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Technology executive with 40+ years of experience in the computer, telecommunications and Internet industries. Developed and managed the development of significant computer software products which have enjoyed market success. Served as VP of Development and Senior Vice President Technology of INTERACTIVE Systems Corp., a startup, for 14 years. Founded open systems standards group and open systems technology group. Served as CTO of various startups. Skilled in software development, systems architecture, networking, the Internet, business development, standards development, and strategic planning.

1992 – Present

Open Systems Technology Associates

Arlington, WA

Principal

Founded technology and management consulting firm specializing in systems architecture, software development and the Internet. Provided consulting services for clients in the areas of strategic planning, technology trends, competitive analysis, system architecture and product planning. Assignments included:

- ◇ Standards Director for ADAPTIX, Inc., a broadband wireless access equipment supplier with products using innovative OFDMA-based technology for the support of mobile wireless systems. Represent company at industry forums such as IEEE 802.16 Standards Committee and WiMAX Forum.
- ◇ Co-founded Intelgo, a company dedicated to providing intelligent calling services in a dual-mode (cell and WiFi access with hand-off) handset using the latest VoIP, SIP and WiFi technologies. Provisional patents have been filed.
- ◇ Chief Systems Architect for Vectrad Networks, a fixed wireless access point-to-multipoint equipment supplier. Developed overall system architecture, hired software team, and represented company in industry forums such as BWIF, WCA and IEEE 802.16.
- ◇ Vice President of Engineering and CTO of Intermind Corporation, an Internet startup now called OneName Corp. Hired the engineering team and lead the team that defined the system architecture. System used and contributed to Internet technologies such as XML, HTML, P3P, P2P, XNS, DNS.
- ◇ Co-founded and co-developed business plan for launching an IP Telephony carrier business (NuTel Corporation, later called Bazillion). Performed market research, analyzed key technology components available from industry suppliers, and architected the platform and OSS support required to deliver the proposed services.
- ◇ Served as CTO for Internet startup with the objective of delivering ads on an Internet screen phone.
- ◇ Served as software advisor to WavTrace, a fixed wireless access point-to-multipoint equipment supplier. Hired key software development staff during the startup phase.
- ◇ Assessed the UNIX strategy of an Australian telecommunications company and made recommendations for the use of desktop systems, mid-range servers, migration to client/server computing and the strategic use of middleware services. Recommended policies were established in the key technology areas for the next three years.
- ◇ Made recommendations on how a service provider in the telecommunications industry could use the Internet to enhance services for its customer base. This included the use of the Internet to access existing services, using the Internet as a transmission vehicle, and integrating the new generation of “smart phones” and “network computers” into their service offering.

