

Alexander Joseph Nelson, Ph.D.

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- RESEARCH AND INTERESTS Digital forensics, computer security, indexing, long-term data management, archival storage.
- CURRENT RESEARCH Applications of metadata and standardizing representations in digital forensics and computer security.
- EDUCATION
- ◇ **Ph.D, Computer Science**
University of California, Santa Cruz, September 2008 – June 2016
Advisor: Professor Darrell D. E. Long
 - ◇ **Master of Science, Computer Science**
University of California, Santa Cruz, June 2013
Advisor: Professor Darrell D. E. Long
 - ◇ **Bachelors of Arts and Sciences, Mathematics and Computer Science**, June 2005
The Evergreen State College, Olympia, WA
- EMPLOYMENT HISTORY
- ◇ **Information Systems Analyst** June 2004 – June 2008
Looking Glass Analytics, Olympia, WA
Web service management, including user interfaces, data processing and reporting service development. Publicly-available projects include WACrimeStats.net (<http://www.wacrimestats.net/>), Paper Trail (<http://www.paper-trail.org/>), and Ask HYS (<http://www.askhys.net/>).
 - ◇ **Graduate Student Researcher** October 2008 – Present
University of California, Santa Cruz
Produced work on secure file systems and forensics, as a member of the Storage Systems Research Center (SSRC) and the Working-group on Applied Security and Privacy (WASP).
 - ◇ **Research Assistant** June 2009 – Winter 2010
Naval Postgraduate School, Monterey, CA
Computer forensics research within the Digital Evaluation and Exploration (DEEP) Laboratory. Produced work on hard drive profiling through statistical sampling.
 - ◇ **Research Assistant** June 2010 – December 2010
Naval Postgraduate School, Monterey, CA
Cloud computing security research. Produced a technical report on security and usability factors related to a Department of Defense cloud computing system.
 - ◇ **Research Assistant** June 2011 – September 2011
Naval Postgraduate School, Monterey, CA
Windows Registry Analysis. Contributed functionality improvements to the Redhat Hivex project.
 - ◇ **Visiting Research Scientist** April 2013 – March 2015
Prometheus Computing, LLC., under contract to the National Institute of Standards and Technology; Gaithersburg, MD. Full-time research scientist in digital forensic and computer security metadata applications.

◇ **Computer Scientist** March 2015 – Present

Computer Security Division, National Institute of Standards and Technology; Gaithersburg, MD. Full-time research scientist in digital forensic and computer security applications, working with the National Vulnerability Database and the National Software Reference Library on software metadata applications. Created data supplements to National Software Reference Library's Reference Data Set. Performed and published research in software forensic signature generation via application of document search formulas.

PROFESSIONAL
ACTIVITIES

◇ **USENIX**

Member

◇ **ACM**

Member

◇ **IEEE**

Member

◇ **AAFS**

Trainee Affiliate

PUBLICATIONS

- ◇ Simson Garfinkel, Alex Nelson, Douglas White and Vassil Roussev, "Using purpose-built functions and block hashes to enable small block and sub-file forensics," in *Proceedings of the DFRWS 2010 Annual Conference*, August 2010.
- ◇ Carlos Maltzahn, Esteban Molina-Estolano, Amandeep Khurana, Alex J. Nelson, Scott A. Brandt, and Sage Weil, "Ceph as a scalable alternative to the Hadoop Distributed File System," *login: The USENIX Magazine*, vol. 35, no. 4, pp. 38–49, August 2010.
- ◇ Alex J. Nelson, James Bret Michael, and George W. Dinolt, "A security perspective of transitioning organizations to the DoD Cloud," Naval Postgraduate School, Monterey, CA, USA, Tech. Rep. NPS-CS-11-002, January 2011.
- ◇ Alex J. Nelson, George W. Dinolt, James Bret Michael, and Man-Tak Shing, "A security and usability perspective of cloud file systems," *Proceedings of the 6th IEEE International Conference on System of Systems Engineering (SoSE)*, Albuquerque, NM, USA, June 2011.
- ◇ Alex J. Nelson, "RegXML: XML conversion of the Windows Registry for forensic processing and distribution," in *Advances in Digital Forensics VIII*, ser. IFIP Advances in Information and Communication Technology, G. Peterson and S. Shenoi, Eds. Springer, 2012.
- ◇ Ziqian Wan, Alex J. Nelson, Tao Li, Darrell D. E. Long, Andy Hospodor, "Computer Hard Drive Geolocation by HTTP Feature Extraction," Technical Report UCSC-SSRC-12-04, May 2012.
- ◇ Simson Garfinkel, Alex Nelson, and Joel Young, "A general strategy for differential forensic analysis," in *Proceedings of the DFRWS 2012 Annual Conference*, August 2012.
- ◇ Alex J. Nelson, Erik Q. Steggall and Darrell D. E. Long, "Cooperative mode: Comparative storage metadata verification applied to the Xbox 360," in *Proceedings of the DFRWS 2014 US Annual Conference*, August 2014.
- ◇ Alexander J. Nelson, *Software signature derivation from sequential digital forensic analysis*. Ph.D. thesis, University of California, Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, June 2016.

