

# David T Naylor

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## **Education** Carnegie Mellon University, Pittsburgh, PA

Ph.D., Computer Science, *Expected May 2017*

- Advisor: Peter Steenkiste

M.S., Computer Science, *May 2015*

## **The University of Iowa, Iowa City, IA**

B.S., Computer Science, *May 2011*

B.S., Mathematics, *May 2011*

- Graduated with Highest Distinction
- Graduated from the Honors Program

**Research Interests** computer networks, network security & privacy, network architecture, Web performance

## **Awards** Graduate

- Juniper Networks Fellowship, *2015–2016*
- ACM SIGCOMM Best Paper Award, *2014*
- NDSEG Fellowship, *2012–2015*

## **Undergraduate**

- Sanxay Prize for Graduate Study, *2011*
- Interdisciplinary Health Group Student Poster Session Award, *2011*
- John Deere Scholarship in Computer Science, *2010*
- Arthur Collins Scholarship in Computer Science, *2008, 2009*
- Dewey B. Stuit Honors Scholarship, *2009*
- Rhodes Dunlap Honors Scholarship, *2008, 2009, 2010*
- William and Effa McMeans Scholarship, *2007–2011*
- Old Gold Scholarship, *2007–2011*
- National Merit Scholar, *2007–2011*

## **Research Projects** Middleboxes and Secure Communication, *Spring 2014–present*

My current research aims to safely include middleboxes in secure communication sessions, giving us both the security benefits of encryption and the performance and functionality benefits of middleboxes. To do so, I have explored using techniques based on standard cryptography as well as trusted computing technologies like Intel SGX and Microsoft VSM.

## **Web Quality of Experience, Spring 2015–present**

In addition to my thesis work, I continue to collaborate with colleagues from Telefónica Research on projects relating to Web performance. Two such projects are the HTTP/2 Dashboard, where we track the adoption of HTTP/2 among the top 2.5 million Alexa sites, and Eyeorg, a tool we built for crowdsourcing large-scale Web quality of experience measurements.

## **Balancing Accountability and Privacy, Fall 2013–present**

This work considers how changes to the network architecture can help strike a balance in the tussle between accountability (i.e., knowing who sends each packet) and privacy (i.e., hiding who

sends each packet). We do this by splitting today’s overloaded source address into two fields: an *accountability address* and a *return address*.

#### **eXpressive Internet Architecture (XIA), Fall 2011–present**

XIA, one of five future Internet architecture projects funded by the NSF, is a clean-slate redesign of the Internet aiming to (1) make the Internet *evolvable*—good ideas in the future shouldn’t require a “flag day” upgrade, (2) support an extensible set of communication paradigms (like content- or service-centric communication) that align with what applications actually want to do, and (3) provide “intrinsic” security at the network layer.

#### **Computational Epidemiology Group** (University of Iowa), *Spring 2009–Summer 2011*

I studied the spread of disease and outbreak prevention; in particular, I did this in a hospital setting by using wireless sensor networks to examine social networks among healthcare workers and to monitor hand hygiene compliance. I used this data to drive outbreak simulations.

### **Industry**

#### **Microsoft Research**, Cambridge, UK

*Research Intern*

**Summer 2016**

Hosts: Thomas Karagiannis and Christos Gkantsidis

Designed an extended version of TLS to allow endpoints to verify that middleboxes are running known, trusted code using technologies like Intel SGX and Microsoft VSM. Implemented a prototype using OpenSSL and the Intel SGX SDK.

#### **Telefónica Research**, Barcelona, Spain

*Research Intern*

**Summer 2014**

Host: Dina Papagiannaki

Studied the performance, energy, and functionality impacts of HTTPS. Based on our findings, designed and implemented Multi-Context TLS, a protocol for including middleboxes in TLS connections with access control.

#### **Virtual Reality Applications Center**, Iowa State University

*Programmer*

**Summer 2008, Summer 2009, Winter 2009**

Host: Eve Wurtele

I worked on a team at ISU’s world-famous virtual reality center developing Meta!Blast, an interactive 3D computer game designed to enhance cell biology education in high schools. One of my projects was developing the game’s character animation library.