- ◇ Wrote a 25-page position paper on the “use of information for competitive advantage” for UNIX International. The central theme of the “Vision 2000” paper was that “advances in semiconductor technology, computers, communications, and human interface technology over the next decade will enable computers to become pervasive.” The major trends identified in this paper are largely being borne out today.
- ◇ Conducted an analysis of the major systems management tools in use for managing UNIX and Windows NT platforms to determine their strengths and weaknesses. Products analyzed included Microsoft SMS, BMC Patrol, CompuWare EcoTools, Computer Associates UniCenter, Tivoli TME 10, and Candle Command Center.
- ◇ Compared the key features of Novell UnixWare and SCO Open Server. The technical analysis of the two products was conducted by installing the products on a Pentium-based computer and analyzing and comparing the key technical features of each.
- ◇ Analyzed Microsoft’s enterprise operating system strategy, focusing on Windows NT, Cairo and related technologies. The impact of Microsoft’s strategy on Novell’s market for network services offered on NetWare and UnixWare was analyzed. Recommendations on opportunities for NetWare and related technologies were made based on findings.
- ◇ Designed the software architecture of a new distributed product for a telecommunications company introducing a next generation network-based application. The application runs in a distributed computing environment on a variety of computing platforms. Distributed middleware, fault-tolerant software, real-time databases, Internet software and other systems software components were evaluated to make the architecture recommendations.
- ◇ Analyzed the systems design of an open systems environment that co-exists with and interoperates with the proprietary operating system environment offered by a major computer vendor. Assessed the completeness of interoperability in the areas of the kernel, file system, security, internationalization, compilation tools, and user utilities, and made recommendations on how interoperability could be improved.
- ◇ Determined the requirements for a real-time operating system, and associated development tools, for a custom-designed embedded computer system. Selected the best match from the state-of-the-art real-time operating systems such as VxWorks from WindRiver, VRTX from MicroTec, and pSOS from Integrated Systems. Negotiated industry-beating licensing terms and conditions with the selected supplier.
- ◇ Developed and presented two-week long hands-on training course on Systems/Network Administration for system support engineers. Covered all major aspects of managing distributed UNIX workstations, including network administration topics such as TCP/IP, DNS, NFS, and NIS.
- ◇ Wrote 150-page InDepth Technical Document on UnixWare 2.0 describing all of the major technical features and benefits of the product.
- ◇ Wrote major sections of a 200-page Porting Guide describing the issues and procedures surrounding the porting of UNIX applications to a vendor’s open computing platform.
- ◇ Developed and presented various industry seminars on client/server computing and open systems standards.
- ◇ Served as “expert witness” in many high technology disputes. Wrote invalidity and non-infringement reports in patent litigation cases, wrote various reports and declarations, gave deposition testimony, and testified in court and arbitration hearings.

1978 – 1992

INTERACTIVE Systems Corp.

Santa Monica, CA

Vice President of Development &
Senior Vice President, Technology

Joined INTERACTIVE Systems Corp. as manager of a project to develop the first UNIX emulation package for VAX/VMS. Promoted to Vice President of Development after two months at the company. Managed remote development sites in Boston, MA and Gaithersburg, MD, as well as headquarters software development in Santa Monica, CA. Promoted to Senior Vice President, Technology in 1986.

Member of executive management team for all 14 years with INTERACTIVE, helping the company grow to 400 people in size and over \$60M in revenue.

- ◇ Designed the software architecture and implemented major components of the first UNIX emulation package for VAX/VMS. Hired and managed the development team for the project. The resulting product made significant contributions to company revenue for ten years.
- ◇ Provided oversight to development of PC/IX, the porting of the UNIX system to the IBM PC AT machine. Negotiated and managed the contract with IBM.
- ◇ Provided oversight to development of VM/IX, the porting of the UNIX system to the IBM 370 Virtual Machine architecture. Negotiated and managed the contract with IBM.
- ◇ Provided oversight to development of AIX for the IBM RT PC computer. This project was performed under contract to IBM and represented a major introduction of a UNIX product on IBM hardware. Negotiated and managed the multi-million dollar contract with IBM.
- ◇ Negotiated and managed numerous development contracts with major computer manufacturers for which INTERACTIVE ported the UNIX system. Software components ported included the complete UNIX operating system and utilities. In many cases the C compiler for the target computer architecture had to be written. Networking components such as the TCP/IP protocol stack and related utilities, as well as NFS, were ported to the target architectures.
- ◇ Negotiated two major UNIX porting contracts with two major Japanese computer manufacturers to port the UNIX system to their computer architecture. These two contracts were crucial to developing further business opportunities. Worked with Softbank in Japan to develop more opportunities with other major Japanese companies.
- ◇ Developed strategy to penetrate the US government market with standards-based UNIX systems. This required that INTERACTIVE products conform to the latest POSIX, OSI and IETF standards.
- ◇ Provided strategic technology direction for INTERACTIVE Products, and Services and Technologies lines of businesses. Identified areas of synergy.
- ◇ Elected member of the UNIX International (UI) Steering Committee, 1989-1992.
- ◇ Represented INTERACTIVE on various industry forums, including X/Open and the Open Software Foundation (OSF).
- ◇ Organized and managed conference program for INTERACTIVE's first Developers' Conference.
- ◇ Organized and managed company-wide INTERACTIVE Technical Staff summit meetings.

