Roxana Geambasu

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Education

Ph.D. in Computer Science, University of Washington (UW), August 2011.
Thesis title: "Empowering Users with Control over Cloud and Mobile Data."

M.S. in Computer Science, University of Washington, 2007.

B.S. in Computer Science, Polytechnic University of Bucharest, Romania (PUB), 2005.

Work Experience

Assistant Professor, Columbia University (CU), 2011 – present.

Software engineering intern, Google, summer 2008.

Research intern, Microsoft Research, summer 2007.

Awards

Microsoft Faculty Fellowship, 2014.

Popular Science "Brilliant 10," 2014.

Google Research Award, 2013.

Honorable mention for the inaugural SIGOPS Dennis M. Ritchie Dissertation Award, 2013.

The William Chan Memorial Dissertation Award, 2011.

Best Student Paper award at the European Conference on Computer Systems, 2011.

Outstanding Student Paper award at the 18th USENIX Security Symposium, 2009.

Google Ph.D. Fellowship in Cloud Computing, 2009 – 2011.

Valedictorian of the 2005 Class at the Polytechnic University of Bucharest (PUB), 2005.

Research Theme

My research revolves around broad systems topics, including operating systems, distributed systems, and security and privacy, with a particular focus on emerging cloud and mobile technologies. One overarching theme is the development of new abstractions for *rigorous and responsible data management*. I believe that many of the security and privacy challenges we face today stem from careless data management practices by mobile apps, service providers, and users. My collaborators and I are building a set of new operating and distributed systems abstractions that facilitate rigorous management of sensitive data.

Current Projects

Modern protection abstractions for modern OSes. Data storage abstractions in OSes have evolved enormously. While traditional OSes used to provide fairly low-level abstractions – files and directories – modern OSes, including Android, iOS, OSX, and recent Windows, embed much higher-level abstractions, such as relational databases or object-relational models. Despite the change in abstraction, many crucial protection systems, such as encryption or deniable systems, still operate at the old file level, which often renders them ineffective. We are investigating new data protection abstractions that are more suitable for modern operating systems, including a new *logical data object* abstraction, which curresponds directly to user-level objects, such as emails, documents, or pictures [1,4].

XRay: Adding transparency to Web services. Today's Web services accumulate enormous sensitive information – such as emails, search logs, or locations – and use them to target advertisements, prices, or products at users. Presently, users have little insight into how their data is used for such purposes. To enhance transparency, we are building *XRay*, a Chrome plugin that predicts what data – such as emails or searches – is used to target which ads in Gmail, which prices in Amazon, etc. The mechanism is Web-service independent, though the plugin is not. The insight is to compare ads/prices witnessed by different accounts with similar, but not identical, subsets of the data [2].

Synapse: Scalable firehose for data-driven service integrations. User data has become the principal asset of the Internet era, which everyone strives to acquire and process. A new economy is emerging, in which continuously changing user data is being sold or shared for others to process upon. That economy must be controlled and managed carefully so that information can be shared efficiently, with strong semantics, and securely across applications. To this end, we are building *Synapse*, an easy-to-use, strong-semantics Web programming framework for large-scale, real-time data sharing between Web services. We have deployed an early version of Synapse at a NYC-based startup.

vTube: Interactive virtual appliance repository for long-term data preservation. While limiting accumulation is important for certain types of content, preserving it long-term is equally important for other types of content. Solutions for short- to medium-term persistence already exist, however long-term preservation (tens to hundreds of years) is an open problem. How can we ensure access to our documents, videos, photos, or applications 50 years from now when their underlying dependencies, such as libraries, codecs, OSes, and hardware platforms, will be obsolete or gone? We are building *vTube*, an interactive repository for long-term preservation and access of digital artifacts. It is similar to YouTube, but streams virtual appliances, i.e., the content plus its dependencies, instead of videos [3].

Relevant Recent Projects

Keypad: Auditing file system for mobile devices. With today's limited anti-theft tools, users can neither assuredly restrict nor remotely monitor a thief's data accesses on a stolen or lost mobile device. I built Keypad, a new file system that enhances data security on mobile devices by providing users with post-theft fine-grained access auditing [7].

Comet: Cloud storage customization with active storage. Today's cloud storage services, such as Amazon S3, are highly inflexible and impose a variety of constraints on their clients: specific data consistency properties, fixed replication factors, limited logging, etc. I built Comet, an extensible storage service that allows clients to inject snippets of code that control the behavior of their data inside the storage service [9].

Vanish: Data lifetime control with self-destructing data. Users' migration to cloud and Web services is causing them to lose control over the lifetime of their data. Vanish is a self-destructing data system that allows users to impose timeouts on their Web data, such as emails, Facebook messages, or Google Docs [8,10], `http://vanish.cs.washington.edu`.

