

# Karl Nyberg

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## Summary

- Experienced software / systems architect in design, development and deployment of scalable, distributed, fault-tolerant, transaction processing systems on UNIX (Linux, Solaris, AIX) with SQL databases (Oracle, MySQL, VoltDB) using Ada, C/C++, DSD, Java in diverse application domains (banking, air traffic control, operating system computer security, telecommunications, image processing).
- Formal methods of programming languages (parsing, theorem proving, static code analysis), automation, writing / evaluation (requirements, specifications, design, code, documentation)
- Interoperation among programming language (Ada, C/C++, Fortran, Java) standards (CORBA), communications protocols (HTTP, TCP/IP, SMTP, RADIUS, DIAMETER), image / data formats (OFX / IFX, XML, PDF, Postscript, TIFF, ESRI Shapefile, HDF).

## Education

Massachusetts Institute of Technology Cambridge, MA

- Master's degree in Electrical Engineering and Computer Science

Thesis: [A Methodology for Using Algebraic Specifications](#)

- Bachelor's degree in Computer Science and Engineering

Thesis: [An Experiment in Using Algebraic Specifications](#)

Stanford University

(virtual via Coursera)

- [Machine Learning](#)

University of Minnesota

(virtual via Coursera)

- Introduction to Recommender Systems

## Awards

- [ACM SIGAda Ada Community Contributions Award](#), November, 2007
- Sun Microsystems "Open Performance Contest" winner for "[A Constructive Approach to Integer Factorization](#)" January 2007
- [IEEE POSIX Pioneer award](#), March 1988

## Professional

- ACM Senior Member, ACM SIGAda (Baltimore / DC Chair)
- US SC22 JTC1 TAG / ISO IETC J22 - Java Study Group (1997 - 1999)
- Federal Advisory Board on Ada (1990 – 1992)
- Ada 9X Requirements Team (1989 – 1990)
- IEEE Technical Committee Operating Systems P1003.1 (1986 – 1988)

## Certifications

- [COMPTIA Security+ 1159M8QJVC14S5PJ](#), to September 2017

**Experience**      August 1985 – Present      Grebyn Corporation      Sterling, VA

Projects: Local, national and international projects ranging from single day to multi-year efforts covering the entire software lifecycle. Newsletters, CDs and books on Ada. Publications listed below and [Google Scholar](#).

Major Clients: Booz Allen Hamilton, Convergys, CSC, Global Protocols, Inc., Honeywell Federal Systems, IBM, Institute for Defense Analyses, Lockheed Martin, Openet Telecom, SAIC, Telos Corporation, VISA.

May 2018 – Sep. 2018      EPAM Inc      McLean, VA

Senior Software Developer

- Part-time effort for SalesForce. Migrated Formula Engine from ANTLR 2.7 to ANTLR 4.7.1. Development environment was Apple Macintosh with git, maven, ant, Java.

Oct. 2010 – Nov. 2011      HTSI/Defense & Space      Greenbelt, MD

Program Manager 5 (SME) (L)

- Temporary, part-time, on-call support for Near Earth Network Services.

Aug. 2005 – Dec. 2005      Geologics      Alexandria, VA

Ada Software Engineer / Software Auditor

- Part-time software review of En Route Automation Modernization on IBM AIX with OC Systems Ada compiler.

Jan. 1983 – May 1986      Verdix Corporation      Chantilly, VA

Various Senior Technical Positions

- Created initial concept of Verdix Secure Local Area Network (VSLAN).
- Authored winning Small Business Innovation Research (SBIR) Phase I proposal for Network Security Devices (later productized as VSLAN).
- Administered computing facilities and supervised junior staff.
- Verdix Ada Development System (VADS) product development, quality assurance and customer support.

