

W. Michael Petullo

Free and open source programmer, security researcher, and teacher

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I have followed in the footsteps of the pioneers of the free and open source software communities since 1999, making humble contributions to the progress of our software base. The outcomes of my work exist at <http://www.flyn.org/> in the form of a number of software packages, research findings, and technical documentation. Through this all, I have had the pleasure of leading and contributing to teams that spanned academia, free and open source software development, and military service.

Work Experience

- 2020–2022 Currently an Assistant Professor within the Computer Science Department at the University of Wisconsin–La Crosse. I wrote Aquinas (<https://www.aquinas.dev/>), a large software system that helps teach students the practices of programming and exploit development. Largely written in Go, Aquinas allows students to submit project solutions with Git that the system then autogrades using a number of techniques.
- 2021–2022 Performed software development as a consultant for a number of clients. Wrote web-based applications in Go. Deployed and maintained Internet services on private hosts, including custom configurations of BIND, Lighttpd, Postfix, and Dovecot.
- 2017–2020 Served as the Director and Lead Developer of the US Army’s Cyber Solutions Development Detachment. This organization consisted of over 100 developers, and it provided custom software and hardware products to the Cyber Mission Force and other Army and Joint customers. *Retired from the US Army as a Lieutenant Colonel in 2020.*
- 2013–2017 Served as an Assistant Professor within the Electrical Engineering and Computer Science Department at the United States Military Academy at West Point.
- 2010–2013 Selected by the US Army for advanced civil schooling. My Ph.D. dissertation is titled “Rethinking Operating System Interfaces to Support Robust Network Applications.”
- 2007–2010 Served as the Communications Officer and Signal Center Director for 3rd Battalion, 3rd Special Forces Group (Airborne). During Operation Enduring Freedom XI, I was responsible for the planning and installation of all IP networks (LAN and TDMA/VSAT/WAN), IT systems, and combat network radio base stations (VHF, single-channel tactical satellite, and HF) in support of a 300-man Special Operations Task Force conducting combat operations in Regional Command–East, Afghanistan. During Operation Enduring Freedom XV, I served as the Chief of Operations for Special Operations Task Force–East, Afghanistan.
- 2004–2006 Employed as a Test Engineer by WMS Gaming. Responsible for the software testing of video slot machines. Developed and executed test plans for the Linux-based CPU-NXT OS and for original game themes. Tested for jurisdictional compliance, interoperability with casino management systems, and functionality.
- 2001–2003 Served as a platoon leader in V Corps’ long-range surveillance company, Company E, 51st Infantry. Provided communication support and training to Infantrymen with the mission of surveillance behind enemy lines. Conducted military static-line parachute operations. Led 36 men. Deployed to Kuwait and Iraq during Operation Iraqi Freedom. Responsible for a major communication equipment modernization program prior to deploying. Designed a satellite radio-based long range media transmission system using PCMCIA data controllers, digital video cameras, and ruggedized laptops. In Iraq I developed a long range communication plan for our surveillance teams during classified operations using tactical satellite and high frequency radios. Was also responsible for maintaining a classified OpenBSD mail server. Participated in a humanitarian mission to repair an elementary school in Balad, Iraq.

Work Experience (continued)

- 1999–2001 Served as a platoon leader in the 32nd Signal Battalion. Responsible for the training and leadership of 60 soldiers. Primary steward of \$15,000,000 in military communications equipment. Maintained tactical telephone and packet switch vehicles and deployed them throughout Germany to support training exercises.
- 1998–1999 Employed as a software developer at `dice.com` in Des Moines, Iowa. Wrote C code that served as the interface between customers and Dice's Oracle database. Was responsible for developing secure, user-friendly CGI programs that supported the company's daily operations.
- 1998–1999 Employed by Drake University as a UNIX system administrator. Selected as the sole designer and administrator of a new Drake University Linux laboratory. Responsible for researching, designing the use of, and configuring software such as NIS, NFS, the automounter tool, and the Big Brother monitoring system. Created many tools to simplify administering the laboratory.