PATENTS

- ◇ Garfinkel, Simson Leon and Nelson, Alexander Joseph. Method for determining hard drive contents through statistical drive sampling. U.S. Patent 8,433,959, filed September 7, 2010, and issued April 30, 2013.

TALKS

- ◇ Alex J. Nelson, Mark W. Storer, Kevin M. Greenan, Ethan L. Miller, Darrell D. E. Long. “Secure data de-duplication,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, April 15, 2009.
- ◇ Alex J. Nelson, Mark W. Storer, Kevin M. Greenan, Ethan L. Miller, Darrell D. E. Long. “Secure data de-duplication,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2009.
- ◇ Simson L. Garfinkel, Aleatha Parker-Wood, Alex J. Nelson. “Automated digital forensics and media exploitation,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, November 4, 2009.
- ◇ Amandeep Khurana, Alex J. Nelson, D.J. Capelis, Ethan L. Miller, Darrell D. E. Long. “Securing Storage in High-End Computing,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, February 3, 2010.
- ◇ Alex J. Nelson, Amandeep Khurana, D.J. Capelis, Ethan L. Miller, Darrell D. E. Long. “Securing Storage in Petascale Systems,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, June 2, 2010.
- ◇ Alex J. Nelson, Brian A. Madden. “Metadata exploration in digital forensics,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, October 20, 2010.
- ◇ Alex J. Nelson, Darrell D. E. Long. “What you may not know your computer knows: Surveying forensic metadata,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, May 16, 2011.
- ◇ Alex J. Nelson, Darrell D. E. Long. “Forensically Surveying Executable Content,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2011.
- ◇ Alex J. Nelson, George W. Dinolt, James B. Michael, Man-Tak Shing. “A security and usability perspective on cloud file systems,” *6th IEEE International Conference of System of Systems Engineering (SoSE)*, Albuquerque, NM, June 27, 2011.
- ◇ Alex J. Nelson. “Cross-Drive Forensic Analysis: The Windows Registry and Geolocation Artifacts,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, October 17, 2011.
- ◇ Alex J. Nelson. “RegXML: XML conversion of the Windows Registry for forensic processing and distribution,” *Eighth Annual IFIP WG 11.9 International Conference on Digital Forensics*, Pretoria, South Africa, January 5, 2012.
- ◇ Alex J. Nelson, Sonali Somyalipi, Nakul Dhotre, Darrell D. E. Long. “Geolocation in Post-Mortem Digital Forensics,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, May 7, 2012.
- ◇ Alex J. Nelson, Sonali Somyalipi, Nakul Dhotre, Darrell D. E. Long. “Geolocation in Post-Mortem Digital Forensics,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 16, 2012.
- ◇ Simson L. Garfinkel, Alex Nelson, Joel Young. “A General Strategy for Differential Forensic Analysis,” *Digital Forensics Research Workshop 2012 Annual Conference (DFRWS)*, Washington, DC, August 7, 2012.
- ◇ Alex J. Nelson. “Techniques for Speeding the Development and Testing of Digital Forensic Tools,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, October 31, 2012.
- ◇ Alex J. Nelson, Mary T. Laamanen, John Tebbutt, Darrell D. E. Long. “Indexing the Windows Registry for Software Detection,” *American Academy of Forensic Sciences 66th Annual Scientific Meeting*, Seattle, WA, February 20, 2014.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “On the Origin of Files and Registry Cells: Measuring Namespace Evolution for Software Identification,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 21, 2014.