## Publications and Talks

- Nyberg, Karl A. "[Automatically Generating DTD-Specific XML Parsers](#)", ACM SIGAda AdaLetters, August 2010. Also available at <http://www.hdfgroup.org/pubs/others/>.
- Nyberg, Karl A. "[Parsing Hierarchical Data Format \(HDF\) Files](#)", ACM SIGAda AdaLetters, August 2010. Also available at <http://www.hdfgroup.org/pubs/others/>.
- Nyberg, Karl A. "[Multi-Core + Multi-Tasking = Multi-Opportunity?](#)", Proceedings of the ACM SIGAda 2007 conference, Fairfax, VA. November 2007; also ACM SIGAda AdaLetters XXXVII #4, pp. 79-81, December 2007. ([Slides](#))
- Nyberg, Karl A. "[A Constructive Approach to Integer Factorization](#)", an evaluation of the Sun Microsystems SunFire T1000.
- Nyberg, Karl A. "[Fun v. Tedium](#)", Letters to the Editor, *IEEE Software*, p. 9, May/June 2007. (Also available at [IEEE Software](#))
- Ausden, Howard and Nyberg, Karl A. "[Using ASIS to Generate C++ Bindings](#)", Proceedings of the ACM SIGAda 2005 conference, Atlanta, GA. November 2005; also ACM SIGAda AdaLetters XXV #4, pp. 23-30, December 2005. ([Slides](#))
- Nyberg, Karl A. "[Windows Disk Drive Recovery with Ada95 – An Application Note](#)", ACM SIGAda AdaLetters XXV #2, pp. 42-44, June 2005.
- Nyberg, Karl A. "[Optical Character Recognition \(OCR\) of Cryptographic Source Code](#)". ACM Washington, DC Special Interest Group on Ada (SIGAda), McLean, VA. May 8, 2003.
- Nyberg, Karl A. "[Barbarians at the Gate – Stopping Spam in its Tracks](#)", 2001.
- Emery, David E.; Mathis, Robert F.; and Nyberg, Karl A. "[Automating the Ada Binding Process for Java - How Far Can We Go?](#)" Reliable Software Technologies: Proceedings of the Ada Europe 1998 conference, June 1998, Uppsala, Sweden.
- Nyberg, Karl A., (Editor), "The Annotated Ada Reference Manual", Third Edition, March 1994.
- Engle, Charles B., Jr and Nyberg, Karl A. "[Mandating Ada Compiler Evaluation](#)", Invited Paper. Minutes of the Federal Advisory Board on Ada, June 27, 1991. Pittsburgh, PA. ([slides](#))
- Nyberg, Karl A., "Ada: Sources & Resources", Third Edition - April 1991.
- Nyberg, Karl A., "A Study of Ada's Input-Output Packages", SEI Special Report. 1990.
- Nyberg, Karl, "Coming of age in the computer industry", *Journal of Pascal, Ada and Modula-2*, Special Issue: Ada in Action, Volume 9, Issue 3, pp. 58-59. May / June 1990.
- The Ada 9X Revision Requests – Fact & Fantasy. MITRE Corporation, McLean, VA. April 10, 1990.
- Nyberg, Karl, "Vaporware, trust, and the Ada Industry", *Journal of Pascal, Ada and Modula-2*, Volume 9, Issue 1, pp. 56-57. January /

February 1990.

- Nyberg, Karl, "Personal reflections: Ada: ill-at-ease", *Journal of Pascal, Ada and Modula-2*, Volume 8, Issue 2, p. 53. March / April 1989.
- Emery, David and Nyberg, Karl A., "[Observations on Portable Ada Systems](#)", in "Ada: The Design Choice", Proceedings of the Ada-Europe International Conference, Madrid, Spain, 13-15 June 1989. Cambridge University Press. Also MITRE Technical Paper MTP-282; February 1989, Bedford, MA. ([slides](#))
- Nyberg, Karl and Udell, Jon, "IntegrAda : An Ada Programming Support Environment for the PC", *Byte*, Vol. 14, Number 1, pp. 213-220, January 1989.
- Nyberg, Karl A., "[Denial of Service Flaws in SDI Software: An Initial Assessment](#)", Proceedings of the Fourth Aerospace Computer Security Applications Conference, December 12-16, 1988, Orlando, FL.
- Donaldson, Albert L.; McHugh, John; Nyberg, Karl A., "[Covert Channels in Trusted LANs](#)", The 11th NBS/NCSC National Computer Security Conference, pp. 226 – 232. October 17-20, 1988, Baltimore, MD.
- Nyberg, Karl A. "The Application of Formal Methods to Ada Software Development". ACM SIGAda, Phoenix, AZ. March 24, 1988.
- Preston, David; Nyberg, Karl A.; Mathis, Robert. "[An Investigation Into the Compatibility of Ada and Formal Verification Technology](#)", 6<sup>th</sup> National Conference on Ada Technology: Ada in the Life Cycle, March 14-17, 1988, Arlington, VA ([extended abstract](#)).
- Nyberg, Karl A. "Porting Ada Applications between a PC and a VAX". Capital Area PC Users Group (CPCUG) Ada Special Interest Group, Bethesda, MD. February 15, 1988.
- Lee, JAN and Nyberg, Karl A., "[Strategies for Introducing Formal Methods Into the Ada Life Cycle](#)", SPC-TR-88-002, Version 1.0. Software Productivity Consortium, January 1988, Reston, VA. Also [Virginia Tech - CS TR-88-09](#).
- Nyberg, Karl A. "[Using Representation Clauses as an Operating System Interface](#)," *Ada Letters*, Volume VII, Number 4, July - August, 1987; pp. 98-101.
- Nyberg, Karl A., "[Implementing Curses in Ada](#)", Proceedings of the 1986 USENIX Winter Conference, January 1986, Denver, CO.
- McHugh, John and Nyberg, Karl A., "[Adapting the Gypsy Verification System to Ada](#)", in Proceedings of the First IDA Workshop on Formal Specification and Verification of Ada, Clyde G. Roby, ed., Memorandum Report #M-146, December 1985, Alexandria, VA. ([slides](#))
- McHugh, John and Nyberg, Karl A., "[Ada Verification Using Existing Tools](#)", IEEE Software Engineering Notes, V 10, no 4. Special Issue: Proceedings of Verkshop III, pp. 104-106. August 1985
- Nyberg, Karl A.; Hook, Audrey A.; Kramer, Jack F., "[The Status of Verification Technology for the Ada Language](#)", IDA Paper #P-1859, July 1985, Alexandria, VA.
- Nyberg, Karl A.; "[A Methodology for Using Algebraic Specifications](#)",

