

Resumé of Robert J. Brown*

Computer Scientist

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Summary

MR. BROWN'S professional experience spans many years and covers a broad range of areas in business and computer science. He has founded two corporations¹ and has been instrumental in developing the technology base for venture capitalizing four others². He has consulted to and conducted R&D activities for a number of large, medium, and small companies. He has conducted seminars on leading edge technologies, published papers in recognized journals, and given presentations at technical conferences. His primary areas of technical expertise include artificial intelligence, real-time, embedded, and safety critical systems. The accompanying tables encapsulate the specifics of his skills.

Table 1: Areas Of Expertise

Artificial Intelligence	Asynchronous Transfer Mode	Audio Compression	Avionics
CASE Tools	CMTS	Communications	Configuration Management
CORBA	Data Acquisition	Dataflow Architectures	Digital Signal Processing
Distributed Objects	DO178-B	Embedded Systems	Energy Management
Expert Systems	Gnu Tools	Graphics	IEC 61508
IEC 62304	Inference Engines	Internet Servers	Knowledge Engineering
Manufacturing Automation	MCNS	Medical Equipment	Military C ³ I
Motion Controls	MPEG-2	Neural Networks	Object Oriented Programming
Parallel Processing	Pattern Recognition	Process Control	Production Rule Systems
Real-Time Applications	Real-Time Operating Systems	Robotics	Simulation
State Machines	System Administration	Systems Engineering	Telephony
Test	Use Cases	Vehicular Controls	Video Compression
Virtual Reality	Wireless Networks	World Wide Web	

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¹Associated Data Consultants, Inc. & Elijah Laboratories, Inc.

²Vanex/MIDC, Teletimer International Inc., Audio Digital Imaging Inc., & Ikadega Inc.

Table 2: High Level Languages

Ada	awk	Basic	C	C++	CLIPS	elisp	expect
FORTTRAN	Forth	HTML	IDL	Java	LISP	L ^A T _E X	PL/I
Pascal	Perl	POSTSCRIPT	Prolog	Python	R	tcl	T _E X

Experience

Spartronics LLC, Strongsville, Ohio. 2024. *Consultant.*

(C, ARM, FreeRTOS, IEC 62304)

Performed independent third party assement of requirements and computer software code for cryptographic aspects of an IEC 62304 Class B patient contacting medical device. Special emphasis was placed on protecting personally identifying information (PII), patient confidential medical information (HIPAA), and client trade secret intellectual property that was contained in communications between the patient contacting device and the controlling host system. Deliverables included detailed comments on document and code reviews, together with a final report summarizing concerns and recommended solutions.

Medtronic plc, North Haven CT. 2021-2023. *Consultant.*

(C, C++, Python, ARM Cortex-M33, FreeRTOS, DDS, WolfSSL, RT600, Trust-Zone, PUF, Root of trust, IEC 62304, MISRA, TDD, IAR, Wi-Fi, BLE, CVSS)

Worked in R&D on concept stage of wireless connectivity add-on board for an endoscopic stapler, an IEC 62304 Class C medical device. Performed CVSS scoring for cyber-security analysis for WiFi/BLE considering secure boot, secure update, and secure DDS publish/subscribe connections. Evaluated multiple real-time operating systems for suitability for this project. Examined PUF based root of trust using RT600 hardware. Investigated Wi-Fi pairing approaches using BLE to eliminate need for operator interaction to pair devices in surgical operating room setting. Developed MISRA compatible thread safe buddy system memory heap to support C++ code, including extensive performance testing. Introduced Test Driven Development (TDD) approach, and developed tool set to support rapid interactive TDD development, running tests either on workstation CPU, or on ARM Cortex-M33 simulator.

Viavi Solutions, Wichita KS. 2020-2021. *Consultant.*

(Python)

Developed test scripts to test Army tactical hand-held COMSEC radios. These scripts are written in Python and run on a test instrument designed and developed by Viavi. These scripts implement tests equivalent to the factory test performed on the radios by the manufacturer, except that they are optimized for use with the Viavi radio test instrument. This instrument was being developed in parallel with these test scripts, so as much of the work was centered on finding and fixing problems with the instrument as on testing the radios. I was responsible for testing radios manufactured by L3Harris and Thales.