1969 – 1978**AT&T Bell Telephone Laboratories**

Murray Hill & Holmdel, NJ

Member of Technical Staff - Communications Research

Supervisor - Bell Data Network Software Development

Joined Communications Research Department to perform research in digital communications. Focused on operating systems research. Designed and implemented a number of operating systems based on the UNIX operating system developed at Bell Telephone Laboratories in the early 1970's. Joined in the start of the Bell Data Network design as a supervisor in 1977.

- ◇ Contributed to the design and implementation of a virtual memory operating system for the Honeywell DDP-516 computer. Wrote various operating system routines and utilities for this system. Worked with early adopters of the system to transfer system knowledge.
- ◇ Designed and implemented a Simple Numerical Application Programming (SNAP) language compiler for writing applications in a virtual memory environment.
- ◇ Developed the first microprocessor UNIX system for a DEC LSI-11 computer system with 40K bytes of memory and 512K bytes of floppy disk storage. This single-user system supported most of the UNIX system utilities, including the C and YACC compilers. It was used to support various projects throughout Bell Telephone Laboratories.
- ◇ Developed the MINI-UNIX system for a PDP11 computer without a memory management unit. This system could support up to four users on a small PDP-11 system with 48K bytes of main memory and 5M

bytes of disk storage. Hundreds of copies of this operating system were distributed outside of the Bell System by Western Electric.

- ◇ Co-designed and developed the first real-time UNIX system, Multi-Environment Real-Time (MERT) system for the larger PDP11 computers. The system provided real-time support for applications and supported UNIX as well as RSX11 applications in separate operating environments. The system was used throughout Bell Telephone Laboratories to support various telecommunications projects.
- ◇ Co-designed and developed the Satellite Processor System (SPS) to support distributed UNIX processing in multiple satellite processors. It used simple “remote procedure calls” to support the distributed computing paradigm. The SPS system was used throughout Bell Telephone Laboratories to test out various experimental telecommunications systems.
- ◇ Designed and implemented extent-based and 32-bit file systems to support real-time processing systems running under control of the MERT operating system.

Publications and Talks:

- ◇ 10 papers published in scientific journals while a graduate student, 1965-69
- ◇ More than a dozen memos published on switching design, software design, and operating systems at Bell Telephone Laboratories, 1970-78
- ◇ Three papers published in the July 1978 BSTJ Special Issue on the UNIX Operating System
- ◇ Paper on MERT published in SIGOPS journal
- ◇ Frequent speaker at UNIX/Open Systems conferences
- ◇ Seminars given worldwide on client/server computing, open systems standards and technology trends

Professional Associations:

- ◇ IEEE, Institute of Electronics and Electrical Engineers
- ◇ USENIX, UNIX Users Group
- ◇ UniForum, People Advocating Open Computing.

Industry Activities and Awards:

- ◇ Founded UniForum Standards Committee, 1981
- ◇ Founded UniForum Technical Committee, 1985
- ◇ Founding Co-chair of IEEE P1003 (POSIX) Committee, 1985
- ◇ Founding member of IEEE P1003.0 Guide Committee, 1988
- ◇ Received UniForum Annual Industry Award, 1987
- ◇ Received AT&T Standards Champion Award, 1993
- ◇ Elected to UniForum Board of Directors, 1987-93, 1997-99
- ◇ Elected to UNIX International (UI) Steering Committee, 1989-1992
- ◇ INTERACTIVE Systems representative to Open Software Foundation (OSF), 1989-1991
- ◇ INTERACTIVE Systems representative to X/Open, 1989-1991
- ◇ Founding Chairman of UTA Editorial Board, 1989-90
- ◇ Board member of Broadband Wireless Internet Forum (BWIF), 2000-2002
- ◇ Voting member of IEEE 802.16 WMAN standards committee, 2000-2007.

EDUCATION:

- ◇ Ph.D., Nuclear Physics, McMaster University, Hamilton, Ontario, Canada 1969
- ◇ B. Engin., Engineering Physics, McMaster University, Hamilton, Ontario, Canada 1965