Master's Thesis, Massachusetts Institute of Technology, June 1981.  
Cambridge, MA.

- Nyberg, Karl A.; "[An Experiment Using Algebraic Specifications](#)",  
Bachelor's Thesis, Massachusetts Institute of Technology, August 1980.  
Cambridge, MA.

## **Specific Project Experience**

### **Telos Corporation. Ashburn, VA**

Supporting automated Operational Deployment of multiple [Telos Ghost](#) networks. Migrated from on-premises to fully cloud based networks. Using JIRA, git, Centos7, OpenVPN, AWS VPC, EC2 instances, Directory Services, S3, limited Windows Administration (Active Directory and Network Policy Server), SSL Certificate generation, iRedMail / RoundCube, OpenFire / inverse.js, and NextCloud using Ansible, Powershell, Python and various scripting languages.

### **Openet Telecom. Reston, VA**

Senior / lead engineer in Solution Assurance group responsible for improving project delivery quality through review of various project life cycle artifacts. Initiated and developed tools for static code analysis of proprietary telecommunications programming language (Data Stream Decoder - DSD) utilizing ANTLR 3.X and 4.X parser technology and Java analysis methods. Identified coding issues associated with parameter passing, variable scoping, dead code elimination, adherence to documentation standards, cyclomatic complexity, and code reformatting (pretty printer). Created automated nightly regression suite testing covering over 80,000 project files. Authored and reviewed requirements, design, implementation and instructional documents. Triaged review tickets and distributed to appropriate staff. Provided training to varied audiences (executive, project management, technical and training staff).

Professional Services Engineer supporting telecommunications deployments. Created automated deployment models for FusionWorks development and production and support of rule based systems with SQL databases to provide telecommunication subscription and mediation efforts that were used by over 50 developers and dozens of test and production environments. Author and maintain documents and wiki pages.

Efforts utilized proprietary programming language (DSD) on Solaris and Linux, Java, bash / ksh / csh, cvs, wiki, Eclipse and Oracle.

### **FHI360**

JAMIS Accounting System Technical Support in transitioning off of Novell LDAP server to Solaris authentication. Coordinate update with replacement of SAN via fiber channel to new SAN infrastructure over NFS to Linux VM (kludgy, but it works! ☺).

### **Booz Allen Hamilton / ASE (A Booz Allen Hamilton subsidiary)**

JAMIS Subject Matter Expert, providing operational support, including, but not limited to: user management on Solaris and Windows, printer system management, daily / weekly / monthly / annual process oversight, backup / distribution to data warehouse, email, Sarbanes Oxley audit and reporting, extensively documenting all processes and procedures. Certified using Booz Allen Hamilton procedures for security practices including Administrator access policies.

### **Waterford Consultants. Round Hill, VA**

Ported / converted / refactored Radio Frequency engineering codes in BASIC using PowerBasic to C on Windows.

**Objective Interface Systems. Herndon, VA**

Supported a requirements traceability effort of ORBExpress CORBA product, utilizing a DO-178B-like safety evaluation process with VeroTrace Requirements Traceability tool. Performed requirement definition and traceability between requirements, design, implementation and test. Created automated bulk import scripts for MS SQL 2005 / 2008.

