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Synopsis:

Experience in computer systems research, development, and management of more than forty years. Work on systems software (languages, compilers, operating systems), e-commerce, parallel and distributed systems, and hardware architecture and design. Built and sold a number of start-up ventures in the computer technology arena.

Work Experience:

1994-Present:

President and Founder of **Frankel and Associates, Incorporated**. Performs consulting in high performance and distributed computing, wireless, e-commerce, and compilers/languages. Designed and implemented hardware and software systems for a speech-enabled, asynchronous handheld messaging appliance, led group to develop architecture, hardware, and software for self-describing building blocks for the architecture and game markets; developed high-performance, portable communications infrastructure for Cray T3E supercomputer, developed language and system for Web site reporting; created commerce-enabled World Wide Web (WWW) stores; architected WWW commerce servers; developed an object code modification system for Pentium PE files; built a sockets-based proxy server. Clients include **Mitsubishi Electric Research Lab (MERL)**, **Auripay, Inc.**, **Lincoln Lab**, **Open Market, Inc.**, **Stratus Computer, Inc./Isis**, and **Transarc Corporation**

2008-2012:

Chief Technology Officer at **Incentive Targeting, Inc.**. Leading a team creating a Software-as-a-Service (SaaS) web application to create, manage, and report on promotional campaigns. Novel aspects include a self-service interface to target consumers based on shopping behavior, a state-of-the-art distributed database to rapidly fulfill SQL queries, and a system to appropriately share chain data with brands. Active with all aspects of building the company: raising funds, selling to chains and brands, interfacing with clients. Sold company to Google.

2000-2001:

Chief Technology Officer at **Auripay, Inc.**. Lead a team to develop state-of-the-art payment systems for secure credit cards via surrogate numbers and for Visa and/or Master Card Association accepted gift cards, incentive cards, corporate purchasing cards, etc. Creation of methodologies to remove the card-not-present designation for Internet payments and to increase credit, debit, and stored-value transaction security. Moving into payment technologies for PDA's, cell phones, and other forms of m-payments. Sold company to Cyota.

1999-2000:

Founder of **CommerceTone, Inc.**. Company provides e-marketing services to small businesses. Built the technical and business model, established business relationships, presented the company to potential investors and raised the initial financial backing for the company. Company was sold to Mercantec, Inc.

1995-2000:

Vice President of Engineering at **Oxbridge Research**. Lead a team to build a commodities futures trading system including computerized strategies, trading station, and portfolio management.

1995-1996:

Visiting Scientist at the **Massachusetts Institute of Technology** in the Programming Systems Research Group at the **Laboratory for Computer Science**.

1988-1994:

Senior Scientist at **Thinking Machines Corporation**, Cambridge, MA. Led teams developing the fundamental technology and products for programming large-scale parallel systems. This work included managing a group of approximately 20 people to develop a compiler and development environment for the C* language and leading a group to port the Unix operating system onto the Connection Machine. Instrumental in forming business relationships and developing close pre- and post-sales interactions with customers. Worked on early design of the CM-5 network architecture, principal designer of the C* parallel computer language, principal designer of the C* compiler, responsible for language strategy and C and C* standardization activities, member of corporate strategy team, ported Unix OS onto the CM-5.

1985-1988:

Principal Research Engineer in Technical Languages and Environments at **Digital Equipment Corporation**, Nashua, NH. Responsible for project to investigate compiling Modula-2 for an experimental multiprocessor computer using an internal data flow graph representation and coalescing graph nodes in the compiler, and served as a consultant on compiler technology and direction to the company. Consulted with Digital's massively parallel computing group.

1982-1985:

Principal Research Engineer in Corporate Research and Architecture at **Digital Equipment Corporation**, Hudson, MA. Responsible for the Concurrency Project, a project to analyze and utilize parallelism in software, and served as a consultant to the rest of the company. Proposed butterfly network-based multiprocessor architecture. Worked on advanced architecture projects in workstations and debuggers. Worked on Digital's efforts in multiprocessors.

1981:

Consultant to **General Systems Group**, Salem, NH. Worked on bringing up a programming environment on the Apollo personal computer.

1979-1982:

Employed at **Xerox Palo Alto Research Center**, Computer Science Laboratory (Xerox PARC-CSL), Palo Alto, CA. Responsible for research in optical character recognition. Developed Ethernet measurement and packet buffering tool (Metric) and continued work on a Pascal compiler and Pascal byte code interpreter. Also served as a consultant to PARC.