### **Publications**

- [1] EYEORG: A Platform For Crowdsourcing Web Quality Of Experience Measurements. Varvello, M., J. Blackburn, **D. Naylor**, K. Papagiannaki. *CoNEXT ’16*, December 2016.
- [2] Is the Web HTTP/2 Yet? Varvello, M., K. Schomp, **D. Naylor**, J. Blackburn, A. Finamore, K. Papagiannaki. *PAM ’16*, March 2016.
- [3] Do You Know Where Your Headers Are? Comparing the Privacy of Network Architectures with Share Count Analysis. **Naylor, D.**, P. Steenkiste. *HotNets ’15*, November 2015.
- [4] Multi-Context TLS (mcTLS): Enabling Secure In-Network Functionality in TLS. **Naylor, D.**, K. Schomp, M. Varvello, I. Leontiadis, J. Blackburn, D. Lopez, K. Papagiannaki, P. Rodriguez, P. Steenkiste. *SIGCOMM ’15*, August 2015.
- [5] Practical, Real-time Centralized Control for CDN-based Live Video Delivery. Mukerjee, M.K., **D. Naylor**, J. Jiang, D. Han, S. Seshan, H. Zhang. *SIGCOMM ’15*, August 2015.
- [6] The Cost of the “S” in HTTPS. **Naylor, D.**, A. Finamore, I. Leontiadis, Y. Grunenberger, M. Mellia, M. Munafò, K. Papagiannaki, P. Steenkiste. *CoNEXT ’14*, December 2014.

- [7] Balancing Accountability and Privacy in the Network. **Naylor, D.**, M.K. Mukerjee, P. Steenkiste. *SIGCOMM '14*, August 2014. **(Best Paper Award)**
- [8] XIA: Architecting a More Trustworthy and Evolvable Internet. **Naylor, D.**, M.K. Mukerjee, P. Agyapong, R. Grandl, R. Kang, M. Machado, S. Brown, C. Doucette, H.C. Hsiao, D. Han, T. Kim, H. Lim, C. Ovon, D. Zhou, S.B. Lee, Y.H. Lin, C. Stuart, D. Barrett, A. Akella, D. Andersen, J. Byers, L. Dabbish, M. Kaminsky, S. Kiesler, J. Peha, A. Perrig, S. Seshan, M. Sirbu, P. Steenkiste. *SIGCOMM CCR*, July 2014.
- [9] Using Sensor Networks to Study the Effect of Peripatetic Healthcare Workers on the Spread of Hospital-Associated Infections. Hornbeck, T., **D. Naylor**, A.M. Segre, G. Thomas, T. Herman, and P.M. Polgreen. *Journal of Infectious Diseases*, 2012.
- [10] On Hand Hygiene Compliance and Diminishing Marginal Returns: An Empirically-Driven Agent-Based Simulation Study. Hornbeck, T., **D. Naylor**, A.M. Segre, G. Thomas, T. Herman, and P.M. Polgreen. *The Computational Social Science Society of the Americas Annual Conference*, 2011.
- [11] Improving Patient Safety With Hand Hygiene Compliance Monitoring. Thomas, G., P. Polgreen, T. Herman, D. Sharma, B. Johns, H. Chen, G. Scranton, **D. Naylor**, M. Ireland, T. McCarty, T. Decker, A. Segre. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 55(1):823–827, 2011.

#### Posters and Demos

- [1] Enabling Near Real-time Central Control for Live Video Delivery in CDNs. Mukerjee, M.K., J. Hong, J. Jiang, **D. Naylor**, D. Han, S. Seshan, H. Zhang. *SIGCOMM '14*, August 2014. (Poster)
- [2] Supporting Network Evolution and Incremental Deployability with XIA. Grandl, R., D. Han, S.B. Lee, H. Lim, M. Machado, M.K. Mukerjee, **D. Naylor**. *SIGCOMM '12*, August 2012. (Demo)
- [3] XIA: An Evolvable, Expressive, and Secure Internet Architecture. **Naylor, D.**, D. Han, M.K. Mukerjee, S.B. Lee, P. Steenkiste. *GENI Engineering Conference 12*, November 2011. (Poster/Demo)
- [4] Analyzing the Impact of Superspreading Using Hospital Contact Networks. **Naylor, D.**, T. Hornbeck, A.M. Segre, and P.M. Polgreen. *International Meeting on Emerging Diseases and Surveillance*, February 2011. (Poster)