**Global Protocols, Inc. Greenbelt, MD**

Performed software development, modification, testing and documentation of a Performance Enhancing Proxy (PEP) component of a Space Communications Protocol Specification (SCPS) TCP acceleration product. Technologies included embedded Linux and C with both proprietary and Open Source Software components. Implemented and tested TCP Explicit Congestion Notification (ECN) module. Performed throughput and performance analysis with GCC development toolset (gcc, gprof, gcov, strace). Documentation generated with doxygen and Wiki technology.

**Tower Source LLC. Waterford, VA & Denver, CO**

Performed web site maintenance, data analysis and extraction, development and rehosting for telecommunications cell tower location service. Technologies used included Linux / Solaris and Apache, MySQL, Java, tomcat, Javascript, HTML, Fortran, Google Maps API, SSL, and USGS National Elevation Data (NED) terrain data.

**JRL Associates. McLean, VA**

Intermittent transportation procurement services for family-owned consultancy.

Metropolitan Atlanta Rapid Transit Authority (MARTA) - Atlanta, GA. Advised and assisted in the selection process for Architect / Engineering services and performed evaluation of submissions and recommendations for General Engineering Consultant.

Metropolitan Bus Authority (MBA) - San Juan, Puerto Rico. Prepared solicitation material, including procurement specification and technical specification, participated in pre-proposal conferences, developed evaluation procedures and factors, reviewed proposals, performed financial analyses and made recommendations on negotiations. Procurements include multimillion dollar regular bus stock, hybrid buses, fare collection systems, labor timecard systems, paratransit vehicles and preventive maintenance and information technology systems upgrades.

Ann Arbor Transportation Authority (AATA) - Ann Arbor, MI. Prepared solicitation material, including procurement and technical specifications, participated in pre-proposal conferences, reviewed proposals and made recommendations.

**Lockheed Martin. Rockville, MD**

Ada Software Engineer on URET / ERAM (User Request Evaluation Tool / En Route Automation Modernization). Developed tools in Ada95 on AIX to provide interoperable support

to Ada95 libraries called by C++ using ASIS (Ada Semantic Interface Specification) on Linux and AIX with GNU Compiler Collection (GCC Ada and C++) and IBM Visual C++ and OC Systems PowerAda. Co-authored and published conference paper regarding effort.

Performed various components of SEI CMM Level 5 software development lifecycle (requirements analysis, design, software development, unit testing, string testing, inspection moderation, configuration management, system build, etc.) on C++ and Ada95 libraries for software developed by self and by other team members.

Performed Detailed Design, Coding, Unit and Integration Test of Inter-Facility Protocol Adapter – URET Interface Protocol (IFPA-UIP) integrating the Track Management exchange function between the URET and the ERAM system for use during upgrade of systems. Performed application builds for a staff of approximately 10-15 developers.

### **America Online. Dulles, VA**

Technical analyst in the registration group at America Online. Translated business requirements into technical requirements, design documents and coding changes. Specified changes to underlying proprietary platform based on UNIX, C, and TCL code.

### **Convergys Corporation. Reston, VA**

Provided technical documentation associated with the Convergys Speech Network (CSN) Open Hosting Environment (OHE) project. Created Operations Manual, documented logical and physical network layout diagrams and prepared Application Procedures Interface document for external users.

### **Lew Read, Inc. Annandale, VA**

Intermittent Solaris support. Provided Solaris x86 5.7 System Administration support for the District of Columbia Superior Court. Updated DNS configuration, reconfigured Ethernet interfaces, installed Veritas backup software, and modified file system layout information. Performed disk drive recovery for Solaris x86 5.8 file systems.

### **InteliData Technologies, Inc. Reston, VA**

Documenting data flow for Electronic Bill Presentment and Payment (EBPP) system from XML-based protocol through Oracle database to back end Open Financial Exchange (OFX) and Master Card Remote Payment Processing System (RPPS) protocol-based payment systems.

Performed QA efforts on a web-based EBPP system, primarily with Rational Enterprise Suite tools. Refined vision, defined functional requirements, wrote frontend customer interface and system use cases, created test plan and related integration interfaces documents. Created a message / protocol reference manual for an XML based protocol for frontend communications. Analyzed protocol certification suite components for Open Financial Exchange (OFX) and Interactive Financial Exchange (IFX) protocols. Performed technical coordination and supervision of six staff members, including employees and contractors. Created support utilities for QA development in C, Ada, Java, UNIX shell.

Development of message based test plan and scripts for electronic financial protocol switching system utilizing OFX and IFX protocols. Prepared test plan specifying over 1300 tests and



automated bulk development of the IFX test cases. Trained staff in financial protocols, test suite and assisted in test case development. Automation of test script generation (in C, Ada, and UNIX shell) resulting in savings in excess of \$200,000.