1978:

Employed at **International Business Machines Corporation's T. J. Watson Research Center**, Yorktown Heights, NY. Worked on the 801 Minicomputer System Project examining the architecture and I/O organization and writing a low level I/O testing package.

1976-1977:

Employed as Systems Programmer by **International Business Machines Corporation**, Harrison, NY. Duties included extensive work on TSO under OS/VS2 MVS running on three 370/168's and one 370/158. In addition, worked on APL/SV, the IBM 5100, Tektronix graphic displays, and numerous system utilities.

1974-1977:

Employed at the **University of Rochester Computing Center** as a Consultant on the University's IBM 360/65 with OS/MVT and HASP. Duties were to oversee the campus facility and answer all questions — programming and otherwise — from outside users, faculty, staff, and students. Concurrently was working as a systems programmer at the main facility.

Teaching Experience:

1995-Present:

Lecturer in Extension at **Harvard University, Extension School**. Teaching Principals of Operating Systems (CSCI E-92), Computer Architecture (CSCI E-93), and Compiler Design and Implementation (CSCI E-95). Taught Introduction to Computer Science Using C++/Java, II (CSCI E-50b). Oversee student research/theses. 2019 recipient of the Petra Shattuck Excellence in Teaching Award.

2001-2002:

Adjunct Professor at **Harvard University, Faculty of Arts and Sciences**. Taught Computer Architecture (CS 146).

1995:

Lecturer at **Boston University**, College of Liberal Arts (CLA), Department of Computer Science. Taught the Introduction to Operating Systems course (CS 552).

1983-1987:

Adjunct Professor at **Harvard University, Faculty of Arts and Sciences**. Created and taught new Computer Science classes on Advanced Computer Architecture and VLSI Design. Taught the Compiler Design course. Oversaw student research work.

1977-1982:

Instructor in Computer Science on the Gordon McKay Endowment at **Harvard University**. Designed and taught a new introductory Computer Science class, Applied Sciences 11, with faculty member. Teaching Fellow in several Computer Science classes at **Harvard University**.

Education:

Graduate of **Harvard University**, Cambridge, MA with Ph.D. degree in Applied Mathematics — Computer Science (1983). Title of dissertation is, “The Architecture of Closely-coupled Distributed Computers and their Language Processors.” The thesis deals with the hardware design of a shared memory multiprocessor computer including detailed analysis of the network architecture and proposes a design technique for its system software to utilize the available parallelism. Work included the implementation of a compiler for Pascal which compiled a single program in parallel across a network of Xerox Alto, Dolphin, and/or Dorado workstations.

Member of the Computer Systems Research Group under Prof. Jerome Saltzer at the **Massachusetts Institute of Technology Laboratory for Computer Science** from 1981 through 1983.

Graduate of **Harvard University**, Cambridge, MA with S.M. degree in Applied Mathematics — Computer Science (1979). Extensive course work in both advanced hardware and software.

Graduate of **University of Rochester**, Rochester, NY with B.S. degree in Computer Engineering — Computer Science and Electrical Engineering (1977). Course work included graduate courses in Computer Science.

Graduate of **J. L. Miller — Great Neck North Sr. H. S.**, Great Neck, NY (1973).

Recipient of Mathematics and Science Awards at Graduation.

National Merit Commendation Recipient.

Regents Scholarship Recipient.

Westinghouse Science Talent Search Finalist and member of Honors Group.

General Background and Experience:

Authored numerous technical reports and papers.

Delivered numerous conference presentations.

Thirteen patents issued or pending.

Implemented cartographic navigational system directed primarily toward the marine industry.

Member of the ANSI C (X3J11) Committee.

Vice-chair of the ANSI C (X3J11) Data Parallel C Extensions (DPCE) Group.

Developed and implemented high-end home automation systems.

Designed and wrote a time-sharing operating system for the Zilog Z-80 microprocessor. System is totally interrupt driven, device independent, and has a UNIX-like user interface. Computer and software are used to control household lights and appliances and to perform other tasks.

Received Harvard University Graduate Scholarship for study in Computer Science.

Created two languages: MADCAP, a batch compiler for FORTRAN-like programs, and SNAP, an interactive interpreter for BASIC-like programs. These projects resulted in my selection as a finalist in the Westinghouse Science Talent Search.

President of Computer Club in high school.

References supplied upon request.