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Professional experience:

Computer Science Department, University of Southern Maine, Portland, ME

2/04-present: Adjunct professor. I teach COS 160 *Structured Problem-Solving: Java*, including the first section of COS 160 to be taught on the Maine Interactive Television network. I also teach COS 161 *Algorithms in Programming*, COS 495/595 *Advanced Web Services* and COS 444 *Software Project Management*, the latter two of which I originated.

1/09-present: Senior Research Fellow, Information and Innovation at USM. Activities include the LodeStone I and II programs which, jointly with the Center for Continuing Education at USM, trained workers displaced by the closing of the Brunswick Naval Air Station; Maine IT Workforce Skills Management, a project for the Maine State Department of Labor, and IT Workforce Decision Support, a project funded by the Maine Economic Improvement Fund, to design an e-marketplace for the IT workforce ecosystem.

Consulting activities

7/11-present: IDEXX Corp., Westbrook Maine. Activities centered on understanding and improving their requirements process and on designing and implementing a database-driven system for requirements management.

Patent defense activities

10/05-present: Various law firms. Expert witness on various cases concerning wireless LAN development and intellectual property relating to wireless LAN.

I.B.M. Corp., Research division, Yorktown Heights, NY

8/06-3/11: supplemental employee for the Mobile Systems projects service-oriented architectures for integration of system management tools. Duties have included technical strategy and papers.

9/99-6/05: Research Staff Member. I was an architect and implementer of Prism, a rule-based Java system for the analysis of system configuration data and for the planning of lifecycle actions. Previously, I was an architect of Maestro, a project in subscription computing services, for which I received a divisional award. This grew out of past work as project leader of Sherpa, an automated software

provisioning project. I lead a cross-site (Yorktown NY, Almaden CA, Haifa Israel) project to simplify IT for small business. With other staff, I demonstrated (4/2000) technical feasibility for total remote management of typical small business computer systems, including public PCs (portable user personality), zero-hassle installation and attribute-based service provisioning. I retired from IBM in 2005.

4/96-9/99: manager of Network Computer Systems. With others, I was responsible for defining IBM Research's program in network computers and for assessing the technical feasibility of JavaOS. We developed the first network computer capable of broadcast-quality (MPEG-2 at CCIR-601 resolution) multimedia and showcased it at Comdex fall 1997. I defined and led the Multi-Device Computing project, an effort to integrate pervasive and personal computing devices.

I had part-time responsibility for tracking technology relevant to mobile computing and providing updates in customer venues and to the IBM VP of Mobile Computing.

I have also been called on to review and contribute to IBM's wireless strategy four times. These have included presentations to key customer executives and have resulted in formulation of product plans and reports directly to the Chairman.

1/95-4/96: on assignment to Power Personal Systems, and then Programming Systems in Raleigh NC. I was lead software architect of IBM's Personal Communications Assistant project. I was responsible for its Internet orientation and use of Java. I received an IBM Corporate Outstanding Technical Achievement Award for this work.

7/92-12/94: manager of Mobile Communication Systems, supervising 7 Research staff (Ph.D.-level). I originated the technical foundation and product concept for the IBM Wireless LAN, a 2.4 Ghz SFH 1 Mbit/sec. radio LAN of advanced design. With others, I developed a prototype of a DECT-like simultaneous voice/data indoor radio system. I received an IBM Corporate Outstanding Technical Achievement Award for this work.

9/89-6/92: senior manager of Mobile Systems, a second-line technical management position supervising 12 Research staff (Ph.D.-level). I supervised the development of the stylus-entry device on the IBM ThinkPad portable computer, and indoor wireless data communications systems, with one announced IBM product (the IBM Infrared Wireless Local Area Network). Between 1989 and 1991 I worked with University and College Systems and with Columbia University's School of Engineering and Applied Science on a prototype of a wireless tablet computer called the "Student Electronic Notebook."

85-89: senior manager of I/O Systems, a second-line technical management position with additional first-line responsibilities. I established the organization and defined its mission. Its projects included Vision Science, Portable Systems and Flat Panel Display systems. I initiated a Printer Systems project instrumental in IBM's first desktop publishing product. The Flat Panel project contributed directly to the IBM/Toshiba DTI active-matrix color LCD panel in Toshiba and IBM laptops. I received an IBM Outstanding Technical Achievement award in July, 1987.

83-85: member of the staff of the IBM Corporate Technical Committee. This was IBM's corporate committee, overseeing technology and science in IBM. I reported to senior technical professional responsible for technology oversight. I conducted numerous studies, including document processing and parallel processor systems.

80-83: manager, Display Systems, a first-line technical management position. I personally designed the logic and programmed the development system (assembler, full-screen debugger) for YODA, an innovative microprocessor-based PC display adapter designed to process multilevel color images and antialiased graphics. The project directly influenced the design of several product display systems including those for the PC/RT and CAD/CAM displays. I received an IBM Outstanding Innovation award in June, 1986.