GE Aviation, Grand Rapids MI. 2019-2020. *Consultant.*

(C, tcl, Xilinx, Zinq, Python, ARM-Cortex, petalinux, boot, FSBL, DOORS, MPsom, LabWindows)

Performed systems test for SMC (Stores Management Computer) for AH-1Z Marine Viper attack helicopter. Developed markup language and python parser to automatically verify results from test log files generated by test run on AH-1Z test stand. Performed BIT verification tests for low level functions of hardware platform for the first stage bootstrap loader of a stores management system. This involved the injection of faults and tests to verify that the fault was properly detected. Developed test harness to automatically run these scripted tests, logging and archiving all relevant timestamped artifacts produced by the test. Modified EMI testing software to work with

Table 3: Machines & Assembler Languages

1401	1805	32010	360	370	3870	68000	68020
68030	68040	68340	68360	68HC11	80186	80196	80286
80287	80386	8048	8051	8085	8086	8087	8096
ARM	EDL	Gould-SEL	HD64180	HP-9000	MIPS	Modcomp	MSP430
NSC-800	PDP-11	PowerPC	RT600	Series-1	Sun Sparc	Symbolics	Z-80

Table 4: Operating Systems & Environments

Ægis	CP/M	EmbOS	FreeRTOS	Sframe Genera	HP-UX	Linux
Motif	MS-DOS	MS-Windows	Novell	NT	O/S	POSIX
pSOS	RMS	RPS	RSX-11/M+	RTM	Solaris	Sun-O/S
SunView	Ultrix	UNIX	USX	VME	VMS	VRTX
VxWorks	Windows-95	World Wide Web	XENIX	X-Windows		

MPSCU device for MQ-25 Navy refueling drone for aircraft carrier deployment. Did root cause analysis for failure of a test for an avionics device on the F-35 fighter.

MSA Safety, Cranberry Twp. PA. 2018-2019. *Consultant.*

(C, FreeRTOS, ARM-Cortex, Ble)

Performed feature design, implementation, and unit test for a battery operated low power industrial gas detection sensor node. Multiple nodes are linked together on a low power grid network to a local hub that connects to a central server over the internet. Configuration is performed by a cell phone application using a bluetooth low energy (Ble) connection. I implemented the instrument configuration feature.

Nucor Steel, Ghent KY. 2018. *Consultant.*

(C++, C#, SQL)

Performed maintenance, bug fix, and enhancement work on a legacy order-to-cash system that tracked each order from inception until the product was produced, shipped, and invoiced. This system was written in C++, C#, SQL, and PowerBuilder. Developed static code analysis tool to determine dependencies among over 1000 SQL stored procedures and the C++, C#, and PowerBuilder files that called them. Enhanced C++ graphics generation application to produce zoomable and panable graphs in SVG that annotated the location of the cursor to 5 significant figures.

84.51°, Cincinnati OH. 2015-2018. *Consultant.*

(C, Python, R, Linux, korn shell, Hadoop, Scala, NiFi, SAFe, Agile, Scrum)

Participated on a scrum team of 4 software engineers to maintain, enhance, and productionize a big data, machine learning, retail replenishment forecasting system. Worked primarily in the areas of data ingestion and specialized database implementation for tree induction learning algorithm optimization. Performed code review, detailed software design, programming, and unit test. Customized tools for static analysis of C source code. Designed and implemented coverage tracking tool for korn shell scripts. Introduced python as a scripting language.

Rockwell Automation, Milwaukee WI. 2014-2015. *Consultant.*

(C++, Python, IAR, ARM, EmbOS, IEC 61508)

Participated in a team of 12 software engineers to develop high speed industrial controller I/O devices in compliance with the IEC 61508 functional safety standard. Performed requirements analysis and elaboration, requirements and code review, detailed software design, programming, and unit test. Developed tools for static analysis of C++ source code. Developed framework for conducting automatic scripted unit tests. Designed functional safety compliant flash file system. Provided expertise to train less experienced engineers to work in a regulated environment.

