

Rich Hilliard

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<http://softsysarchitect.net/consulting/>

Employment

Technical consultant, NHANSA, INC. (September 2015–December 2020)

Developing NFORGE, a systems engineering workbench for modeling to support creation, analysis and reasoning about complex systems via multiple viewpoints, with a focus on real-time performance concerns.

Consulting Software Systems Architect (May 2001–2020)

Software systems architecture services including stakeholder and concern analyses, architectural viewpoint definition, architectural view modeling, modeling and analysis to address extra-functional concerns (e.g., quality of service, performance, safety and security), and best practices on architecture description using ISO/IEC/IEEE 42010 (IEEE Std 1471). Oversaw interface and data integration across multiple software and data suppliers; created strategy for enterprise data management, common logical and transient data models.

Consultant in software architecture and data management for state transportation systems.

Advisor on next-generation software architecture approaches and technology options for transportation asset management systems. Ontology definition using XML for traffic asset management decision analysis for National Cooperative Highway Research Program (NCHRP).

Developed software strategy and software management plan for NASA's Advanced Spectroscopic and Coronagraphic Explorer mission.

Developed software applications to manage, analyze, and present student results on standardized assessments with Java and XML, as a part of education product line.

Software engineering and software management for NASA's Solar-B (christened *Hinode* after launch) X-Ray Telescope (XRT). Co-authored the XRT Software Management Plan, aided its implementation, and prepared the XRT Flight Subsystem Software Requirements Specification. Provided continuing maintenance of the XRT software requirements baseline.

Software engineering method development, project and technology evaluation and assessment, business process definition and modeling for various clients.

Clients include: Boeing, CELT Corporation, Cambridge Publications, Cambridge Systematics, Harvard-Smithsonian Astrophysical Observatory, NASA, Netegrity, Inc., Riverton Corporation, SAIC and Spy Pond Partners.

Chief Technical Officer, CONSENTCACHE, INC. (July 2000–July 2001)

As co-founder of an unfunded Internet startup, devised technical approach to privacy management, architected initial service offerings and led prototype development to deliver initial capability in XML and Java.

Director of Architecture, ephibian (formerly, INTEGRATED SYSTEMS AND INTERNET SOLUTIONS, INC.) (June 1998–July 2000)

Director of architectural consulting services.

Chief architect for the InternetEngine product line development.

Co-creator of the Product Line Engineering Process for ephibian.

Lead Architect, THE MITRE CORPORATION (August 1994–May 1998)

Founding member of the Chief Architects' Office of the Air Force's Electronic Systems Center. Developed architecture-based acquisition strategy for Air Force Command and Control (C2) systems. Conducted architectural reviews of Air Force C2 programs

Contributor to Air Force's *Command and Control System Target Architecture*, a reference architecture for Air Force C2 acquisitions.

Principal investigator for the *Architecture Description Framework* research project into architecture representation and tools.

Lead developer and team leader of MITRE's *Architecture Quality Assessment*.

Co-inventor of MITRE's practical architecture method.

Contributor to the Army's Sustaining Base Information Services architecture.

Architect for the Army Reserve Component Automation System Validation Team.

Contributor to CORBA IDL/Ada 95 Mapping, Object Management Group, May 1995.

Principal Engineer, INTERMETRICS, INC. (January 1991–July 1994)

Member of the Ada 9X Mapping/Revision Team, for the design and development of the Ada 95 ISO standard.

Member of AdaMagic software development environment product team.

Developer of Intermetrics' Ada 9X/ANDF compilation system.

Developer of Ada 95 object-oriented bindings to X Window System (Xlib and Xt layers).

Lead Engineer, THE MITRE CORPORATION (November 1982–December 1990)

Director, Ada Technology Specialty Group: Led research and technical advisory activities for Air Force Electronic Systems Division (ESD) programs using Ada, including: research into distributed software development environments; distributed simulation framework for Battle Management/C3 applications modeling; performance analysis of real-time embedded applications in Ada; consultant to numerous ESD programs on software engineering and Ada, acquisition strategy, trade studies and contractor assessments, source selection and procurements; led teams to prototype command and control, message handling, and management information systems.

Project Leader, Automatic Programming Applications: developed knowledge-based system to generate Ada code from graphical, constraint-based specifications.

Group Leader, Ada Acquisition Support: technical leader of team directing use of Ada on WWMCCS Information System. Ada tools prototyping and evaluation, definition of Ada design rules. Environment evaluation, specification and procurement. Use of military acquisition standards including DoD–Std–2167.

