

Amy Babay

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November 2017

Education

PhD in Computer Science, Johns Hopkins University In Progress
PhD Research: Structured overlay networks for a new generation of Internet services, dependable infrastructure, intrusion-tolerant SCADA for the power grid

Masters of Science in Engineering in Computer Science, Johns Hopkins University May 2014
Thesis: *The Accelerated Ring Protocol: Ordered Multicast for Modern Data Centers*

Bachelor of Arts in Cognitive Science, minor in Classics, Johns Hopkins University May 2012
GPA: 4.00. Phi Beta Kappa, University Honors, Departmental Honors, Dean's List

Honors and Awards

Best Paper Award (out of 531 submissions), for "Timely, Reliable, and Cost-Effective Internet Transport Service using Dissemination Graphs," Amy Babay, Emily Wagner, Michael Dinitz, and Yair Amir, IEEE International Conference on Distributed Computing Systems (ICDCS), June 2017.

Johns Hopkins Computer Science Department Special Service Award for "outstanding work to benefit the department, Johns Hopkins University, and the community," May 2015.

Excellence in Cognitive Science Award, awarded annually to a graduating Cognitive Science major for academic excellence and outstanding accomplishment in research, May 2012.

Research

Research Assistant, JHU Distributed Systems and Networks Lab September 2014-Present
June 2012-April 2014

PhD research: Developing protocols to support a new generation of Internet services, using structured overlay networks. This work has included a timely and highly reliable Internet transport service for interactive applications with demanding latency constraints, such as remote manipulation or remote robotic surgery, as well as an intrusion-tolerant network service for monitoring and control of high-value infrastructure (www.spines.org).

Building dependable infrastructure systems that maintain correct operation and predictable performance, even in the presence of sophisticated attacks and compromises. This work has developed an intrusion-tolerant SCADA system for the power grid that is resilient to both system-level compromises and network attacks (www.dsn.jhu.edu/spire).

Masters research, accelerated ring protocol: Designed and implemented a new reliable, ordered multicast protocol based on a logical token ring, improving throughput on 1-gigabit and 10-gigabit local area networks by 30-50% and reducing latency by 20-35%. Implemented the protocol in the open-source Spread toolkit, where it was adopted as the default ordering protocol for datacenter environments (www.spread.org).

Additional research: Big Data consistency, Paxos coordination, group-communication-based replication, virtual synchrony, intrusion tolerance.

Publications and Products

Released Software

Co-creator of the *Spire intrusion-tolerant SCADA system for the power grid*. Yair Amir, Trevor Aron, Amy Babay, Thomas Tantillo. First release May 2017 (creator since version 1.0, May 2017). An intrusion-tolerant SCADA system with performance guarantees under attack. Successfully withstood a red-team attack conducted by Sandia National Laboratories at Pacific Northwest National Laboratory from March 27 to April 7, 2017. (www.dsn.jhu.edu/spire).

Co-creator of the *Prime intrusion-tolerant replication engine*. Yair Amir, Jonathan Kirsch, John Lane, Marco Platania, Amy Babay, Thomas Tantillo. First release June 2010, latest release May 2017 (creator since version 3.0, May 2017). An intrusion-tolerant replication engine. Implements the first Byzantine-fault-tolerant replication protocol with performance guarantees under attack. (www.dsn.jhu.edu/prime).

Major contributor to the *Spread toolkit*. Yair Amir, Michal Miskin-Amir, Jonathan Stanton, John Schultz. First release October 1997, latest release February 2017 (major contributor since version 4.4.0, May 2014). Group Communication toolkit providing reliable, high performance, resilient messaging for local and wide-area networks. (www.spread.org).

Conference Papers

Amy Babay, Emily Wagner, Michael Dinitz, and Yair Amir, "Timely, Reliable, and Cost-Effective Internet Transport Service using Dissemination Graphs" in *Proceedings of the 37th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Atlanta, GA, June 2017, pp. 1-12. **Best paper.**

Daniel Obenshain, Thomas Tantillo, Amy Babay, John Schultz, Andrew Newell, Md. Endadul Hoque, Yair Amir, and Cristina Nita-Rotaru, "Practical Intrusion-Tolerant Networks" in *Proceedings of the 36th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Nara, Japan, June 2016, pp. 45-56.