Mueller Company, Chattanooga TN. 2013-2014. *Consultant.*

(C++, XML, MSP430, git, Linux, DSS, Javascript, java, bash, Rhino, Eclipse, CodeComposer)

Ported the MSP430 On-Target scripted testing framework (see 2012 QiG Group project below) originally developed for C to work with C++. Performed design reviews, code reviews, unit test, and integration test for a new data

Table 5: Tools

bind	ClearCase	CVS	DNS	DOORS	Eclipse	emacs
Firewalls	Framemaker	ftp	g++	gcc	gdb	Ghostview
git	lynx	make	MOO	MUSE	netscape	RCS
resolver	RISC-watch	ssh	STP	SubVersion	telnet	VNC

acquisition and telemetry product designed to operate unattended on battery power for 5 years without any other power source.

IDAir Co., Huntsville AL. 2013. *Consultant.*

(C, C++, java, SWIG, bash, Linux, Android)

Ported C/C++ image recognition library software to work with Java in an Android environment.

Philips Respironics, Pittsburgh PA. 2013. *Consultant.*

(C, C++, HP Quality Center, IEC-62304)

Performed system level testing of respirator and ventilator equipment software in conformance with IEC 62304 quality standards for medical equipment.

QiG Group, Cleveland OH. 2012. *Consultant.*

(C, TFS, XML, MSP430, CCSV5, DSS, Javascript, java, SWIG, bash, NI-DAQ, Rhino, Eclipse, CodeComposer, Scrum, IEC-62304)

Designed and implemented the MSP430 On-Target testing framework, a fully scripted automatic test facility. Used this to test an implantable neurostimulator medical device. This runs software unit tests automously, in accordance with IEC-62304 requirements for medical devices. This required interfacing the National Instruments DAQ (Data Acquisition device) with the TI CodeComposer DSS JTAG hardware debug device into the Mozilla Rhino scripting engine used to interface with the TI DSS debug server, which is written in Java. It also required automatically generating C source files used as scaffolding to conduct the tests, and automatically building the target image to include the scaffolding. Wrote Javascript software unit test runner as a collection of shell scripts. Wrote automatic test report generation software. Wrote test scripts to test the target device in this environment.

General Electric Appliances, Louisville KY. 2011-2012. *Consultant.*

(C, CVS, XML, Renesas)

Helped the client get clothes washer and dryer microprocessor control software ready to go into production. Received problem reports from the test team and investigated problems to determine the root cause, then proposed how to repair the defect, and implemented that repair, including white box testing of the result. This required knowledge of both the mechanical and electrical hardware as well as the control software. The control software was implemented as a large heirchical state machine.

Rockwell Collins, Cedar Rapids IA. 2010-2011. *Consultant.*

(C, C++, Python, XML, XSLT, Subversion, Windows-XP, RTX, AFDX, DO-178/B)

Developed a test stand for a family of flight control computers for various regional jets. Implemented AFDX (Arinc-664) networking and interfaced the C code of the AFDX protocol stack to the Python language, as the test scripts to be run on the stand are to be written in Python. Implemented RBP (Reliable Burst Protocol), a TCP-like connection oriented protocol, on top of AFDX. Developed XML based configuration file format and processing code to configure the stand for the target aircraft.

IRD Balancing, Louisville KY. 2009-2010. *Consultant.*

(C, C++, C#, CVS, Subversion, Windows-CE, 8051)

Performed requirements gathering, requirements analysis, requirements elaboration, use cases, algorithm design and prototyping for a new computerized balancing instrument. The instrument is designed to handle small to very large rotors operating at 30 RPM to 100,000 RPM. The data acquisition and digital filtering takes place on a pair of 8051 cpus, and the statistical digital signal processing takes place on the embedded Intel based PC. The graphical user interface is streamlined to minimize unnecessary operator interaction. It is designed be multi-lingual for worldwide deployment.