Technical Staff, Software Technology Transfer: Ada transition planning for Air Force Electronic Systems Division. Contract monitoring: Training and Performance Support System.

President, N.I.L. GROUP (January 1980–November 1982)

Project Manager for CAI:OS, computer-aided instructional system for nuclear power plant operations training.

Instructor and consultant in Structured Analysis. Systems analysis of aerospace manufacturing modernization programs for Boeing, Grumman, Northrop, Hughes, and Rockwell.

Engineer, HIGHER ORDER SOFTWARE (October 1978–January 1980)

Author and contributor to the development of the IDEF methods for Air Force’s Integrated Computer-Aided Manufacturing (ICAM) Program.

Co-designer of HOS Analyzer, prototype software development tool for HOS AXES methodology.

Instructor and consultant in HOS AXES and other methods: SADT, PSL/PSA, SREM, HDM.

Principal requirements analyst for ICAM Decision Support System.

Instructor, MASSACHUSETTS INSTITUTE OF TECHNOLOGY (September 1974–June 1979)

Instructor in MIT’s Experimental Study Group. Developed and taught courses in computer science, artificial intelligence and linguistics.

Selected Professional Activities

Member of Free Software Foundation.

Member of IEEE Computer Society.

Program committee, Software Architecture in Practice Track (SAIP) of the International Conference on Software Architecture (ICSA) 2021.

Presenter *Concepts and Design Philosophy Behind ISO/IEC/IEEE 42010 Systems and software engineering Architecture description* at The 2nd Annual INCOSE New England Fall Workshop, September 2020.

Reviewer, *Engineering Reports*, 2020.

Reviewer, *Journal of Software: Evolution and Process*, 2020.

ICSA 2019 Most Influential Paper Award, with David Emery for “Every Architecture Description needs a framework” from 2009 Joint Working IEEE/IFIP Conference on Software Architecture & European Conference on Software Architecture 14–17 September 2009, Cambridge UK.

Expert, ISO/IEC JTC 1/AG8, Advisory Group on Meta Reference Architecture and Reference Architecture for Systems Integration, December 2018–present.

Chair, Enterprise IT Committee of the Professional & Educational Activities Board, IEEE Computer Society, 2019–present.

Program committee, RCoSE/DDrEE'19: Joint 4th International Workshop on Rapid Continuous Software Engineering and 1st International Workshop on Data-Driven Decisions, Experimentation and Evolution @ International Conference on Software Engineering (ICSE'19) Montréal, Canada, May 2019.

Reviewer, *Frontiers of Computer Science*, 2018.

Lecturer, iSAPS: Second International Software Architecture PhD School, Leyden The Netherlands, 2018.

Industrial track co-chair, International Conference on Software Architecture, ISCA Gothenburg, Sweden, April 2017.

Program committee, International Conference on Software Architecture (ICSA, formerly WICSA + CompArch), 2017–present.

Member, ICSA Steering Committee, 2017–present.

Program committee, European Conference on Software Architecture (ECSA), 2016–2017.

Program committee, ECSA Tool Demonstration Track, 2016.

Reviewer, *IEEE Software*, 2016.

Program committee International Workshop on Models and Evolution @ MODELS, 2016–2017.

Liaison to The Open Group from ISO JTC 1/SC 7/WG 42 (Architecture), 2016–2018.

Chair, Engineering Disciplines Committee of the Professional & Educational Activities Board, IEEE Computer Society, 2016–2018.

Program committee, 13th Working IEEE/IFIP Conference on Software Architecture & 10th Federated Conference Series on Component-Based Software Engineering and Software Architecture (WICSA & CompArch) Venice, April 2016.

IEEE Computer Society alternate delegate to Federation of Enterprise Architecture Professional Organizations (FEAPO), March 2015–present.

Invited peer reviewer of *A Review of the Next Generation Air Transportation System: Implications and Importance of System Architecture* for the Computer Science and Telecommunications Board of the National Research Council, 2015.

Reviewer, *Journal of Universal Computer Science*, 2015.

Guest editor (with Rafael Capilla and Jan Bosch), Special Issue of *IEEE Software*, Trends in Systems and Software Variability, May/June 2015.

Program committee, European Conference on Software Architecture, (ECSA 2015), and ECSA 2015 Architecture Tool Demo track.

Program committee, 12th Working IEEE/IFIP Conference on Software Architecture, 2015.

FEAPO Taxonomy Working Group, February 2014–present.

Vice-chair, IFIP TC 2, Working Group 2.10, Software Architecture, June 2013–present.

Invited Expert, The Open Group Architecture Forum, TOGAF Next Working Group 2013–present.

