Timothy J. Salo

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QUALIFICATIONS

- Three decades experience researching, designing, developing, marketing, deploying and operating data communications and Internet technologies, products, and networks
- Principal Investigator for AFRL, DARPA, NASA, NOAA, NSF research contracts
- Fifteen years management experience: research, product management, software development

RESESARCH INTERESTS

Principal research interests include: enhanced, Internet-like protocols and related technologies for use in severely resource-constrained environments, where very limited bandwidth, processor power, memory, or electrical power make the use of unmodified Internet protocols infeasible; potential applications of these technologies include large-scale, wide-area wireless networks for environmental monitoring and hydrologic warning, wireless machine-to-machine networks, wireless ad hoc networks, low-power wireless networks, wireless sensor networks, tactical networks, and space networks.

EXPERIENCE

2000 – **Founder and President, Salo IT Solutions, Inc.**, Minneapolis, MN. <http://www.saloits.com/>

Research, design, and implement advanced Internet technologies and solutions for demanding network environments, such as wireless ad hoc networks, low-power wireless networks, wireless sensor networks, tactical networks, space networks, hydrologic warning systems and large-scale environmental monitoring networks.

- **Principal Investigator**, *NOAA/eNvironmental Beacon (nBeacon) System*. Funded by NOAA.
- **Principal Investigator**, *Wide-area Environmental Sensing and alerTing networks (WESTnets)*, Funded National Oceanic and Atmospheric Administration (NOAA).
- **Principal Investigator**, *Analysis of Very Narrowband Requirements for Hydrologic Frequencies*. Funded by NOAA.
- **Principal Investigator**, *ALERT-2 Protocol Development.* Funded by NOAA.
- **Principal Investigator**, *An Extensible QoS Framework for Secure Tactical Networks*. Funded by Air Force Research Laboratory (ARFL).

EXPERIENCE (continued)

2022 – **Graduate Research Assistant, University of Minnesota**, Minneapolis, MN.

2020 – 2021 **Graduate Teaching Assistant, University of Minnesota**, Minneapolis, MN.

- Graduate Teaching Assistant for CSci 4211 (Introduction to Computer Networks) and CSci 4061 (Introduction to Operating Systems).

2017 – 2018 **Lecturer**, UW-Stout, Menomonie, Wi.

- Taught two sections of CS-442, Systems Programming (Operating Systems).

2014 **Adjunct Faculty, University of St. Thomas**, St. Paul, MN

Taught CISC 370, Computer Networks.

2001 – 2004 **Sr. R&D Engineer, Architecture Technology Corp.**, Eden Prairie, MN.

Created proposals for and oversaw execution of federally funded network research and development projects. Projects included:

- **Principal Investigator**, *Embedded Transport Agents for Near-Earth Communications*. Funded by NASA Glenn Research Center.
- **Principal Investigator**, *Proximity Networks Technology Assessment*. Funded by NASA Glenn Research Center.

1988 – 2000 **Director, Advanced Networking Group, Network Computing Services, Inc.** (formerly Minnesota Supercomputer Center, Inc.; acquired by Cray Research, Inc., SGI, and netASPx), Minneapolis, MN.

Created, acquired external funding for, and managed an Internet research group. Responsible for projects from conception through completion, including:

- **Principal Investigato**r, *Real-Time Visualization of IP Flows over Switched WANs*. Funded by DARPA.
- **Principal Investigator**, *MAGIC-II*. Funded by DARPA.
- **Principal Investigator**, *MAGIC Gigabit Testbed*. Funded by DARPA.

1979 – 1988 **Manager, Product Management; Product Manager; Manager, Compiler and Tools Development; Systems Engineer; Senior Systems Programmer, NCR Comten**, St. Paul, MN.

1976 – 1979 **Systems Software Programmer, University of Minnesota**, Minneapolis, MN.

EDUCATION

- Ph.D. Candidate, Computer Science, University of Minnesota, present
- Masters of Science, Computer Science, University of Minnesota, 2019
- Masters of Science, Software Engineering, University of St. Thomas, 2002
- Masters of Business Administration, University of Minnesota, 1986
- Bachelor of Science with Distinction, Computer Science, University of Minnesota, 1978

PATENTS

Salo, Timothy J., "Method and Apparatus for Providing Semantically Aware Network Services", U.S. Patent Number 8,745,185 B1, Issued June 3, 2014.

Salo, Timothy J., "Apparatus and Method for Providing Semantically Aware Network Services", U.S. Patent Number 9,338,253 B2, Issued May 10, 2016.

Salo, Timothy J., "Semantically Aware Network Services and Method", Patent Number 9,985,934, Issued May 29, 2018.

Salo, Timothy J., "Semantically Aware Network Method and Apparatus", Patent Number 11,102,181, Issued August 24, 2021.

