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Profile

Two decades of computer science research and development activities are evidenced by an extensive record that demonstrates both creativity and the ability to rapidly implement innovative software technologies. These creations have covered a broad spectrum, ranging from the design and implementation of foundational technologies such as operating systems, compilers and their corresponding runtime environments, fault-tolerant, non-stop, massively multithreaded, event-driven, transparently distributed object-oriented application frameworks to system/network management technologies for the Internet, high-performance math kernels for supercomputers and bespoke business applications that handled high frequency options trading, general ledger, invoicing, inventory control, etc.

Some development activities involved the implementation of well-understood concepts (e.g., Basic Linear Algebra Subroutines for supercomputers or automation of business tasks that had been previously performed by hand); however, the majority required the invention of new ideas that were subsequently realized by robust commercial implementations that in turn made the technology accessible to a wide audience. XGMON serves as a concise illustration: even though it was conceived and implemented during a matter of weeks in 1988 to perform the network management of the NSFNET backbone, this Unix/X11 application was multithreaded, dynamically extensible and focused on enabling the rapid development of network management applications by support staff. Its flexibility and capabilities caused it to be used not only to manage conventional standards-based IP networks, but also to be used in apparently unrelated problem domains, such as a USAF satellite tracking system and control of the tollbooths of the Italian Autostrade.

Skills

Starting with the automation of business processes via programs written in C and COBOL, the development of applications and technologies running under Unix has been a near-daily activity since 1983; however, from 1996 onwards, each development effort has been maintained as a single source code image that is compatible with both Unix (e.g., Solaris, Linux, OpenBSD, AIX) and Microsoft's Win32 API.

Preferred well-known development language is C++ (used since 1987). Commercial products developed using C++, C, BASIC, COBOL, Cray-2 Assembler, Zilog Z-80 Assembler, FORTRAN, Intel x86 assembler, etc. Research projects developed using Pascal, Lisp, ML, BCPL, IBM 360/370 Assembler, Motorola 68000 assembler, Cray X-MP assembler and other obscure languages.

Innovation is aided by accurately assessing the viability of new technologies that serve as building blocks for subsequent breakthroughs; leadership was demonstrated by being a successful advocate for technologies whose value was not yet widely understood. Notable examples include 1) being a member of the teams that created the NSFNET backbone from 1988-1993 and developed the TCP/IP products for VM, MVS, OS/2,and OS/400 when the IBM strategic direction was for SNA and OSI, 2) in 1989, introducing the use of C++ for development work into IBM by making available the cfront C++ compiler for 4.3BSD, 3) in 1996, adding Linux as a supported DRAGONS platform. In a time when only IBM product divisions were permitted to generate revenue, IBM Research licensed the DRAGONS technology directly to third parties, launched a separate company and entered into reseller agreements with other

firms.

Application Domains

Primary R&D activities have been in distributed systems (usually in the network and system management domain), with a focus on implementing high-performance multithreaded transparently distributed frameworks to enable the development of distributed, nonstop, fault-tolerant applications.

Applications ranged from custom accounting/inventory control/billing systems, compilers (e.g., the **CEDARS** compiler for class scheduling [done for U-M], **G**, **OOG** [done for IBM], **OIL2** [done for FARGOS Development, LLC]), network/systems management platforms and technologies (**XGMON**, **DRAGONS**, RFC 1228, RFC 1592, **SNMP Query Engine** for Netview/390, **9076 SP1/SP2** system monitor/framework for distributed systems management, The Enterprise Management Protocol [**TEMP**]), to genetic algorithms (VLAN configuration) and Byzantine fault-tolerant transaction monitors (**FARGOS/SolidState**). Designed and implemented price feed layer (exchange interfaces, network distribution layer and client APIs that supported synthetic variables and merged prices), shared memory variable API and utilities for statistics and control, and low-latency execution engines for high-frequency options trading on several exchanges (ISE, CBOE, NASDAQ, NYSE, ARCA, OSE, SGX, Eurex, etc.).

In addition, designed and implemented a multitasking operating system for TRS-80 Model 1's, implemented math kernels for Cray-2 vector multiprocessors, dynamic loader and lightweight process library for SunOS.