Co-editor (with Paris Avgeriou and Micheal Stal), Special issue of *IEEE Software* on Architecture sustainability, Nov/Dec 2013.

Program committee, 11th Working IEEE/IFIP Conference on Software Architecture (WICSA 2014).

Program committee, European Conference on Software Architecture (ECSA), 2014.

Program committee, First **ACadeMics** Tooling with Eclipse Workshop (ACME), co-located with ECOOP, ECSA and ECMFA, 2013.

Program committee, Quality of Software Architectures Conference (QoSA), 2012–2014.

Surveying the Twin Peaks, keynote talk for Second International Workshop on the Twin Peaks of Requirements and Architecture at ICSE 2013, San Francisco.

Program committee, SEI Architecture Technology User Network (SATURN) Conference, 2013, 2014.

IEEE liaison to ISO/IEC JTC1/SC7 Architecting Guidance Study Group, 2013–2014.

Member, ISO/IEC JTC 1/SC 7, Ontology Study Group, June 2012–2013.

Reviewer, *Software and Systems Modeling*, 2012, 2014.

Program committee, Joint 10th Working IEEE/IFIP Conference on Software Architecture & 6th European Conference on Software Architecture (WICSA/ECSA 2012).

Program committee, International Workshop on Variability in Software Architecture, 2012 and 2014.

Co-editor (with Patricia Lago), Special issue of the *Journal of Systems and Software*, “Selected papers from the 9th Working IEEE/IFIP Conference on Software Architecture (WICSA 2011)” 85(9), September 2012.

Webmaster, IEEE Maine Section, 2012–2019.

Publicity chair, Joint 10th Working IEEE/IFIP Conference on Software Architecture & 6th European Conference on Software Architecture (WICSA/ECSA 2012).

Reviewer, *IEEE Systems Journal*, 2012–2013.

International Joint Working Group Chair Award, IEEE Standards Association, 2011.

Project editor, ISO/IEC/IEEE 42010, *Software and systems engineering — Architecture description*, IEEE liaison to ISO/IEC JTC 1/SC 7/WG 42, 2006–present.

Program co-chair (with Patricia Lago), 9th Working IEEE/IFIP Conference on Software Architecture, 2011.

Program committee, First International Workshop on Variability in Software Architecture (VARSA), 2011.

Program committee, 2nd International ACM SIGSOFT Symposium on Architecting Critical Systems (ISARCS), 2011.

Reviewer, *Communications of the Association of Computing Machinery*, 2010.

Reviewer, *LNCS Transactions on Pattern Languages of Programming*, 2010.

Guest co-editor (with Paris Avgeriou and Patricia Lago), *IEEE Software* Special Issue on Framing Stakeholders' Concerns, 2010.

Program committee, Workshops on Sharing and Reusing Architectural Knowledge, 2008–2011.

Reviewer, *Science of Computer Programming*, 2010.

Red team reviewer, *Achieving Effective Acquisition of Information Technology in the Department of Defense*, National Research Council, 2009.

Steering committee, WICSA conference series, 2009–present.

IEEE Computer Society Outstanding Contribution Award, “for outstanding technical and leadership contributions as the project editor of ISO/IEC 42010/IEEE 1471”, 2007.

Co-organizer (with Paul Clements, David Emery and Philippe Kruchten), First Workshop on Aspects in Architectural Description, 2007.

Reviewer, *IEEE Transactions on Software Engineering*, 2007–2009.

Reviewer, *Journal of Software and Systems Modeling*, 2007, 2012.

Reviewer, *Journal of Systems and Software*, 2006–2011.

Reviewer, *IEEE Software*, 2005, 2013.

Reviewer, *Journal of Software Maintenance and Evolution*, 2004.

Member, IFIP TC 2, Working Group 2.10, Software Architecture, 2005–present (invited participant since 2002).

Reviewer, *IBM Journal of Systems and Software*, 2003.

Visiting scholar at Massachusetts Institute of Technology, Experimental Study Group, May 2001–present.

Technical editor, IEEE 1016:2009, *Standard for Information Technology—Systems Design—Software Design Descriptions*, 2001–2009.

Program committee, Second, Third and Fourth Workshops on Aspect-Oriented Modeling with UML, 2002–2003.

Program committee, Methods and Techniques for Software Architecture Review and Assessment (SARA) Workshop at ICSE, May 2002.

Co-organizer, First Workshop on Architectural Viewpoints at 2nd Working IEEE/IFIP Conference on Software Architecture, 2001.

Respondent to Object Management Group's Request for Information for Unified Modeling Language 2.0, 1999.