#### **Escom Corporation. Oakton, VA**

Converted ASMTMP (Adaptive SMTP) spam filter quarantine software from C into Java. Created Apache web server load module. Developed test software in C for Trusted Minix.

#### **IBM Corporation. Herndon, VA**

Performed multiple electronic banking projects, including design, development and maintenance of the IBM IFS (Interactive Financial Services) platform and the VISA Interactive Electronic Banking System platform. Utilized Sun / Solaris and IBM RS6000 / AIX with C, Java, Javascript, REXX, MQ, IPlanet, MTI, SQL, DB2, Informix, Interbase, Netscape Enterprise Server and WebSphere. Developed new design specifications and implemented solutions and fixed outstanding defects. Served as technical interface to external (both non-development and customer) organizations. Performed defect triage, management, assignment and resolution.

#### **Integrion Financial Network. Herndon, VA**

Performed multiple electronic banking projects. Architecture design and development for protocol conversion between differing electronic bill payment and banking protocols. Designed and implemented extensions to banking simulator. Sun / Solaris and IBM RS6000 / AIX hardware with C, MQ series, MTI, SQL, DB2, Informix.

#### **VISA Interactive / International. Herndon, VA**

Performed technology transfer and support of divestiture of VISA Interactive applications to a third party in London, England. Performed development and coordination of technical training, procurement of hardware and software for the third party staff

Development, staffing and training of a third party validation group. Performed training and support of third party developers, including installation and modification of applications utilizing C, TCP/IP, X.25, Interbase, Informix on Sun / Solaris. Edited initial version of Access Device Message Standard (ADMS) protocol reference manual.

#### **VAST Corporation. Vienna, VA**

Part of a six person Boeing Reserve Component Automation System (RCAS) performance analysis team. Simplified architecture and reduced Ada code to achieve two orders of magnitude improvement in startup / execution time. Developed compilation order tool. Hardware was IBM PCs running SCO UNIX with Verdex Ada Development System (VADS).

#### **SAIC. Reston, VA**

Multiple contracts for productization of the OCR Power Server (OPS). Developed process control and voting software that merged the output results of multiple OCR software engines resulting in significantly increased recognition accuracy. Hardware was Sun / SunOS in C, with additional IBM PC / DOS platforms via TCP/IP. Integrated machine print OCR and hand print

Intelligent Character Recognition (ICR). Provided design documentation and status reports showing effectiveness of algorithms employed.

**Atlantic Research Corporation. Rosslyn, VA**

Performed cost to complete analysis for the Iceland Air Defense System (IADS), a large radar collection system written in Ada operating under VAX / VMS.

**E-Systems. Falls Church, VA**

Supported development and debugging of large Ada / X Windows / database application. Utilized Sun / SunOS with VADS.

**Verdix Corporation. Chantilly / Herndon, VA**

Multiple consulting efforts. Developed test software for Ada binding to X Windows product; computer systems security audit; provided general UNIX system administration support (emergency system reloads, system / mail / news configurations, physical relocation, etc.); and served as customer service support backup. Utilized VAX / UNIX, Sun / SunOS, Sequent Dynix.

**Institute for Defense Analyses. Alexandria, VA**

Part of a four to six member team responsible for the analysis of the revision requests as part of the Ada 9X revision process. Organized requests into requirements.

**Software Engineering Institute. Pittsburgh, PA**

Prepared report on the input / output requirements for Ada 9X revision process.

**Honeywell Federal Systems, Inc. Vienna, VA**

Provided support for WIS Workstation proposal effort. Recommended software products, performed benchmark evaluations, prepared white papers. Developed Ada binding to OS interfaces with Apple Macintosh / AUX with TeleSoft TeleGen Ada.

**ORI/Calculon. Rosslyn, VA**

Supported the Marine Corps proposal technical evaluation of software development capabilities for contract awarding of the MCTSSA contract.

**Software Productivity Consortium. Reston, VA**

Contributed to a report on the use of formal methods in the Ada software development lifecycle.

**Computer Sciences Corporation. Fairfax, VA**

Developed white papers and proposal for Ada Verification Environment.

**Software A & E. Rosslyn, VA**

Prepared conference report on denial of service (DOS) attacks against SDI (Strategic Defense Initiative) software. Reviewed available design documents and performed interviews at the Naval Research Laboratory (NRL).

**Computer\*Thought. Dallas, TX**

Supported the development and translation of a LISP-based expert system into Ada on VAX / VMS and VAX / Ultrix.

**IIT Research Institute. Lanham, MD**

Prepared report on formal verification and theorem proving of Ada software.