Jonathan R. Stanton

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RESEARCH INTERESTS

Distributed systems, network protocols, distributed security.

EDUCATION

expected Feb 2002	Ph.D. in Computer Science	The Johns Hopkins University, *Practical Wide Area Group Communication.* Adviser: Prof. Yair Amir.
1998	M.S.E. in Computer Science	The Johns Hopkins University.
1995	B.A. in Mathematics	Cornell University.

WORK EXPERIENCE

Academic

Sept. 2001 – present	Assistant Research Professor. Johns Hopkins University.
Sept. 1996 – Aug. 2001	Research Assistant. Johns Hopkins University.
July 1995 – Aug. 1996	Teaching Assistant. Johns Hopkins University.
Sept. 1994 – May 1995	Teaching Assistant. Cornell University.
May 1994 – Sept. 1994	Instructor. Cornell University.

Non-Academic

Sept. 2000 – present	Co-Founder and Officer. Spread Concepts LLC.

GRANTS

- Co-PI, "A Cost-Benefit Approach to Fault Tolerant Communication and Information Access," DARPA BAA 00-01, $944,015, May 2000 – April 2003 (with Yair Amir (Co-PI) and Baruch Awerbuch (Co-PI)).
- Co-PI, "High Performance, Robust and Secure Group Communications," DARPA BAA 99-33, $1,350,824 of which $450,000 is co-funded by the NSA, May 2000 – April 2003 (with Yair Amir (Co-PI), Baruch Awerbuch (Co-PI), and Gene Tsudik as a sub-contractor from UC Irvine).

RESEARCH AND PUBLICATIONS

My research focuses on designing, exploring, and building scalable, high-performance, reliable distributed systems that take advantage of wide-area networks. I am one of the creators of the Spread system that is described below. I help lead or participate in a number of distributed systems developed in the Center for Networking and Distributed Systems at Johns Hopkins University. These include a secure group communication system supporting privacy, integrity, and authentication; a scalable, efficient replication tool for databases, and high availability tools for clusters. I have also worked on custom network protocols and sophisticated flow-control models for application-level overlay networks.

Released Software

- Spread – I am the chief architect of the Spread wide-area group messaging toolkit (http://www.spread.org/). Currently, Spread is believed to have thousands of users in commercial, research, and teaching environments. Several popular applications use Spread, such as the Apache-SSL secure web server, a distributed logging service for the Apache and thttpd web servers, the native database replication in Postgres, and the Zope application server. Spread is part of FreeBSD and is included in some Linux distributions. We have recorded over 2500 distinct downloads from our web site. Spread has an active developer and user community from around the world.

Refereed Conference Proceedings

"Flow Control for Many-to-Many Multicast: A Cost-Benefit Approach," Yair Amir, Baruch Awerbuch, Claudiu Danilov, and Jonathan Stanton, *To appear in Proceedings of Fifth IEEE Conference on Open Architectures and Network Programming, New York, New York*, June 28-29, 2002.

"Framework for Authentication and Access Control of Client-Server Group Communication Systems," Yair Amir, Cristina Nita-Rotaru, and Jonathan Stanton, *Third International Networked Group Communications Workshop, London, UK.* November 7-9, 2001, Published in LNCS 2233, 120-128.

"Exploring Robustness in Group Key Agreement," Yair Amir, Yongdae Kim, Cristina Nita-Rotaru, John Schultz, Jonathan Stanton, and Gene Tsudik, *21th IEEE International Conference on Distributed Computing Systems (ICDCS), Phoenix, Arizona,* April 16-19, 2001, 399-408.

"A Low Latency, Loss Tolerant Architecture and Protocol for Wide Area Group Communication," Yair Amir, Claudiu Danilov, and Jonathan Stanton, *International Conference on Dependable Systems and Networks (ICDSN) (previously FTCS-30), New York, New York*, June 25-28, 2000, 327-336.

"Secure Group Communication in Asynchronous Networks with Failures: Integration and Experiments," Yair Amir, Giuseppe Ateniese, Damian Hasse, Yongdae Kim, Cristina Nita-Rotaru, Theo Schlossnagle, John Schultz, Jonathan Stanton, and Gene Tsudik, *20th IEEE International Conference on Distributed Computing Systems (ICDCS), Taipei, Taiwan,* April 10-13, 2000, 330-343.