Software Architecture Review and Assessment (SARA) industry working group.

Selected by IEEE Computer Society to develop the curriculum for *The Architecture of Software-Intensive Systems* as a part of the IEEE Software Engineering Competency Recognition Program.

Panel chair, *Thinking outside the boxes and lines: practicing architects*, at the Software Engineering and Knowledge Engineering, 1998.

Secretary, IEEE Architecture Working Group and technical editor of IEEE Std 1471:2000, *Recommended Practice for Architectural Description of Software-Intensive Systems*, 1995–2001.

Board of Directors, League for Programming Freedom, 2010–2013.

Signatory of *Computer Scientists' Amicus Brief to The Supreme Court of the United States*, October Term, 1995. In Lotus Development Corporation, Petitioner, *v.* Borland International, Inc., Respondent.

Secretary of Ada/Motif Binding Working Group within IEEE POSIX (P1003.5), 1994–1995.

Organizer and Program Chair, *Informal Workshop on Object Oriented Programming in Ada*, September 1989, Woburn, Massachusetts.

Selected Publications

“Architecture Modeling for Resource Margin Estimation” with S. Srinivasan, R. Kegley, M. Gerhardt, C. Granger, J. Preston, S. Drager, M. Anderson, R. Rosa, and A. Charsagua, at *High Confidence Software and Systems Conference*, Annapolis, MD 13–17 Sept 2020.

“Empirical Bounds of Multicore Cache Interference for Real-Time Schedulability Analysis” with Srinu Srinivasan, Russell Kegley, Mark Gerhardt, Jonathan Preston, Clifford Granger, Steven Drager, Matthew Anderson, Richard Rosa, Alan Charsagua, Nithya Srinivasan and Rin Ha, In *IEEE/AIAA 38th Digital Avionics Systems Conference (DASC)*, September 2019. *Awarded best paper of session.*

“Assessing migration of a 20-year-old system to a micro-service platform using ATAM” with Pablo Cruz, Hernan Astudillo and Miguel Collado, In *Proceedings of International Conference on Software Architecture (ICSA 2019)*, Hamburg, Germany, March 2019.

“Modeling Context with an Architecture Viewpoint” with Adriatik Bedjeti, Patricia Lago, Grace Lewis and Remco de Boer. In *Proceedings of International Conference on Software Architecture (ICSA 2017)*, Gothenburg, Sweden, 2017.

“Lessons from the fundamental unity of architecting”. In *Software Engineering in the Systems Context* Editors: Ivar Jacobson and Harold ‘Bud’ Lawson, 2015.

“What can BPM learn from Enterprise Architecture” with Mark von Rosing and Henrik von Scheel. In *The Complete BPM Handbook*, 2015.

“Towards an Improved Stakeholder Management for Software Reference Architectures” with Samuil Angelov. ECSA 2014.

“Architecting in Networked Organizations” with Damian Andrew Tamburri, Patricia Lago and Christoph Dorn. WICSA 2014.

“Forces on Architecture Decisions” with Uwe van Heesch, Paris Avgeriou. Joint 10th Working IEEE/IFIP Conference on Software Architecture & 6th European Conference on Software Architecture (WICSA/ECSA 2012)

“On the Composition and Reuse of Viewpoints across Architecture Frameworks”, with Ivano Malavolta, Henry Muccini and Patrizio Pelliccione. Joint 10th Working IEEE/IFIP Conference on Software Architecture & 6th European Conference on Software Architecture (WICSA/ECSA 2012)

“A documentation framework for architecture decisions,” with U. van Heesch and P. Avgeriou. *The Journal of Systems & Software*, **85**(4), pp. 795–820, April 2012.

“Reviewing an architecture document,” in Clements et al., *Documenting Software Architectures: views and beyond*, (2nd edition), 2011.

“ISO/IEC 42010 neé IEEE Std 1471,” chapter in Clements et al., *Documenting Software Architectures: views and beyond*, (2nd edition), 2011.

“On representing variation,” First International Workshop on Variability in Software Product Line Architectures, *4th European Conference on Software Architecture*, 2010.

“Realizing architecture frameworks through megamodelling techniques,” with H. Muccini, I. Malavolta and P. Pelliccione, in *25th IEEE/ACM International Conference on Automated Software Engineering (ASE 2010)*, 2010.

“Every Architecture Description Needs a Framework: Expressing Architecture Frameworks Using ISO/IEC 42010,” with D. Emery. *Joint Working IEEE/IFIP Conference on Software Architecture 2009 and European Conference on Software Architecture*, 2009.