Comtech Mobile Datacom, Germantown MD. 2008-2009. *Consultant.*

(C, C++, CVS, POSIX, Python)

Developed cryptographic software for a military satellite communications application (FBCB2). Performed reverse engineering and refactoring on legacy source code to prepare for NIST validation as a FIPS 140-2 and FIPS 140-3 (draft) cryptographic module. Designed power-up and self-test functions to place the module in FIPS mode. The module was implemented as a dynamic shared object (DSO) under RHEL 4/5.

Eaton Aerospace Actuation Systems, Grand Rapids MI. 2008. *Consultant.*

(C, D0178-B, D00RS, ClearCase, perl, Python, D0-178/B)

Performed SOI-3 readiness review and remediation for the Flap System Control Unit (FCSU) for the Embraer “Phenom 100” executive jet. Performed requirements engineering and traceability in compliance with DO178-B B level software. Designed and implemented interactive graphical software to perform call tree and stack usage and C programming language include file heirarchy analysis to satisfy reporting requirements. Designed and implemented software to automate the insertion of white and grey box test code into production releases of the source code.

Hamilton Sundstrand, Rockford IL. 2007-2008. *Consultant.*

(C, D0178-B, D00RS, PPC-555, perl, python, D0-178/B)

Performed systems engineering for the electrical power distribution system software and communications networking for the Boeing 787 “Dreamliner” passenger jet. Coordinated system integration efforts with Boeing in Seattle, Hamilton Sundstrand in Illinois, ECE in Paris, and TTTech in Austria, and subcontractors in Bangalore and Russia. Performed requirements engineering and traceability in compliance with DO178-B A level software. Designed and implemented software to auto-generate configuration data for electric power distribution equipment, solving complex problems that spanned three companies responsible for providing and deploying that data, and using ARINC-615A data loader to load these tables, and resolving dependencies with other systems on the airplane.

Lexmark, Lexington KY. 2006-2007. *Consultant.*

(perl, POSIX, python, make, imake, automake, autoconf, subversion)

Supported and enhanced proprietary build system to serve 300 software developers around the world. System supports a mix of open and proprietary source code and targets a wide range of cpu’s and operating systems in an embedded application. Code base on NAS storage runs many terabytes and tens of millions of lines of source code. The build system makes extensive use of parallelism to turn around large builds quickly.

Goss International, Chicago IL. 2006. *Consultant.*

(ANSI Common Lisp, C++, STL)

Helped convert a complex legacy program from the original Lisp code to C++ code so that the client’s in-house software staff could support and enhance it. The program calculates optimal ways to configure large newspaper printing presses.

DRS Technologies, St. Louis MO. 2006. *Consultant.*

(C, Linux, POSIX, VxWorks, X11R6, VNC)

Designed X-windows software architecture to replace multiple displays, keyboards, and pointing devices (mice, touch screens, trackballs, etc.) on multiple computer systems from multiple vendors with a single Common Display that replaced all the seperate displays. The system is deployed in an Army ground tactical survielance vehicle. The earlier design with multiple displays crowded the operator and blocked his vision of the surrounding terrain. The new system saves space, battery power, and weight, as well as improving the soldier’s ability to see the surroundings. The systems used X11 and a mix of embedded Linux and VxWorks. Custom ports of X11 and VNC tools, as well as data and image compression libraries were made to the VxWorks environment.

Motorola, Schaumburg IL. 2004-2005. *Consultant.*

(C, C++, VC++)

Designed test harness software for the HSD high speed RF data modem power management enhancement feature. This involved developing a scriptable tool to exercise the PPP connection between the client device and the modem, including being able to observe the traffic exchanged between the devices, and protocol validation using formal methods based on finite state machine models. A finite state machine model of the protocol is designed in a graphical tool, and the state table is extracted from the tool’s output XML file. The state table is then used as input to test suite generation software that outputs the validation test suites. I was responsible for developing the test suite generation tool.