Patents

U.S. Patent 6,748,416 – Client-side method and apparatus for improving the availability and performance of network mediated services

Experience

Senior Programmer **December 2006 – February 2010**

Volant Trading, LLC **99 Wall St 25th Floor, New York, NY 10005**

Designed and implemented the performance-sensitive components for Volant's first years of operation. These included the low-latency (i.e., less than 70 microseconds), high-frequency execution engines that embedded the logic and risk controls for options trading which were the firm's reason for existence as well as the multicast price feed layer supporting synthetic prices and merging across multiple exchanges (e.g., exchange connectivity, multicast distribution layer, client APIs, caches, and associated utilities for logging, reports and replay for simulation). These frameworks were interfaced to ISE, CBOE, NASDAQ, NYSE, ARCA, OSE, SGX, Eurex, etc. to perform the business of the firm. All option trades were done via Immediate-Or-Cancel orders (or nearest equivalent capability); in the symbols that were traded, the firm was responsible for approx. 4% of the US market volume and had an approx. 85% success rate for orders submitted in response to an option price change. Implemented a clone of IBM's ODE sandbox-based build environment with automated builds and multiple test environments. Designed and implemented an API for shared memory statistics and control variables and related utilities to permit non-intrusive management of applications with no impact on latency. Designed and implemented efficient log filter that could consume multiple files and streams in parallel, extract content of interest and format for display in appropriate colors; this was used for all trader event GUIs and to drive background utilities like event-specific sound generation.

Consultant **May 2003 – October 2006**

IBM High Performance Development Laboratory **2455 South Road, Poughkeepsie, NY 12601**

As a consultant, identified design defects in IBM's Reliable Scalable Clustering Technology, created models of expected performance and provided education regarding algorithm design, modern C++ and compilers. A notable contribution to the scaling improvements required to support Lawrence Livermore National Lab's ASC Purple supercomputer included both identifying the flaw in the group consensus protocol that caused stabilization times to be over an hour and proposing the solution that reduced the time to less than 2 seconds. Added packet fragmentation/reassembly support to enable arbitrarily large messages within RSCT's reliable messaging layer. During 2005-2006, taught a weekly class on the fundamentals of distributed algorithms with a focus on the origins of the technology being shipped by IBM. Directed the design and implementation of the automated test suite for RSCT Infiniband support on Linux and AIX.

Founder and CEO **July 1999 – Present**

FARGOS Development, LLC **505 Popula Blvd., Wappingers Falls, NY 12590**

Performed design, implementation and documentation of the high-performance, secure, transparently distributed, architecture-neutral, multilingual object-oriented applications infrastructure known as FARGOS/VISTA and the FARGOS/SolidState Byzantine fault-tolerant transaction monitor. Managed and contributed to development efforts of various web-based customer-specific applications.

Senior Programmer **May 1988 - July 1999**

IBM T. J. Watson Research Center **P. O. Box 218, Yorktown Heights, NY 10598**

Invented and implemented the XGMON and DRAGONS technologies for the National Science Foundation Network as well as the original SNMP network management agents for the backbone routers, which in turn were ported to VM, MVS, and OS/2. A reduced function version of XGMON was sold as the Network Management/6000 Licensed Program Product for AIX. DRAGONS was selected by the Open Software Foundation to provide the real-time component of their Distributed Management Environment. Invented the SNMP Distributed Program Interface, documented years later as RFC 1228, which enabled management of the NSFNET's Cylink ACSUs and permitted the implementation of the VM and MVS SNMP agents. Ported Sun RPC to VM for the VM 1.2 TCP/IP release and also wrote the BSD socket interface compatibility layer on top of the original Pascal-based VM APIs. Invented and implemented the SNMP Query Engine to enable SNMP support for Netview/390 and integrated it with XGMON to create first multi-user SNMP network management platform. Invented and implemented the DRAGONS Display Manager as the GUI technology for the 9076 SP1 System Monitor and provided the DRAGONS-based applications for the system monitor and management framework.

Other research activities included configuration of virtual LANs by genetic algorithms, an Internet access cartridge for the Nintendo SNES, fault-tolerant services, enterprise management protocols, and pervasive computing. The XGMON and DRAGONS technologies were afforded special case treatment and licensed to select IBM customers before being generally available as products. IBM Research took the extraordinary step of creating *NetSmith's, Ltd.* as an independent firm dedicated to selling DRAGONS and other companies licensed the DRAGONS technology suite for resale under their own brands.