A Structured Approach for Reviewing Architecture Documentation, with R. Nord, P. Clements and D. Emery, Technical Note CMU/SEI-2009-TN-030.

“Reviewing Architecture Documents Using Question Sets,” with R. Nord, P. Clements, and D. Emery. WICSA–ECSA 2009.

“Characterizing relations between architectural views,” with N. Boucké, D. Weyns, T. Holvoet and A. Helleboogh. in *Proceedings of the Second European Conference on Software Architecture (ECSA 2008)*, Lecture Notes in Computer Science, volume 5292.

“Updating IEEE 1471: Architecture frameworks and other topics,” with D. Emery. In *Proceedings Seventh Working IEEE/IFIP Conference on Software Architecture (WICSA 2008)*.

“Using Aspects in Architectural Description,” in *Proceedings of the 10th International Workshop on Early Aspects*, Lecture Notes in Computer Science, volume 4765.

“Architecture Description Languages in Practice–Session Report” with E. Woods. In *Proceedings of the 5th Working IEEE/IFIP Conference on Software Architecture (WICSA 2005)*.

“ANSI/IEEE 1471 and Systems Engineering,” with M. Maier and D. Emery. In *Systems Engineering: the Journal of the International Council on Systems Engineering (INCOSE)*, 7(3), 2004.

“Managing architectural concerns,” *Proceedings of the Conference on Integrated Design and Process Technology (IDPT-2002)*, Pasadena, USA, June 2002.

“Don’t ask, don’t tell Inference,” *Proceedings of the ICSE’2001 Workshop on Living with Inconsistency*.

“Viewpoint modeling,” *Proceedings of the ICSE’2001 Workshop on Describing Software Architectures with the UML*, May 2001.

“Introducing IEEE 1471,” with M. Maier and D. Emery, *IEEE Computer*, April 2001.

“IEEE 1471 and Beyond,” SEI Software Architecture Description Workshop, January 2001.

“Views as modules,” *Proceedings of the Fourth International Software Architecture Workshop (ISAW-4)*, Limerick, Ireland, June 2000.

“Architectural Integration and Evolution in a Model World,” with A. Egyed, *Proceedings of the Fourth International Software Architecture Workshop (ISAW-4)*, Limerick, Ireland, June 2000.

"Using the Unified Modeling Language for Architectural Description," In *UML'99 The Unified Modeling Language, Second International Conference, Lecture Notes in Computer Science*, volume 1723, Springer.

"Patterns of Practical Architecting," *OOPSLA'99 Workshop on Patterns in Software Architecture*.

"Aspects, Concerns, Views, ...," *OOPSLA'99 Workshop on Multidimensional Separation of Concerns*.

"Views and Viewpoints in Software Systems Architecture," position paper for *First Working IFIP Conference on Software Architecture*, February 1999, San Antonio, Texas.

"Expressiveness in Architecture Description Languages," with T. Rice, *Third International Workshop on Software Architecture*, November 1998, Orlando.

"Representing software systems architectures or, components, connections, and (why not?) first-class constraints and views," in *Joint Proceedings of the SIGSOFT'96 Workshops, 2nd International Workshop on the Architecture of Software Systems*, October 15–16, 1996, San Francisco.

"Toward a recommended practice for architectural description," with W. J. Ellis, P. T. Poon, D. Rayford, T. F. Saunders, B. Sherlund, and R. L. Wade. In *Proceedings of 2nd IEEE International Conference on Engineering of Complex Computer Systems*, Montreal, October, 1996.

"Experiences Applying a Practical Architectural Method," with D. Emery, and T. Rice, In *Proceedings Reliable Software Technologies—Ada Europe'96*, Alfred Strohmeier (editor), Springer-Verlag, Lecture Notes in Computer Science, volume 1088.

"The Architectural Metaphor as a Foundation for Systems Engineering," with T. Rice and S. Schwarm. *Proceedings INCOSE '96 Symposium*, Boston, July 1996.

Co-author, ISO/IEC 8652:1995, *Information Technology — Programming Languages — Ada*.

"Objects, Inheritance and Polymorphism in Ada 9X," presented at TRI-Ada '91, San Jose.

"Specifying Active Objects," *OOPSLA'88 Workshop on Specification and Design for Object Oriented Programming*.

"A Method of Behavior-Director Design," with M. Gerhardt, *OOPSLA'87*.

Feasibility of Ada Code Generation with an Automatic Programming System, MITRE Technical Report, 1987.

WIS Ada Design Language Standard, with C. Byrnes, MITRE Technical Report, 1986.

"Computer-assisted Simulation," *DATA TRAINING*, 1(3), 1981.