72-80: I held various technical positions including office automation studies, the design (with others) of IBM's first semiconductor-memory frame buffer display, bus architecture for a distributed microprocessor parallel system, and a staff assignment to the Director of Research.

72-11: Patent activities. I have been named a Research division "Master Inventor" and have been granted 50 U.S patents.

Columbia University School of Engineering and Applied Science, New York, NY

75-97: Adjunct Professor of Computer Science. I originated a two-semester sequence in digital computer organization and architecture, taught continuously since 1975. This is a first-year graduate course; a core course for the Ph.D. qualifiers. I began teaching on the Columbia Video Network in 1989 and internationally, on the National Technical University, in 1996. Peak enrollment in this course topped 140. I received Columbia Engineering's Adjunct Faculty award (Adjunct Professor of the Year") in 1989.

CompuScan Inc., Teterboro, NJ

4/70-4/72: Director of Programming. a first-line technical management position supervising 3-6 programmers. I was responsible for all system design and programming of two optical character recognition systems: a state-of-the-art

microfilm reader, and a low-cost direct paper scanner. The microfilm reader did significant projects for the US DOD (Russian input), the US Patent Office (conversion of patents), and New Jersey Bell Telephone. Directly responsible for CompuScan receiving a \$1M contract from NJ Bell, won in competition with IBM. The paper scanner became an industry leader in the newspaper industry. Lead programmer for several subsystems in both scanners.

Summers: amateur radio counselor at Pierce Camp Birchmont, Wolfeboro NH and positions with Mergenthaler Linotype, Brooklyn, NY (OCR studies). For two summers I served as a console operator and engineer at WLIB-AM, serving the Harlem community from studios on 125th street in New York City.

Education:

Doctor of Engineering Science, Columbia University School of Engineering and Applied Science, New York, NY (1970). This degree is equivalent to the University Ph.D. degree in every respect, but is granted by the engineering school and requires only one foreign language. I also received M.Sc. and B.Sc. (electrical engineering) degrees from the engineering school and an A.B. degree from Columbia College in 1965. Continuing education included IBM internal courses (management, SNA, Semi-Markov processes) and self-taught material (C++, HTML, Java, Web Services).

Papers and publications:

- “BlueStar: Managed Services for Enterprise Mobility” with Steve Mastrianni and others, IEEE International Conference on e-Business Engineering (ICEBE 2008), October 22-24, Xi’an, China
- “IT Autopilot: a flexible IT service management and delivery platform for small and medium business”, with others, IBM J. R&D, vol. 46, no. 3 (July 2007)
- “Personal Autonomic Computing Reflex Reactions and Self-Healing,” with Roy Sterritt, published in IEEE Transactions on Systems, Man and Cybernetics, special issue on Engineering of Autonomic Systems, vol. 36 no. 3, May 2006
- “PAC-MEN Personal Autonomic Computing Monitoring Environment” with Roy Sterritt, published in Proceedings of the 15th Annual Workshop on Database and Expert Systems Applications (DEXA ’04)
- “An Architecture for the Coordination of System Management Services,” with Vijay K. Naik and Ajay Mohindra, in the IBM Systems Journal special issue on e-Utility systems, vol. 43, No. 1, Spring 2004
- “Harmony: A Desktop Grid for Delivering Enterprise Computations,” with Vijay K. Naik and Swaminathan Sivasubramanian, presented at the Fourth International Workshop on Grid Computing, Phoenix, Arizona, November 2003.
- “Challenges in Autonomic Personal Computing,” with David Frank, presented at AUCOPA ’03, Banff, Alberta, Canada, August 2003.

- “Autonomic Personal Computing,” with others, IBM Systems Journal special issue on autonomic computing, vol. 42 no. 1, Spring 2004
- “The Emerging Model of Subscription Computing,” with Ajay Mohindra and Dennis Shea, IEEE IT Professional, August 2002
- “Design Alternatives for Wireless LAN,” with Frederic Bauchot, IEEE Network magazine, April/May 1994, IBM France’s best paper for 1994.
- “YODA: An advanced display for personal computers,” with Satish Gupta and others, IBM J. R&D, vol. 31, no. 1 (January 1987)

Reports:

Maine IT Workforce Skills Management (April 2011), a report to the Maine State Department of Labor.

IT Workforce Decision Support (June 2011), a report to the Maine State Economic Improvement Fund.

Book chapters and sections:

- “Input/Output and Devices: General Considerations, and Microprocessor System I/O” in *Fundamentals Handbook of Electrical and Computer Engineering III*, S.L. Chang, ed., Wiley-Interscience, 1983 and in *Eshbach’s Handbook of Engineering Fundamentals*, fourth ed., Wiley-Interscience, 1990

Teaching short courses:

- In 1999 I taught a six-hour course, "Network Computing with Objects," to the seventy patent examiners in computing and networking at the US Patent and Trademark Office, Washington, D.C., and taught a second course with others, “Autonomic Computing,” in 2002. In 2006 and 2008 I taught a one-day version of Advanced Web Services to incoming examiners.