Systems Programmer **May 1987 – April 1988**

The University of Michigan **1075 Beal Avenue, Ann Arbor, MI 48109**

As a systems programmer, implemented a dynamic loader for 4.3BSD UNIX (SunOS on Sun 3's), a library to implement lightweight processes (i.e., user-space multithreading) and a process checkpoint/restart facility.

Consultant **January 1986 – December 1986**

Research Institute for Advanced Computer Science

NASA Ames Research Center **Moffet Field, CA 94035**

As a consultant, was responsible for developing appropriate techniques for benchmarking Cray 2 supercomputers and the implementation of ultra-high performance algorithms for use by the computational chemistry group working on the NAS project. Most notable accomplishment was the implementation of the fastest matrix multiplication kernel for the Cray 2. Designed and implemented a "microtasking" library for the Cray 2.

Research Assistant **May 1985 – December 1986**

Magnetic Fusion Energy Computer Center at Lawrence Livermore

Los Alamos National Lab

San Diego Supercomputer Center

Numerical Aerodynamic Simulator project at NASA Ames Research Center

As a research assistant to Donald A. Calahan, designed and implemented several high-performance kernels for the Cray 2 scientific library (e.g., scalar times a vector, vector times a vector, matrix times a matrix, etc.). Designed and implemented benchmarking routines. Performed only available comparisons on the effect of pseudo-banking on the Cray-2 before and after implementation of this hardware modification on the NAS Cray 2. Various benchmarking experiments comparing algorithm performance between dissimilar architectures, such as vector processors (e.g., Cray 2, Cray Y-MP) and hypercubes (e.g., nCUBE, Intel).

Expert Analyst **May 1985 – February 1986**

Cravath, Swaine and Moore **Worldwide Plaza, 825 Eighth Avenue New York, NY 10019**

In what has been stated to be one of the landmark court cases pertaining to "look-and-feel", was retained to determine whether the source of one program was a derivative of another. Analysis results were explained in court by Bernard A. Galler and were sufficiently compelling to win a summary judgment.

Independent Research **September 1984 – May 1986**

University of Michigan **1075 Beal Avenue, Ann Arbor, MI 48109**

9/84-12/84: Designed and implemented **FARGOS** (Fantastic And Really Great Operating System), a multi-tasking operating system for TRS-80 model I microcomputers.

1/86-5/86: Implemented a Unix System III-based simulator of the TRS-80 Model I with multi-processor extensions and enhanced **FARGOS** to support multiple processors, which became **FARGOS/MP**.

Publications

G. Carpenter & G. Goldszmidt, “Remote Management of Narwhal Clients using TEMP”, NOMS 2000, http://www.fargos.net/documents/papers/NOMS2000.pdf

G. Carpenter, “Enabling the Management of Everything using TEMP”, Globecom 99, http://www.fargos.net/documents/papers/Globecom99.pdf

G. Carpenter & G. Goldszmidt, “Improving the Availability and Performance of Network Mediated Services”, INET99, http://www.fargos.net/documents/papers/Inet99nca.pdf

R. Lehman, G. Carpenter & N. Hien, “Concurrent Network Management with a Distributed Management Tool”, USENIX LISA VI, http://www.fargos.net/documents/papers/LISA.pdf

RFC 1228: SNMP-DPI: Simple Network Management Protocol Distributed Program Interface, http://www.ietf.org/rfc/rfc1228.txt

RFC 1592: SNMP DPI Version 2, http://www.ietf.org/rfc/rfc1592.txt

Awards

IBM Outstanding Technical Achievement for the National Science Foundation Network (the network management software).

IBM Outstanding Technical Achievement for 9076 SP1 System Monitor (DRAGONS-based infrastructure and applications).

IBM Research Technical Group Award for contributions to TCP/IP (SNMP DPI, SNMP Query Engine to enable SNMP support for Netview)

Education

M. S. in Computer Science and Engineering from the University of Michigan, Ann Arbor, Michigan (awarded May 1987).

B. S. with Distinction Honors in Computer and Communication Sciences from the University of Michigan, Ann Arbor, Michigan (awarded May 1985).

Citizenship

United States citizen.

Additional Information Online

http://www.fargos.net/gcc.html provides links to several published papers and additional details about prior work.

http://www.fargos.net/gccAwards.html documents some of the awards that were received in recognition of technical accomplishments.

http://www.fargos.net/GCCcareerNotes.pdf holds copies of appraisals, thank you notes, and press clippings.