Technical Reports

"Practical Wide-Area Database Replication," Yair Amir, Claudiu Danilov, Michal Miskin-Amir, Jonathan Stanton, and Ciprian Tutu, *Technical Report CNDS-2002-1, submitted to a conference.*

"Robust Contributory Key Agreement in Secure Spread," Yair Amir, Yongdae Kim, Cristina Nita-Rotaru, John Schultz, Jonathan Stanton, and Gene Tsudik, *submitted to a journal.*

"The Spread Wide Area Group Communication System," Yair Amir and Jonathan Stanton, *Technical Report CNDS-98-4.*

Professional Service

- Member of the Program Committee for the *IEEE International Conference on Distributed Computing Systems*, Vienna, Austria July 2002.
- Reviewer for DISC 1998, FTCS 1999, ICDCS 2000, 2001, IPDPS 2002, Journal of Parallel and Distributed Computing.
- Served on Graduate Admissions Committee for Johns Hopkins Computer Science Department in 1998.

PRESENTATIONS AND LECTURES

Workshops

- Invited Speaker at the Spread Workshop June 2001.
- Invited Panelist at IEEE ICDCS April 2001 Workshop on Applied Reliable Group Communication.

Conference Lectures

- Networked Group Communication Workshop, London, November 2001.
- International Conference on Dependable Systems and Networks, New York City, July 2000.
- International Conference on Distributed Computing Systems, Taipei, March 2000.

Other Presentations

- Fault Tolerant Networks PI meeting, San Diego, January 2002.
- Johns Hopkins Information Security Institute Open House, Baltimore, October 2001.
- Dynamic Coalition PI meeting, Colorado Springs, July 2001.

TEACHING

Johns Hopkins University.

- Instructor for Distributed Systems, Fall 2001.
- Co-instructor for Distributed Systems, Fall 1999, Fall 2000.

  Distributed Systems is a senior undergraduate and graduate course with 40 students. It covers the theory of distributed algorithms, how distributed systems are built and used today, and includes programming assignments and a final project.

- Teaching Assistant for Parallel Algorithms, Spring 1996.
- Teaching Assistant for Computer Architecture, Fall 1995.
- Volunteer intercollegiate debate coach for Cornell University and Towson University from Fall 1995 until Spring 1997.

Cornell University.

- Teaching Assistant for Introduction to Programming, Fall 1994, Spring 1995.
- Instructor in basic computer and web use as well as author of instructional materials, Summer 1994.
- Assistant Instructor for Introduction to Debate in the Communications Department, Fall 1993.

SKILLS

C, Java, HTML, Pascal, Perl, Bash, Unix, Linux, Macintosh, MS-DOS, MS-Windows.

INTERESTS

Skiing, Science Fiction, Backpacking.

REFERENCES

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Founding Director Information Security Institute
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Research Interests

I have worked for the last five years on the research and development of a scalable, high-performance, wide-area group messaging toolkit called Spread. The Spread toolkit was made publicly available over two and a half years ago and has become a popular package for reliable messaging. Currently, Spread is believed to have thousands of users in commercial, research, and teaching environments. Several popular applications use Spread, such as the Apache-SSL secure web server, a distributed logging service for the Apache and thttpd web servers, the native database replication in Postgres, and the Zope application server. Spread is part of FreeBSD and is included in some Linux distributions. We have recorded over 2500 distinct downloads from our web site.

About three years ago, the difficult problem of security for group-oriented systems became apparent and I, along with my adviser Professor Yair Amir and with Professor Tsudik from UC Irvine (previously from USC/ISI), started a project to create a secure group communication system.

Also, over the last five years I have helped my adviser and Professor Baruch Awerbuch to establish the Center for Networking and Distributed Systems. I have been involved in building and maintaining the computing infrastructure, selecting and working with the masters and Ph.D students, and obtaining financial resources to support research. About two years ago I helped write two DARPA proposals that were funded, and became a co-PI on both of them. I believe I have a solid start on what it takes to be a successful systems professor who leads an active lab.

My goal is to explore how to construct reliable, high-performance distributed systems, and then actually build them.

I want to work in the intersection of networking, distributed protocols and systems, and security research. One of the major challenges today is to make networks, and the distributed protocols that run over them, more reliable and trustworthy. This is definitely a long term task. It is also a task that will require collaboration among researchers, which for me is one of the most rewarding parts of research.