Amy Babay and Yair Amir, "Fast total ordering for modern data centers" in *Proceedings of the 36th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Nara, Japan, June 2016, pp. 669-679.

Invited Papers

Amy Babay, Claudiu Danilov, John Lane, Michal Miskin-Amir, Daniel Obenshain, John Schultz, Jonathan Stanton, Thomas Tantillo, and Yair Amir, “Structured Overlay Networks for a New Generation of Internet Services” in *Proceedings of the 37th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Atlanta, GA, June 2017, pp. 1771-1779. (Vision Track).

Posters and Student Forum Papers

Amy Babay, “Timely, Reliable, and Cost-effective Transport Service Using Dissemination Graphs” in *IEEE/IFIP International Conference Dependable Systems and Networks (DSN)*, Rio de Janeiro, Brazil, June 2015. (Student Forum).

Amy Babay and Yair Amir, “Fast total ordering for modern data centers” in *Proceedings of the 35th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Columbus, OH, June 2015, pp. 762-763. (Extended Abstract and Poster).

Patent Applications

Yair Amir, Amy Babay, and Thomas Tantillo, “Systems and Methods for Cloud-Based Control and Data Acquisition with Abstract State,” United States Provisional Patent Application 62/451,341, filed January 2017.

Yair Amir, Amy Babay, and Thomas Tantillo, “Network-Attack-Resilient Intrusion-Tolerant SCADA Architecture,” International Patent Application PCT/US17/38565, filed June 2017.

Invited Talks

2017-11-13	Carnegie Mellon University	<i>Timely, Reliable, and Cost-Effective Internet Transport Service using Dissemination Graphs</i>
2017-11-10	Cornell University	<i>Timely, Reliable, and Cost-Effective Internet Transport Service using Dissemination Graphs</i>
2017-11-07	Princeton University	<i>Timely, Reliable, and Cost-Effective Internet Transport Service using Dissemination Graphs</i>
2017-10-13	Northeastern University	<i>Spire: Intrusion-Tolerant SCADA for the Power Grid</i>

Mentoring

Edmund (Ned) Duhaime. MSE May 2017. Co-advised with Yair Amir. Study: “Seamless Overlays for Application Use.”

Emily Wagner. MSE December 2016. Co-advised with Yair Amir. Project: “The Playback Network Simulator: Overlay Performance Simulations with Captured Data.”

Teaching

Co-Instructor, Intermediate Programming (C/C++), JHU

Fall 2017, Fall 2015,
Spring 2014, Fall 2013

Co-taught all aspects of the 60 – 90 student undergraduate course (divided into 30-student sections), including lectures, assignments, tests and grading. Worked with a team of course and teaching assistants to provide a hands-on interactive experience for students.

Special help, Distributed Systems, JHU

Fall 2014, Fall 2012

Met with students to answer questions and review project designs, graded programming and theoretical assignments

Undergraduate Course Assistant, Intermediate Programming (C/C++), JHU

Spring 2012

Assisted students one-on-one during tutorials and graded programming assignments, providing individualized feedback based on careful code review.

Professional Experience

Software Engineer, LTN Global Communications

May 2014-August 2014

Access-control system: Played an important role in the design and implementation of a system for maintaining access-control rules for a multicast flow transport and delivery service on a global scale. Code base was written in C using the TLS and DTLS protocols in OpenSSL.

Log collection and processing: Wrote Python scripts to automatically organize, compress, and collect existing logs from remote appliances across the globe, reducing the multi-Terabyte space usage by 95%.

External Grants

“AitF: EXPL: Wide-area Dissemination under Strict Reliability, Timeliness, and Cost Constraints,” National Science Foundation, September 2015 – August 2017, \$400,000. PI: Michael Dinitz, Co-PI: Yair Amir.

Coursework

Advanced computer science courses: Distributed Systems, Advanced Distributed Systems and Networks, Data-Intensive Computing, Computational Genomics, Security and Privacy in Computing, Machine Learning in Complex Domains, Algorithms, Approximation Algorithms