Publications

[1] Riley Spahn, Jonathan Bell, Sravan Bhamidipati, Michael Lee, Roxana Geambasu, and Gail Kaiser. "Pebbles: Fine-Grained Data Management Abstractions for Modern Operating Systems." In *Proceedings of USENIX Operating Systems Design and Implementation (OSDI)*, Broomfield, CO, October 2014.

[2] Mathias Lécuyer, Guillaume Ducoffe, Francis Lan, Andrei Papancea, Theofilos Petsios, Riley Spahn, Augustin Chaintreau, and Roxana Geambasu. "XRay: Increasing the Web's Transparency with Differential Correlation." In *Proceedings of the USENIX Security Symposium*, San Diego, CA, August 2014.

[3] Yoshihisa Abe, Roxana Geambasu, Kaustubh Joshi, H. Andres Lagar-Cavilla, and Mahadev Satyanarayanan. "vTube: Efficient Streaming of Virtual Appliances Over Last-Mile Networks." In *Proceedings of the ACM Symposium on Cloud Computing (SoCC)*, Santa Clara, CA, October 2013.

[4] Yang Tang, Phillip Ames, Sravan Bhamidipati, Ashish Bijlani, Roxana Geambasu, and Nikhil Sarda. "CleanOS: Limiting mobile data exposure with idle eviction." In *Proceedings of the 10th USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, Hollywood, CA, October 2012.

[5] Angelos D. Keromytis, Roxana Geambasu, Simha Sethumadhavan, Salvatore J. Stolfo, Junfeng Yang, Azzedine Benameur, Marc Dacier, Matthew Elder, Darrell Kienzle, and Angelos Stavrou. "The MEERKATS Cloud Security Architecture." In *Proceedings of the 3rd International Workshop on Security and Privacy in Cloud Computing (ICDCS-SPCC)*, Macao, China, June 2012.

[6] Roxana Geambasu. "Regaining Control over Cloud and Mobile Data." Ph.D. dissertation, University of Washington, Seattle, WA, August 2011. **Honorable Mention for the Inaugural Dennis M. Ritchie Doctoral Dissertation Award (2013). The William Chan Memorial Dissertation Award (2011).**

[7] Roxana Geambasu, John P. John, Tadayoshi Kohno, Steven D. Gribble, and Henry M. Levy. "Keypad: An auditing file system for theft-prone devices." In *Proceedings of the European Conference on Computer Systems (EuroSys)*, Salzburg, Austria, April 2011. **Best Student Paper Award.**

[8] Roxana Geambasu, Tadayoshi Kohno, Arvind Krishnamurthy, Amit Levy, Henry M. Levy, Paul Gardner, and Vinnie Moscaritolo. "New directions for self-destructing data." Technical Report, University of Washington, UW-CSE-11-08-01, 2011.

[9] Roxana Geambasu, Amit Levy, Tadayoshi Kohno, Arvind Krishnamurthy, and Henry M. Levy. "Comet: An active distributed key/value store." In *Proceedings of the 9th USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, Vancouver, Canada, October 2010.

[10] Roxana Geambasu, Tadayoshi Kohno, Amit Levy, and Henry M. Levy. "Increasing data privacy with self-destructing data." In *Proceedings of the 18th USENIX Security Symposium*, Montreal, Canada, August 2009. **Outstanding Student Paper Award.**

[11] Roxana Geambasu, Steven D. Gribble, and Henry M. Levy. "CloudViews: Communal data sharing in public clouds." In *Proceedings of the 1st USENIX Workshop on Hot Topics in Cloud Computing (HotCloud)*, San Diego, CA, June 2009.

[12] Roxana Geambasu, Andrew Birrell, and John MacCormick. "Using formal specification to understand and compare fault-tolerant storage systems." In *Proceedings of the 38th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN-DCCS)*, Anchorage, AK, June 2008.

[13] Roxana Geambasu, Cherie Cheung, Alexander Moshchuk, Steven D. Gribble, and Henry M. Levy. "Organizing and sharing of Web-service objects with Menagerie." In *Proceedings of the 17th International World Wide Web Conference (WWW)*, Beijing, China, April 2008.

[14] Roxana Geambasu, Magdalena Balazinska, Steven D. Gribble, Henry M. Levy. "Home-Views: Peer-to-peer middleware for personal data sharing applications." In *Proceedings of the 26th ACM International Conference on Management of Data (SIGMOD)*, Beijing, China, June 2007.

[15] Roxana Geambasu, Tanya Bragin, Jaeyeon Jung, Magdalena Balazinska. "On-Demand view materialization and indexing for network forensic analysis." In *Proceedings of the 3rd International Workshop on Networking Meets Databases (NetDB)*, Boston, MA, April 2007.

Impact   Invited to talk about my work on data privacy and transparency on Capitol Hill, 2014. Attendees include members of the Cybersecurity Caucus of the House of Representatives.