Education

- 2013 Doctor of Philosophy in Computer Science, University of Illinois at Chicago
2005 Master of Science in Computer Science, DePaul University
1999 Bachelor of Science in Computer Science, Drake University

Free and Open Source Programming

- 2018–Present Designed, built, and presently maintain Aquinas, an interactive learning system that aims to teach computer programming and exploit development. Deployed at <http://www.aquinas.dev>.
- 2020 Worked with Thomas Petazzoni to add SELinux support to OpenWrt. Documented by Linux Weekly News (<https://lwn.net/Articles/832876/>).
- 2016–2017 Implemented with four students VISORFLOW, a tool that uses VM introspection to impose a simple, information-flow based access control model on guests running Linux or Windows. VISORFLOW neither requires notable modifications to the guest operating system nor depends on specialized applications.
- 2015–2016 Implemented with two students SIMPLEFLOW, a modification to the Linux kernel that uses the Linux Security Module interface to implement a simple, information-flow based access control model.
- 2010–Present Contributor to the Ethos research operating system project, including contributions to both the kernel and its userspace. Also one of the lead designers and implementors of the MINIMALT network protocol. These were the subjects of my Ph.D. dissertation.
- 2010–Present Serve as an OpenWrt contributor; I presently maintain 54 packages.
- 2008–Present Maintain libdmapsharing and dmapd which implement Apple's iTunes and iPhoto media-sharing protocols.
- 2008 Added support to GRUB for encrypted boot partitions.
- 2005 Implemented support for removable, encrypted disks on Fedora and Red Hat Enterprise Linux.
- 2004 Wrote pam-keyring, which was eventually integrated into GNOME's gnome-keyring.
- 2003–Present Serve as a Fedora Project contributor; I presently maintain 44 packages.
- 1999–Present Submitted over 60 source patches to a wide range of open source projects.
- 1999–Present Established Flynn Computing, a project I started to provide custom software solutions based on free and open source software. Located at <http://www.flyn.org>.

Refereed Publications

- Petullo, W. Michael. "Courses as Code: The Aquinas Learning System". In: *Cyber Security Experimentation and Test Workshop*. CSET '22. Virtual: Association for Computing Machinery, Aug. 2022. URL: <http://www.flyn.org/publications/2022-Aquinas.pdf>.
- Nosco, Tim, Jared Ziegler, Zechariah Clark, Davy Marrero, et al. "The Industrial Age of Hacking". In: *Proceedings of the 29th USENIX Security Symposium*. USENIX Security '20. (16% acceptance rate). Boston, Massachusetts, USA: USENIX Association, Aug. 2020. URL: <http://www.flyn.org/publications/2020-Industrial-Hacking.pdf>.

Refereed Publications (continued)