- ◇ Alex J. Nelson. “On the Origin of Files and Registry Cells: Measuring Namespace Evolution for Software Identification,” *Computer Science Ph.D. Qualifying Exam*, Santa Cruz, CA, May 23, 2014.
- ◇ Alex J. Nelson, Erik Q. Steggall and Darrell D. E. Long, “Cooperative mode: Comparative storage metadata verification applied to the Xbox 360,” *Digital Forensics Research Workshop 2014 US Annual Conference (DFRWS-USA)*, Denver, CO, August 5, 2014.
- ◇ Mary T. Laamenen and Alex J. Nelson, “NSRL Next Generation – Diskprinting,” *Forensics @ NIST*, Gaithersburg, MD, December 3, 2014.
- ◇ Alex J. Nelson, “Developing Software Signatures with Digital Forensic Sequence Analysis,” *Storage Systems Research Center Seminar*, Santa Cruz, CA, December 8, 2014.
- ◇ Alex Nelson, “Enumerating and Analyzing Storage Data with Digital Forensics XML,” *CurateGear 2015*, Chapel Hill, NC, January 7, 2015.
- ◇ Alex J. Nelson, Darrell D. E. Long. “Software Signature Derivation from Sequential Digital Forensic Analysis,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 23, 2015.
- ◇ Alex J. Nelson, Simson L. Garfinkel. “Measuring Systematic and Random Error in Digital Forensics,” *International Symposium on Forensic Science Error Management*, Arlington, VA, July 23, 2015.
- ◇ Alex J. Nelson, “Navigating Unmountable Media with the Digital Forensics XMLFile System,” *CurateGear 2016*, Chapel Hill, NC, January 14, 2016.
- ◇ Alex J. Nelson, “Software signature derivation from sequential digital forensic analysis,” *dissertation defense*, Santa Cruz, CA, May 3, 2016.
- (CO-AUTHOR, NOT PRESENTER) ◇ Simson Garfinkel, Alex Nelson, Douglas White, Vassil Roussev. “Using purpose-built functions and block hashes to enable small block and sub-file forensics,” *Digital Forensics Research Workshop 2010 Annual Conference (DFRWS)*, Portland, OR, August 2010.
- ◇ Andrew W. Hospodor, D J Capelis, Alex J. Nelson, Darrell D. E. Long. “Firefox Extensions Towards SSL Usability Study,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2011.
- ◇ John Tebbutt, Mary T. Laamanen, Alex J. Nelson. “Tracking the Effects of Software on Systems: A Forensic Metadata Collection,” *American Academy of Forensic Sciences 66th Annual Scientific Meeting*, Seattle, WA, February 20, 2014.
- ◇ James Jones, Tahir Khan, Kathryn Laskey, Alexander Nelson, Mary Laamanen and Douglas White. “Inferring Past Activity from Partial Digital Artifacts,” *Digital Forensics Research Workshop 2015 Annual Conference (DFRWS)*, Philadelphia, PA, August 10, 2015.
- ◇ James Jones, Tahir Khan, Kathryn Laskey, Alexander Nelson, Mary Laamanen and Douglas White. “Inferring Past Activity from Partial Digital Artifacts,” *Open Source Digital Forensics Conference (OSDFCon)*, Herndon, VA, October 28, 2015.
- POSTER PRESENTATIONS ◇ Alex J. Nelson, Mark W. Storer, Kevin M. Greenan, Ethan L. Miller, Darrell D. E. Long. “Secure data de-duplication,” *Jack Baskin School of Engineering Research Review*, Santa Cruz, CA, May 15, 2009.
- ◇ Alex J. Nelson, Mark W. Storer, Kevin M. Greenan, Ethan L. Miller, Darrell D. E. Long. “Secure data de-duplication,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2009.
- ◇ Alex J. Nelson, Amandeep Khurana, D.J. Capelis, Ethan L. Miller, Darrell D. E. Long. “Securing Storage in Petascale Systems,” *Jack Baskin School of Engineering Research Review*, Santa Cruz, CA, May 14, 2010.