New York Times Bits article about the XRay project, 2014. `http://bits.blogs.nytimes.com/2014/08/18/xray-a-new-tool-for-tracking-the-use-of-personal-data-on-the-web/`. Other media coverage followed, including participation in the Lopate Show at the NYC branch of NPR.

Deployment in production of an early prototype of Synapse at Crowdtap, a NYC-based startup, 2013. We used experience from the deployment to feed into next iterations. `https://github.com/crowdtap/promiscuous`

First deployment of security measures in a commercial, giant-scale distributed hash table (DHT), 2010. I designed, evaluated, and deployed practical security defenses against Sybil data-crawling attacks on DHTs. My challenging experience with this deployment led to the design of Comet, an extensible DHT, published in OSDI 2010.

Extensive media coverage around the Vanish project, 2009. Articles appeared in The New York Times, NPR, The Economist, King 5 Seattle, and other outlets.

Professional Service

Extended PC *European Conference on Computer Systems (EuroSys)*, 2015.

Member of Information Science and Technology (ISAT) study group, a select advisory group to DARPA that provides advice on long range research directions in information sciences and technology, 2014-2017.

NSF Panel for Secure and Trustworthy Computing (SaTC), 2014.

PC *USENIX Operating Systems Design and Implementation Conference (OSDI)*, 2014.

PC *ACM Cloud Computing Security Workshop (CCSW)*, 2013.

PC *ACM Symposium on Cloud Computing (SoCC)*, 2013.

PC *USENIX Security Symposium*, 2013.

PC *Workshop on Hot Topics in Operating Systems (HotOS)*, 2013.

PC *Workshop on Mobile Computing Systems and Applications (HotMobile)*, 2013.

PC *European Conference on Computer Systems (EuroSys)*, 2013.

Review Committee for the 2013 EuroSys Roger Needham Ph.D. Award, 2013.

NSF Panel for Computer Systems Research (CSR), 2012.

External PC *USENIX Operating Systems Design and Implementation (OSDI)*, 2012.

PC *USENIX Security Symposium*, 2012.

PC *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, 2011.

Diversity, Outreach

Organize hands-on app programming workshop for the Annual Engineering Exploration event organized by the Society of Women Engineers for New York City K-12 female students, 2014.

Faculty advisor on Columbia's Engleston Scholar mentorship program, 2013.

Department host at Columbia's Engineering Women's Forum, 2012, 2013.

Panelist for New York City Girls Computer Science and Engineering Conference, 2012.

Funding

Microsoft Faculty Fellowship, $200,000, 2014-2016.

Microsoft Research gift, $15,000, 2014.

PI on NSF CAREER, "New Operating Systems Abstractions for Responsible Data Management," $499,999, 2014-2019.

PI on Google Faculty Fellowship, "Promiscuous: Scalable, Consistent Firehose for Data-Driven Web Service Integrations," $79,807 across two Co-PIs, 2013-2014.

PI on Columbia Provost's Grant for Junior Faculty Who Contribute to the Diversity Goals of the University, "CleanOS: Limiting Sensitive Data Exposure in Mobile Operating Systems," $25,000, 2013-2014.

PI on DARPA Contract No. FA8650-11-C-7190, "MEERKATS: Maintaining EnterprisE Resiliency via Kaleidoscopic Adaptation & Transformation of Software Services," $6,619,270 across six Co-PIs, 2011-2015. Original PI was Angelos Keromytis.

Invited Talks

Panelist for the "Princeton Web Transparency Conference," 2014.

"Toward a Transparent Web." Invited speaker at the Diversity workshop co-located with OSDI, 2014.

"New Abstractions for Responsible Big-Data Management." Invited speaker at the DIMACS Workshop on Secure Cloud Computing, 2014.

"Increasing Privacy in a Data-Driven World." Microsoft Faculty Fellowship final competition, 2014.

"New Abstractions for Responsible Big-Data Management." Microsoft Research, 2013.

"Responsible Big-Data Management." Journalism Security Seminar organized by Columbia's Journalism School, 2013.

"Regaining Control over Mobile and Cloud Data." Cloud Computing Security Forum, part of the IEEE Global Communications Conference (Globecom), 2011.

"Cloud Computing: Benefits and Challenges." Expert talk at Columbia Senate Information Technology Committee, 2011.

"Regaining Control over Mobile and Cloud Data." Invited talk delivered at universities and industrial labs: AT&T Labs NYC, Brown University, Carnegie Mellon University, Columbia University, Cornell University, Duke University, Georgia Institute of Technology, Google, Harvard University, IBM Research, Intel Corporation, Massachussetts Institute of Technology (MIT), Microsoft Research, New York University, Symantec Research Labs, University of California at Los Angeles, University of Southern California, 2011-2012.

"Self-destructing Data and Beyond." Invited talk at the University of British Columbia Systems Colloquium, 2010.

"Vanish: Increasing Data Privacy with Self-destructing Data." Invited talk at the Google Graduate Student Forum, 2010.