I believe one of the best ways to manage the complexity of modern systems is to build well-defined, correct, and efficient software toolkits. These toolkits provide abstractions that isolate some of the hard parts of building distributed and networked applications. Some of the interesting challenges when creating toolkits are discovering what service or semantics provide the right abstraction, designing efficient protocols to provide that abstraction, and proving both the correctness and security of the toolkit.

During the next few years, I would like to focus on the following specific research areas.

- Group communications — My Ph.D research focused on the development of a high performance, scalable group messaging system that is optimized for wide-area networks such as

the Internet, yet still provides flexible and strong semantic guarantees. The resulting system is one of the highest performing and most widely used group messaging toolkits in the world. Group communication systems simplify the design and development of reliable distributed services such as consistent replication, interactive conferencing, and multicast publishing. Strong group messaging services for Internet wide networks will be an important tool for future replicated application servers. I plan to continue research on how to make group messaging scale up to large Internet applications, what types of semantic models are most appropriate for different applications, and how group communication techniques can help solve different types of problems.

- Distributed system security — Distributed systems that function over public networks require strong security services, but strong security often has high performance costs. As part of my work adding security to the Spread messaging toolkit, I have focused on how an integration of security with the design of the system can provide strong security without a prohibitive performance impact. I am interested in working on how to address security and performance in distributed systems in an integrated way. This research topic calls for working with other researchers, especially those in security and cryptography.

- Scalable, decentralized services — The predominant architecture used today in Internet services is client-server, in which the server may be distributed but it is still centralized. The bandwidth and computational resources available today to Internet users, and concerns about privacy and the power of centralized authority, have driven a movement to develop decentralized models for Internet services. I have recently begun research on how decentralized services can be built so that they provide scalability in both users and data management and resilience to the faults and changes in resources that are inevitable in any dynamic system. I am interested in continuing this line of research in services such as directory lookups and network data storage.

- Custom network protocols — One very interesting question in networking today is how custom protocols running on an overlay network interact with the underlying physical network. As part of my Ph.D research, I developed a reliable, weakly ordered transport protocol and designed an overlay network architecture to efficiently disseminate multicast messages and the control information required to correctly deliver them. I believe the overlay network model has great potential for solving real applications need for smart, highly efficient network services. To accomplish this goal, research is needed in developing protocols and understanding how they can be used successfully and safely on the Internet.

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Statement of Teaching

I view teaching as a multifaceted activity including many types of human interactions and taking place in many different environments. Teaching involves giving lectures to start students off, preparing exercises to help them learn on their own, and working with them one-on-one.

I have had the opportunity to teach several different types of students and classes. In the fall of 2001 I taught the Distributed Systems course for senior undergraduate and graduate students at Johns Hopkins as an Assistant Research Professor while my adviser was on sabbatical. I was responsible for the lectures, exercises, grading and supervising teaching assistants. Earlier, in the Fall of 1999 and 2000, I co-taught the Distributed Systems course along with my adviser. In this role I taught approximately half of the lectures, designed and created presentations for several new lectures, and was responsible for working with teaching assistants to grade the programming exercises and final project.

While an undergraduate at Cornell, I spent a summer teaching word processing and Internet use classes to non-traditional students such as faculty and staff. I also helped teach a Communications course entitled "Introduction to Debate" that involved both practical debating skills as well as rhetoric and logic theory. During graduate school I was an active volunteer coach for two university debate teams. In this role I shared my skills and knowledge with both beginning and experienced debaters. I also had a traditional teaching role as the teaching assistant for a senior undergraduate and graduate course on Computer Architecture in the Fall of 1995 and for a graduate course on Parallel Algorithms in the Spring of 1996.

Johns Hopkins University

- Instructor for Distributed Systems, Fall 2001.
- Co-instructor for Distributed Systems, Fall 1999, Fall 2000.
- Teaching Assistant for Parallel Algorithms in Spring 1996 and Computer Architecture in Fall 1995.
- Volunteer intercollegiate debate coach for Cornell University and Towson University from Fall 1995 until Spring 1997.

Cornell University

- Teaching Assistant for Introduction to Programming, Fall 1994 and Spring 1995.
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