- ◇ Alex J. Nelson, Amandeep Khurana, D.J. Capelis, Ethan L. Miller, Darrell D. E. Long. “Securing Storage in Petascale Systems,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, June 2, 2010.
- ◇ Alex J. Nelson, Darrell D. E. Long. “Forensically Surveying Executable Content,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2011.
- ◇ Alex J. Nelson, Darrell D. E. Long. “Forensically Surveying Executable Content,” *Spring 2012 CRIS Meeting at UCSC*, Santa Cruz, CA, April 4, 2012.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “On the Origin of Files and Registry Cells: Measuring Namespace Evolution for Software Identification,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 21, 2014.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “On the Origin of Files and Registry Cells: Measuring Namespace Evolution for Software Identification,” *Forensics @ NIST*, Gaithersburg, MD, December 4, 2014.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “Software Signature Derivation from Sequential Digital Forensic Analysis,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 23, 2015.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “Software Signature Derivation from Sequential Digital Forensic Analysis,” *Digital Forensics Research Workshop 2015 US Annual Conference (DFRWS-USA)*, Philadelphia, PA, August 10, 2015.
- (CO-AUTHOR, NOT PRESENTER) ◇ Andrew W. Hospodor, D J Capelis, Alex J. Nelson, Darrell D. E. Long. “Firefox Extensions Towards SSL Usability Study,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2011.
- ◇ Ziqian Wan, Alex Nelson, Darrell Long. “Computer disk geo-location by feature extraction,” *Storage Systems Research Center Retreat*, Santa Cruz, CA, May 18, 2011.
- ◇ Alex J. Nelson, Mary T. Laamanen, Darrell D. E. Long. “On the Origin of Files and Registry Cells: Measuring Namespace Evolution for Software Identification,” *NIST Information Technology Laboratories Science Day*, Gaithersburg, MD, October 1, 2014. (Presented by Mary Laamenen.)
- OPEN SOURCE SOFTWARE CONTRIBUTIONS ◇ Alex Nelson and Noah Watkins. Support for ceph kernel client. ASF JIRA, <https://issues.apache.org/jira/browse/HADOOP-6779>, May 2010.
- ◇ Alex Nelson. Windows Registry XML processing added to the Digital Forensics XML library, used in *bulk_extractor* and *fiwalk* from <http://afflib.org/>. August 2011.
- ◇ Alex Nelson. Windows Registry timestamp reporting, data location reporting, Mac OS X building in the Hivex library from <https://github.com/libguestfs/hivex>. March 2012.
- ◇ Alex Nelson. Support material for RegXML (Nelson, IFIP 2012). https://users.soe.ucsc.edu/~ajnelson/research/nelson_ifip12/. March 2012.
- ◇ Alex Nelson. *RegXML Extractor*. https://github.com/ajnelson/regxml_extractor. May 2012.
- ◇ Alex Nelson. *GeoProc*, disk image geolocation artifact analyzer. <https://github.com/ajnelson/geoproc>. December 2012.
- ◇ Alex Nelson and Erik Steggall. “Adaptations of The Sleuth Kit to read the Xbox 360 file system.” <https://github.com/ajnelson/sleuthkit/tree/sleuthkit-xtaf>, May 2012.
- ◇ Justin Tracey, Alex Nelson, and Erik Steggall. “Support for additional NTFS INDX structure parsers.” <https://github.com/williballenthin/INDXParse>, April 2013.
- ◇ Alex Nelson. *UPartsFS*, disk partition table as a userspace file system. <https://github.com/ajnelson/upartsfs>. May 2013.