- O'Connor, T.J., William Enck, W. Michael Petullo, and Akash Verma. "PIVOTWALL: SDN-Based Information Flow Control". In: *Proceedings of the Symposium on SDN Research*. SOSR '18. Los Angeles, California, USA: ACM, Mar. 2018.
- Shockley, Matt, Chris Maixner, Ryan Johnson, Mitch DeRidder, et al. "Using VISORFLOW to Control Information Flow without Modifying the Operating System Kernel or its Userspace". In: *Proceedings of the 2017 ACM CCS International Workshop on Managing Insider Security Threats*. MIST '17. Dallas, Texas, USA: ACM, Oct. 2017, pp. 13–24. URL: <http://www.flyn.org/publications/2017-VisorFlow.pdf>.
- Johnson, Ryan, Jessie Lass, and W. Michael Petullo. "Studying Naïve Users and the Insider Threat with SIMPLEFLOW". In: *Proceedings of the 8th ACM CCS International Workshop on Managing Insider Security Threats*. MIST '16. Vienna, Austria: ACM, Oct. 2016, pp. 35–46. URL: <http://www.flyn.org/publications/2016-SimpleFlow.pdf>.
- Petullo, W. Michael, Kyle Moses, Ben Klimkowski, Ryan Hand, et al. "The Use of Cyber-Defense Exercises in Undergraduate Computing Education". In: *Proceedings of the 2016 USENIX Workshop on Advances in Security Education*. ASE '16. Austin, Texas, USA: USENIX Association, Aug. 2016. URL: <http://www.flyn.org/publications/2016-CDX.pdf>.
- Petullo, W. Michael and Joseph Suh. "On the Generality and Convenience of Etypes". In: *Proceedings of the 2015 IEEE Security and Privacy Workshops*. San Jose, California, USA: IEEE, May 2015. URL: <http://www.flyn.org/publications/2015-Etypes-Generality.pdf>.
- St. Amour, Leo and W. Michael Petullo. "Improving Application Security Through TLS-Library Redesign". In: *Proceedings of the Fifth International Conference on Security, Privacy, and Applied Cryptography Engineering*. Ed. by Peter Schwabe, Jon Solworth, and Rajat Subhra. (30% acceptance rate). Jaipur, Rajasthan, India: Springer, Oct. 2015. URL: <http://www.flyn.org/publications/2015-libtlssep.pdf>.
- Moses, Kyle V. and W. Michael Petullo. "Teaching Computer Security". In: *Proceedings of the ASEE Middle Atlantic Section Meeting*. ASEE MidAtlantic '14. Swarthmore, Pennsylvania, USA: ASEE, Nov. 2014. URL: <http://www.flyn.org/publications/2014-Teaching-Computer-Security.pdf>.
- Petullo, W. Michael, Jon A. Solworth, Wenyan Fei, and Pat Gavlin. "Ethos' Deeply Integrated Distributed Types". In: *Proceedings of the 2014 IEEE Security and Privacy Workshops*. San Jose, California, USA: IEEE, May 2014. URL: <http://www.flyn.org/publications/2014-Ethos-Types.pdf>.
- Petullo, W. Michael and Jon A. Solworth. "Simple-to-use, Secure-by-design Networking in Ethos". In: *Proceedings of the 6th European Workshop on System Security*. EUROSEC '13. (30% acceptance rate). Prague, Czech Republic: ACM, Apr. 2013. URL: <http://www.flyn.org/publications/2013-Simple-Secure-Networking.pdf>.
- Petullo, W. Michael, Xu Zhang, Jon A. Solworth, Daniel J. Bernstein, et al. "MINIMALT: Minimal-latency Networking Through Better Security". In: *Proceedings of the 2013 ACM SIGSAC Conference on Computer and Communications Security*. CCS '13. (20% acceptance rate). Berlin, Germany: ACM, Nov. 2013, pp. 425–438. URL: <http://www.flyn.org/publications/2013-MinimalLT.pdf>.
- Petullo, W. Michael and Jon A. Solworth. "Digital identity security architecture in Ethos". In: *Proceedings of the 7th ACM workshop on Digital Identity Management*. DIM '11. (45% acceptance rate). Chicago, Illinois, USA: ACM, Oct. 2011, pp. 23–30. ISBN: 978-1-4503-1006-2. URL: <http://www.flyn.org/publications/2011-Ethos-Identity.pdf>.

Ph.D. Dissertation

- Petullo, W. Michael. "Rethinking Operating System Interfaces to Support Robust Network Applications". PhD thesis. Chicago, Illinois, USA: University of Illinois at Chicago, May 2013. URL: <http://www.flyn.org/publications/2013-Petullo-Dissertation.pdf>.

Teaching Assignments

2022–2023	UW–L CS120, Software Design 1 UW–L CS356, Software Exploitation UW–L CS410/510, Open Source Software Development UW–L CS441, Operating System Concepts UW–L CS455/555, Fundamentals of Information Security
2021–2022	UW–L CS120, Software Design 1 UW–L CS356, Software Exploitation UW–L CS455/555, Fundamentals of Information Security UW–L CS456/556, Secure Software Development
2020–2021	UW–L CS120, Software Design 1 UW–L CS410/510, Open Source Development UW–L CS455/555, Fundamentals of Information Security UW–L CS456/556, Secure Software Development
2016–2017	USMA CS481, Operating Systems USMA CS401, Software Systems Design USMA XE402, Integrative Systems Design USMA CS474, Fundamentals of Computer Theory USMA CS482, Cyber Security Engineering
2015–2016	USMA CS481, Operating Systems USMA CS401, Software Systems Design USMA XE402, Integrative Systems Design USMA CS301, Fundamentals of Computer Science USMA CS482, Cyber Security Engineering
2014–2015	USMA CS481, Operating Systems USMA CS482, Cyber Security Engineering
2013–2014	USMA CS481, Operating Systems USMA IT305, Theory and Practice of Military Information Systems

Invited Talks and Presentations

Petullo, W. Michael and Jon A. Solworth. “The Lazy Kernel Hacker and Application Programmer”. Presentation at the 3rd ACM workshop on Runtime Environments, Systems, Layering and Virtualized Environments. Houston, Texas, USA, Mar. 2013. URL: <http://www.flyn.org/publications/2013-Lazy-Kernel-Hacker.pdf>.

