

Timothy J. Salo

Salo IT Solutions, Inc.

(612) 605-6896

P.O. Box 141049

salo <at> saloits <dot> com

Minneapolis, MN 55414-6049

www.saloits.com/Resume.pdf

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

RESEARCH 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

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

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

2000 – **Founder and President, Salo IT Solutions, Inc.**, Minneapolis, MN.

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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.

EXPERIENCE (continued)

- **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).
- 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:
- **Architect**, Future Combat Systems (FCS) System of System (SoS) Common Operating Environment (SOSCOE). Under contract to Boeing.
 - **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 Investigator**, *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

- Graduate Student, Computer Science Ph.D. program, University of Minnesota, present
- 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

RESEARCH CONTRACTS AND GRANTS

- **Principal Investigator**, NOAA/eNvironmental Beacon (nBeacon) System, National Oceanic and Atmospheric Administration (NOAA).

The nBeacon system was intended to push localized, timely, relevant NOAA data products to public users' smartphones, tablets, and other mobile devices in a convenient, unobtrusive, accessible, easily understandable format. This system used Bluetooth Low-Energy (BLE) beacons to trigger notifications on nearby users' smartphones. In essence, the nBeacon System was to provide a new distribution channel for NOAA data products and services to the general public. Funded by NOAA. The project concluded in March 2016.

- **Principal Investigator**, *Wide-area Environmental Sensing and alerTing networks (WESTnets)*, National Oceanic and Atmospheric Administration, Contract WC133R11CN0135, September 7, 2011 – March 6, 2012.

Developed proof-of-concept implementation of the Wide-area, Environmental Sensing and alerTing network (WESTnet) protocols, a next-generation suite of wireless network protocols that will provide enhanced services for hydrologic warning systems and large-scale, wide-area, environmental monitoring networks.

- **Principal Investigator**, *Analysis of Very Narrowband Requirements for Hydrologic Frequencies*, National Oceanic and Atmospheric Administration, order DG133W10SE3038, October 1, 2010 – September 30, 2011.

Analyzed the implications for the hydrologic warning system (HWS) community of the future federal very narrowband requirement for radio equipment; conducted field trials to evaluate potentially applicable radio equipment.

- **Principal Investigator**, *ALERT-2 Protocol Development*, National Oceanic and Atmospheric Administration, contract DG133R07CN0175, July 16, 2007 – January 15, 2008.

Design next-generation wireless communication protocols for automated flood-warning systems. <<http://www.alert-2.com/>>

- **Principal Investigator**, *An Extensible QoS Framework for Secure Tactical Networks*, Air Force Research Laboratory, contract FA8750-05-C-0151, April 11, 2005 – January 10, 2006.

Developed an extensible architectural framework, protocol enhancements and other technologies that provide scalable, fine-grained, content-aware, quality-of-service (QoS) assurances and other advanced services in IP networks.

- **Principal Investigator**, *Embedded TCP Agents for Near-Earth Communications*, National Aeronautics and Space Administration, Glenn Research Center, contract NNC04CA52C, January 2004 – July 2004.

Developed extensible, embedded transport agents, which continuously adapt the behavior of the Internet-standard Transmission Control Protocol (TCP) to the unique requirements of near-Earth space communications.

RESEARCH CONTRACTS AND GRANTS (continued)

- **Principal Investigator**, *Proximity Networks Technology Assessment*, National Aeronautics and Space Administration, Glenn Research Center, April 1, 2002 - July 30, 2002.
Evaluated maturity of technologies potentially applicable to NASA proximity (e.g., sensor) networks.
- **Principal Investigator**, *Real-Time Visualization of IP Flows over Nontraditional Media*, Defense Advanced Research Projects Agency, contract F30602-98-C-0211, June 1998 - December 2000.
Demonstrated techniques for detailed, global visualization of the state of IP-over-connection-oriented networks such as IP-over-ATM networks. <<http://www.networkvisualization.com/>>
- **Principal Investigator**, *MAGIC-II*, Defense Advanced Research Projects Agency, subcontract to contract F19628-95-C-0215, August 1996 - September 1998.
Researched architectures and technologies for integrating high-speed, wide-area ATM networks into large, public IP internets. Also, develop Host ATM Research Platform (HARP) software, a freely available platform for research of IP/ATM networks, which is distributed with the FreeBSD operating system. <<http://www.msci.magic.net/>>
- **Additional Principal Investigator**, *National Virtual Network Access Point*, National Science Foundation, subcontract to cooperative agreement NCR-9321072, July 1994 - June 1998.
Explored architectures for using ATM as a medium for public inter-network interconnections.
- **Principal Investigator**, *Network Research for MAGIC Gigabit Testbed*, Advanced Projects Research Agency, contract F19628-92-C-0072, June 1992 - December 1995.
Conducted network research on integrating high-speed, wide-area, ATM networks into large, public IP internets. Also ensured end-to-end connectivity for the MAGIC Gigabit Testbed at the ATM through TCP/UDP layers by selecting and procuring equipment and providing systems engineering and systems integration services.
- **Principal Investigator**, *Very High-Speed Remote File System*, Advanced Projects Research Agency, contract DAAL03-91-C-0049, September 1991 - September 1992.
Examined issues resulting from connecting very high-speed remote file systems to supercomputers over high-speed, wide-area networks.
- **Principal Investigator**, *New Connections to NSFNET*, National Science Foundation, NCR-9120190, June 1992 - January 1995.
Connected four Minnesota private colleges (College of St. Benedict; Concordia College, St. Paul; Minneapolis College of Art and Design; St. John's University) to the NSFNET.

PATENTS

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

Salo, Timothy J., “Apparatus and Method for Providing Semantically Aware Network Services”, Issued May 10, 2016.

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

PUBLICATIONS AND PRESENTATIONS

- 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.
- 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>>

PUBLICATIONS (Continued)

- 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.