- ◇ Alex Nelson and Erik Steggall. DFXML generation with *uxtaf*. <https://github.com/ajnelson/uxtaf>. July 2013.
- ◇ Alex Nelson. DFXML generation with *py360*. <https://github.com/ajnelson/py360>. July 2013.
- ◇ Alex Nelson. *FSNView*, file system parser comparator. <https://github.com/ajnelson/fsnview>. July 2013.
- ◇ Alex Nelson. *Diskprint analysis workflow*. https://github.com/ajnelson/diskprint_workflow. July 2013.
- ◇ Alex Nelson. *Digital Forensics XML Schema*. https://github.com/dfxml-working-group/dfxml_schema. August 2013.
- ◇ Alex Nelson. *DFXMLFS*, a userspace file system to interact with a DFXML metadata manifest like a file system, original disk not needed. <https://github.com/ajnelson/dfxmlfs>. January 2015.
- ◇ Miscellaneous tests and/or revisions also contributed to *gnulib* and *The Sleuth Kit*.

GRADUATE
COURSEWORK

- ◇ **Central Connecticut State University**
 - Introduction to Data Mining – Fall 2006
 - Data Mining Methods – Spring 2007
- ◇ **University of California, Santa Cruz**
 - Analysis of Algorithms – Fall 2008
 - Computer Architecture – Fall 2008
 - Programming Languages – Winter 2009
 - Advanced Operating Systems – Winter 2009
 - Advanced Computer Security – Spring 2009
 - Information Retrieval – Fall 2009
 - Distributed Systems – Winter 2010
 - Bayesian Statistics – Winter 2010
 - Storage Systems – Spring 2010
 - Data Management in the Cloud – audited Spring 2010
 - Introduction to Information Theory – audited Fall 2010
 - Reputation Systems – Winter 2012
- ◇ **Naval Postgraduate School, Monterey, CA**
 - Data Fusion – Summer 2009
 - Security Policies, Models & Formal Methods – audited Summer 2010

GRADUATE
RESEARCH
PROJECTS

- ◇ **Secure data de-duplication**
 - Ethan L. Miller, University of California, Santa Cruz
 - Winter 2009 – Summer 2009
- ◇ **Information flow analysis in IMP**
 - Cormac Flanagan, University of California, Santa Cruz
 - Winter 2009
- ◇ **Fast disk analysis with random sector sampling**
 - Simson Garfinkel, Naval Postgraduate School, Monterey, CA
 - Summer 2009 – Winter 2010

- ◇ **Exposing Ceph's locality information to Hadoop**
Carlos Maltzahn and Darrell D. E. Long, University of California, Santa Cruz
Spring 2009
- ◇ **Securing storage in petascale systems**
Ethan L. Miller, University of California, Santa Cruz
Winter 2010 – Fall 2010
- ◇ **Metadata exploration in digital forensics**
Darrell D. E. Long, University of California, Santa Cruz
Winter 2011 – June 2016
- ◇ **Windows Registry analysis**
Simson Garfinkel, Naval Postgraduate School, Arlington, VA
Summer 2011

UNDERGRADUATE◇ **Connectionism**

RESEARCH
PROJECTS The Implementation of an object-oriented artificial neural network
Sheryl Shulman, The Evergreen State College
Spring 2005

ADVISORY
BOARD ◇ BitCurator Access Project.

TECHNICAL
COMMITTEE ◇ Digital Forensics Research Workshop USA 2015 (DFRWS-USA 2015).
◇ Digital Forensics Research Workshop USA 2016 (DFRWS-USA 2016).
◇ 8th EAI International Conference on Digital Forensics & Cyber Crime (ICDF2C 2016).

ORGANIZING
COMMITTEE ◇ Digital Forensics Research Workshop USA 2015 (DFRWS-USA 2015).
◇ Digital Forensics Research Workshop USA 2016 (DFRWS-USA 2016).
◇ Digital Forensics Research Workshop USA 2017 (DFRWS-USA 2017).

REVIEWER ◇ The 26th IEEE Symposium on Massive Storage Systems and Technologies: Research Track
(MSST2010), May 2010.
◇ The 27th IEEE Symposium on Massive Storage Systems and Technologies: Research Track
(MSST2011), May 2011.
◇ IEEE Computers and Security (COSE).