Petullo, W. Michael. *Let's Help Johnny Write Robust Applications*. Invited talk, December 3, University of Wisconsin–Madison. 2012.

Magazine Articles

- Petullo, W. Michael. "Building custom firmware with OpenWrt". In: *Linux Journal* 2010.196 (Aug. 2010). Belltown Media, pp. 56–61. ISSN: 1075-3583. URL: <http://www.linuxjournal.com/article/10687>.
- "From camera to website: Building an open source video streamer". In: *Red Hat Magazine* (Apr. 2008). URL: <http://magazine.redhat.com/2008/04/24/from-camera-to-website-building-an-open-source-video-streamer/>.
 - "Open source telephony: a Fedora-based VoIP server with Asterisk". In: *Red Hat Magazine* (July 2008). URL: <http://magazine.redhat.com/2008/07/24/open-source-telephony-a-fedora-based-voip-server-with-asterisk/>.
 - "Serving Apples: Integrating Mac OS X clients into a Fedora network". In: *Red Hat Magazine* (Jan. 2008). URL: <http://magazine.redhat.com/2008/01/17/serving-apples-integrating-mac-os-x-clients-into-a-fedora-network/>.
 - "Disk encryption in Fedora: Past, present and future". In: *Red Hat Magazine* (Jan. 2007). URL: <http://magazine.redhat.com/2007/01/18/disk-encryption-in-fedora-past-present-and-future/>.
 - "Adding encryption support to HAL: A user's experience with Fedora development". In: *Red Hat Magazine* (Oct. 2005). URL: <http://www.redhat.com/magazine/012oct05/features/hal/>.
 - "Developing GNOME applications with Java". In: *Linux Journal* 2005.135 (July 2005). Belltown Media, pp. 72–78. ISSN: 1075-3583. URL: <http://www.linuxjournal.com/article/8111>.
 - "Encrypt your root filesystem". In: *Linux Journal* 2005.129 (Jan. 2005). Belltown Media. ISSN: 1075-3583. URL: <http://www.linuxjournal.com/article/7743>.
 - "Implementing encrypted home directories". In: *Linux Journal* 2003.112 (Aug. 2003). Belltown Media. ISSN: 1075-3583. URL: <http://www.linuxjournal.com/article/6481>.
 - "Amateur Video Production Using Free Software and Linux". In: *Linux Journal* (May 2002). Belltown Media. URL: <http://www.linuxjournal.com/article/5817>.

Grants Awarded

- 2015 National Science Foundation CRII: SaTC: Next-Generation Robust Software (\$30,234)
2022 UW–L: An Internet-Wide Learning Platform that Supports System- and Network-Security Education (\$1,500)

Committees and Panels

- 2022 Program Committee, 27th Annual Conference on Innovation and Technology in Computer Science Education
2017 Program Committee, Ninth ACM CCS International Workshop on Managing Insider Security Threats
2015 Program Committee, Fifth International Conference on Security, Privacy, and Applied Cryptography Engineering
National Science Foundation Secure and Trustworthy Cyberspace

Academic Service and Professional Activities

- 2021–Present Department of Computer Science network and computer system administrator
2014–2017 Head Coach, United States Military Academy Cyber Defense Exercise Team. Our team won the 2016 competition against our fellow United States Service Academies and the Royal Military College of Canada.
2014–2016 Deputy Program Director, United States Military Academy Computer Science Program.
2014–2016 Steering Committee Member, United States Military Academy Computer Science Program.
2013–2016 Faculty Advisor, United States Military Academy Chapter of YIII.
2011–2012 Coordinator for a weekly seminar at the University of Illinois at Chicago covering advanced topics in programming (average attendance was 35 students).
2010 Mentor, Google Summer of Code; my student added DACP remote-control support to libdmapsharing.
2005–Present Member, YIII, the International Honor Society for the Computing and Information Disciplines.