#### Talks

- [1] EYEORG: A Platform For Crowdsourcing Web Quality Of Experience Measurements. *CoNEXT '16*, December 2016.
- [2] Balancing Privacy and Functionality: Secure Communication with Middleboxes. *CyLab Seminar Series, CMU*, December 2016.
- [3] Managing Privacy Tradeoffs in the Internet. *Microsoft Research Cambridge*, August 2016.
- [4] Do You Know Where Your Headers Are? Comparing the Privacy of Network Architectures with Share Count Analysis. *HotNets '15*, November 2015. <https://youtu.be/gNAD-hicF6s>
- [5] Multi-Context TLS (mcTLS): Enabling Secure In-Network Functionality in TLS. *SIGCOMM '15*, August 2015. <https://youtu.be/9ERBeLU-yZI>
- [6] The Cost of the “S” in HTTPS. *CoNEXT '14*, December 2014.
- [7] Balancing Accountability and Privacy in the Network. *SIGCOMM '14*, August 2014.
- [8] eXpressive Internet Architecture. *GENI Engineering Conference 15*, October 2012. <https://youtu.be/oHYKgVW4-o> (jump to 9:10)

<b>Teaching</b>	Fall 2013	<b>TA for Undergraduate Computer Networks (15-441)</b>	<i>Peter Steenkiste</i>
	Fall 2012	<b>TA for Graduate Computer Networks (15-744)</b>	<i>Peter Steenkiste</i>

<b>Graduate Coursework</b>	<b>Carnegie Mellon University</b>		
	Spring 2014	<b>Software Security</b>	<i>Lujo Bauer</i>
	Spring 2013	<b>Machine Learning</b>	<i>Barnabás Póczos and Alex Smola</i>
	Fall 2012	<b>Computer Architecture</b>	<i>Todd Mowry</i>
	Fall 2012	<b>Network Security</b>	<i>Adrian Perrig</i>
	Spring 2012	<b>Advanced Storage Systems</b>	<i>Greg Ganger and Garth Gibson</i>
	Spring 2012	<b>Graduate Algorithms</b>	<i>Manuel Blum</i>
	Fall 2011	<b>Computer Networks</b>	<i>Peter Steenkiste</i>
	Fall 2011	<b>Types and Programming Languages</b>	<i>Bob Harper</i>
	<b>The University of Iowa</b>		
	Spring 2011	<b>Distributed Systems and Algorithms</b>	<i>Sukumar Ghosh</i>
	Spring 2010	<b>Artificial Intelligence</b>	<i>Alberto Segre</i>
	Fall 2009	<b>Knowledge Discovery (Machine Learning)</b>	<i>Nick Street</i>

<b>Service</b>	<b>Doctoral Review Committee, Carnegie Mellon University</b>	
	<i>Member</i>	<b>Spring 2013 – present</b>

<b>CS Admitted Student Open House, Carnegie Mellon University</b>	
<i>Student Co-Coordinator</i>	<b>Spring 2013, Spring 2014</b>

<b>Dec/5, Carnegie Mellon University</b>	
<i>President</i>	<b>Fall 2012 – Spring 2013</b>
Co-direct the School of Computer Science's graduate student social organization. My primary responsibility is organizing the Dec/5 "TGs" — SCS-wide happy hours sponsored by industry recruiters and held roughly twice a month.	

<b>Lecture Committee, University of Iowa</b>	
<i>Member</i>	<b>Fall 2010 – Spring 2011</b>
Planned and produced the only student-run lecture series in the US. Duties included contacting agents, preparing publicity materials, hosting speakers on campus, and coordinating lectures' technical needs. Our Lecture Series included Aasif Mandvi from The Daily Show and Wikipedia founder Jimmy Wales.	

<b>Other Interests</b>	photography, theatrical lighting design, running
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<b>References</b>	<b>Peter Steenkiste</b> <i>Professor</i> Computer Science and ECE Departments Carnegie Mellon University prs AT cs.cmu.edu	<b>Srinivasan Seshan</b> <i>Professor</i> Computer Science Carnegie Mellon University srini AT cs.cmu.edu
	<b>Adrian Perrig</b> <i>Professor</i> Computer Science ETH Zürich adrian.perrig AT inf.ethz.ch	<b>Konstantina Papagiannaki</b> <i>Staff Engineer</i> Google, Inc. dpapagia AT google.com