys 2009).

### Wireless Algorithms

Despite the omnipresence of wireless networks, surprisingly little is known about their computational complexity and efficiency. We developed techniques to understand the fundamental communication limits of arbitrary wireless networks, in a reasonable physical model such as SINR. We published several papers tackling this question, starting with a paper at INFOCOM 2006. Some papers answer the question in a quite general way (INFOCOM 2009, ICALP 2009), some others mix theory with

practice (HotNets 2006). There is a lot of recent interest in this area, a yearly workshop called WRAWN is dedicated to this subject.

### Selected Publications

Christoph Lenzen and Roger Wattenhofer. Tight Bounds for Parallel Randomized Load Balancing. Proceedings of the 43<sup>rd</sup> Symposium on Theory of Computing (STOC), San Jose, California, US, June 2011.

Christoph Lenzen, Thomas Locher, and Roger Wattenhofer. Tight Bounds for Clock Synchronization. Journal of the ACM (JACM), Volume 57, Issue 2, January 2010. (Journal version of a FOCS 2008 paper, and a PODC 2009 paper winning the best paper award.)

Christoph Lenzen, Philipp Sommer, and Roger Wattenhofer. Optimal Clock Synchronization in Networks. Proceedings of the 7<sup>th</sup> ACM Conference on Embedded Networked Sensor Systems (SenSys), Berkeley, California, USA, November 2009.

Fabian Kuhn, Thomas Locher, and Roger Wattenhofer. Tight Bounds for Distributed Selection. Proceedings of the 19<sup>th</sup> ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), San Diego, California, June 2007. (Best paper award, a popular variant of this paper has been invited by the Communications of the ACM (CACM) magazine, published in the Section Research Highlights, Volume 51, Issue 9, 93-99, Sept. 2008.)

Nicolas Burri, Pascal von Rickenbach, and Roger Wattenhofer. Dozer: Ultra-Low Power Data Gathering in Sensor Networks. Proceedings of the 6<sup>th</sup> International Conference on Information Processing in Sensor Networks (IPSN), Cambridge, Massachusetts, April 2007.

Thomas Moscibroda, Stefan Schmid, and Roger Wattenhofer. When Selfish Meets Evil: Byzantine Players in a Virus Inoculation Game. Proceedings of the 25<sup>th</sup> ACM Symposium on Principles of Distributed Computing (PODC), Denver, Colorado, July 2006.

Hagit Attiya, Fabian Kuhn, Greg Plaxton, Mirjam Tolksdorf, and Roger Wattenhofer. Efficient Adaptive Collect Using Randomization. Journal on Distributed Computing, 18(3), Pages 179-188, February 2006. (Journal version of a DISC 2004 paper, winning the best student paper award.)

Thomas Moscibroda and Roger Wattenhofer. The Complexity of Connectivity in Wireless Networks. Proceedings of 25<sup>th</sup> Annual Conference of Computer Communications (INFOCOM), Barcelona, Spain, April 2006.

Fabian Kuhn and Roger Wattenhofer. Constant-Time Distributed Dominating Set Approximation. Springer Journal for Distributed Computing, Volume 17, Number 4, Pages 303-310, May 2005. (Journal version of a PODC 2003 paper, winning the best student paper award.)

Fabian Kuhn, Thomas Moscibroda, and Roger Wattenhofer. Polylogarithmic Clustering Algorithms in Multihop Radio Networks. Proceedings of the 10<sup>th</sup> Annual International Conference on Mobile Computing and Networking (MobiCom), Philadelphia, Pennsylvania, September 2004. (Best presentation award.)

Fabian Kuhn, Thomas Moscibroda, and Roger Wattenhofer. What Cannot be Computed Locally! Proceedings of the 23<sup>rd</sup> ACM Symposium on Principles of Distributed Computing (PODC), St. John's, Newfoundland, Canada, July 2004. (Best student paper award.)

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