PUBLICATIONS AND PRESENTATIONS

- Salo, Timothy J., Udhaya Kumar Dayalan, Rostand A. K. Fezeu, Ziyan Wu, and Zhi-Li Zhang. "Fine-Grained, Application-Driven, QoS for IP and 5G Networks", IEEE Next G Summit, June 14, 2022, Johns Hopkins University Applied Physics Lab.
- Salo, Timothy J. and Zhi-Li Zhang, "Semantically Aware, Mission-Oriented (SAMO) Networks: A Framework for Application/Network Integration", NAI '20: Proceedings of the Workshop on Network Application Integration/CoDesign, August 2020, Washington, D.C.
- Salo, Timothy J., "Android Things: Adding Intelligence to the Network Edge", DefFest MN, February 2, 2019, Minneapolis, MN
- Salo, Timothy J., "Interfacing Android Things with an Arduino Real-World Experience and Observations", IoTDevFest, January 26, 2019, Phoenix, AZ
- Salo, Timothy J., "Android Things: Getting Started with Adding Intelligence to the Network Edge", Sensors Midwest 2018, October 17, 2018. Chicago, IL
- Salo, Timothy J., "Getting Started with Android Things: Google's Internet of Things Solution", IoTFuse 2018, May 3, 2018. Minneapolis, MN
- Salo, Timothy J., "Getting Started with Android Things, Google's Internet of Things Solution", DevFestMN, February 10, 2018, Minneapolis, MN.
- Salo, Timothy J., "Bluetooth Low Energy (BLE) Beacons: A Technical Introduction", DevFestMN, February 4, 2017, Minneapolis, MN.
- Salo, Timothy J., "Bluetooth Low Energy (BLE) Beacons: A Technical Introduction", MinneBar 12, March 25, 2017, Minneapolis, MN.
- Salo, Timothy J., "Bluetooth Low Energy (BLE) Beacons: A Technical Introduction", Embedded System Conference – Silicon Valley, December 6, 2016, San Jose, CA.
- Salo, Timothy J., "Bluetooth Low Energy (BLE) Beacon Technologies from Google: Physical Web, Eddystone, and More", DevFestMN [a Google Developers Group conference], February 6, 2016, Minneapolis, MN.
- Salo, Timothy J., "Protocols and Architectures for Internet of Things and Home Automation", Embedded Systems Conference, November 4, 2015, Minneapolis, MN.

PUBLICATIONS AND PRESENTATIONS (Continued)

- Salo, Timothy J., "Protocols for the Internet of Things and Home Automation: A Brief Survey", IoTFuse, March 19, 2015, Minneapolis, MN.
- Salo, Timothy J., "Bluetooth Beacons: iBeacon, Physical Web, and Beyond", Embedded Systems Conference, November 5, 2014, Minneapolis, MN.
- Salo, Timothy J., "Wire the Plant, Save the World: The Internet of Natural Things", Ignite presentation, Google I/O Developers Conference, San Francisco, CA, June 25, 2014.
- Salo, Timothy J., "Narrowband IP over Amateur Radio Networks (NIPARnets): Next-Generation Networking for Amateur Radio", *Proceedings of the ARRL and TAPR 32nd Digital Communications Conference*, Seattle, WA, September 20-21, 2013. Pages 51-58. <http://www.saloits.com/papers/AMSAT2013.pdf>
- Salo, Timothy J., "Proposed Network-Centric Architecture for the Advanced Communications Package (ACP)". *Proceedings of the AMSAT-NA 22nd Space Symposium, Atlanta, GA, October 24-26, 2008*. Silver Spring, MD: The Radio Amateur Satellite Corporation. Pages 33-43. <http://www.saloits.com/papers/AMSAT2008.pdf>
- Salo, Timothy J., "ALERT-2 Protocol Development Project", ALERT Users Group 22nd Conference and Exposition, Palm Springs, CA, May 8, 2008. <http://www.saloits.com/papers/ALERT-2-AUG.05-08-08.pdf>
- Salo, Timothy J., *ALERT-2 Protocol Development: Phase I Final Report*, January 15, 2008. <http://www.saloits.com/papers/ALERT-2-Phase-I-Final-Report.pdf>
- Salo, Timothy J. "Multi-Factor Fingerprints for Personal Computer Hardware". *Proceedings of the 2007 Military Communications Conference (MILCOM 2007)*, Orlando, FL, October 29-31, 2007. IEEE, 2007.
- Salo, Timothy J., "ALERT-2 Working Meeting", ALERT Users Group, Sacramento, CA, October 25, 2007. <http://www.saloits.com/papers/ALERT-2-Sacramento-10-24-07.pdf>
- Salo, Timothy J. "The DoD Space Test Program: Free Launches for Amateur Satellites". *Proceedings of the AMSAT-NA 22nd Space Symposium*, Arlington, VA, October 8-10, 2004. Newington, CT: ARRL, 2004. Pages 184-190.
- Salo, Timothy J. "Embedded Transport Agents for Near-Earth Communications". The Fourth Space Internet Workshop (SIW-4), Baltimore, MD, June 8-10, 2004.
- Salo, Timothy J. "A Proposed Microsat Open Experimental Platform for Amateur Space Communications Research". *Proceedings of the AMSAT-NA 21st Space Symposium, Toronto,* Ontario, October 17-19, 2003. Newington, CT: ARRL, 2003. 93-103.
- Salo, Timothy J., Barry A. Trent, and Timothy Hartley. *Proximity Networks Technology Assessment.* NASA Contractor Report NASA/CR-2003-212623. NASA Glenn Research Center, October 2003.
- Bonney, Jordan and Timothy J. Salo. *Modeling Report for Ad Hoc Quality of Service in FCS.* Boeing contractor report, March 17, 2002.

- Bonney, Jordan and Timothy J. Salo. *A Study of Network Quality of Service*. Boeing contractor report, March 14, 2002.
- Salo, Timothy J. "Real-Time Visualization of IP Streams Over Switched WANs". NLANR/Internet-2/CANARIE Techs Workshop, Toronto, Ontario, August 21, 2000.
- Salo, Timothy J. "Real-Time Visualization of IP Streams Over Switched WANs". North American Network Operators' Group (NANOG), Albuquerque, NM, June 13, 2000.
- Chinoy, Bilal and Timothy J. Salo. "Internet Exchanges: Policy-Driven Evolution". *Coordinating the Internet*, Brian Kahin and James H. Keller, eds. Cambridge, MA: MIT Press, July 1997.