Aliant Techsystems, Cincinnati OH. 2004. *Consultant.*

(C, C++)

Performed system integration for the Army’s **Spider** project in preparation for Critical Design Review (CDR) and field testing. This project implements a self-organizing man-in-the-loop distributed ad hoc wireless sensor network to control a field of anti-personnel land mines in conformance with new United Nations regulations requiring a humane alternative to conventional land mines that is safe for civilians.

General Electric Medical Imaging Systems, Waukesha WI. 2002-2003. *Consultant.*

(C, C++, Linux, POSIX, RFB, VNC, Xlib)

Implemented `gemsvnc` a prototype Remote Console Observation and Control, or RCOC, capability for Unix hosted medical imaging devices for the purpose of permitting service and training personnel to observe and operate the device remotely over the internet. Starting with open sourced and Gnu Public Licensed VNC servers and a GPLed library to implement the Remote Framebuffer Protocol that lies at the heart of VNC, enhancements were made to address the need to access an already running X-server and mirror its display thru a VPN over the internet. Numerous performance enhancements were made to permit real-time observation of dynamically changing medical images, and other enhancements were added to address the needs of safety, liability, and patient privacy.

Motorola SBNS Group, Northbrook IL. 2000-2001. *Consultant.*

(C, C++, VPN)

Analyzed legacy build system and recommended changes to improve performance and reduce turnaround time. Researched existing Virtual Private Network technologies and prototyped a VPN to permit telecommuting. Developed and demonstrated methods to produce both hardcopy and web-based documentation from the same source files for next generation satellite set-top boxes.

Motorola Telematics Group, Elk Grove Village IL. 2000. *Consultant.*

(GSM, Bluetooth, USB, MOST, OBEX, SIM)

Responsible for requirements gathering and elaboration for Bluetooth wireless ad-hoc networking support for the CP211 project.

Ikadega Inc, Northbrook IL. 2000. *Consultant.*

(C++, UML, eCos, POSIX, PowerPC, ATM)

Assisted in the software architecture and design of a multi-processor high capacity streaming video server. Designed and implemented configuration management system, including automated build and unit test. Designed and implemented a memory resident real-time multi-process relational database system with a non-blocking transaction monitor.

Motorola Cellular Subscriber Group, Libertyville IL. 1999. *Consultant.*

(C, assembler, 68332, GSM)

Responsible for implementing enhancements to the Electronic Man-Machine Interface, or EMMI, a test tool for GSM cellular telephones. Enhancements permit new features on new designs of phones to be properly supported by the EMMI. Enhanced toolchain for use with In-Circuit Emulator. Researched and recommended source text browser. Mentored Motorola employees in new techniques.

Videojet Systems Inc, Schaumburg IL. 1999. *Consultant.*

(C++, Java, IDL, CORBA, Chorus, Linux, PPC, Imake)

Responsible for re-engineering the build system for a large multi-cpu project involving over 4000 directories of source files. Reduced developer's re-build time from 4 hours to 2.5 minutes.

Motorola AIEG, Northbrook IL. 1999. *Consultant.*

(C++, assembler, PPC, pSOS)

Responsible for implementing BSP between PPCBug BIOS functions and the OSEK portable real-time operating system for a multi-cpu ECU for a well known European automobile manufacturer. Specified development toolchain. Project was shared between US and 3 European countries. Travel to UK.

3com Corporation, Rolling Meadows IL. 1998-1999. *Consultant.*

(C, HTML, HTTP, CGI, MCNS, PPC, pSOS)

Responsible for implementing an HTTP web server embedded within an external cable modem, permitting the user to set-up, adjust, and monitor the cable modem. The only communications pathway between the cable modem and the user's computer is a 10baseT ethernet cable. Implemented an embedded diskless file system to support the web server. Implemented HTML web pages and associated CGI routines to handle the user interface. This permitted the user to completely monitor and control all user modifiable internal parameters entirely from the web browser of his choice.

Zenith Electronics Corp, Glenview IL. 1997-1998. Consultant.

(C++, Java, IDL, Chorus, CORBA, CVS, Linux, MC68040, MC68360, MIPS, PPC, Unix, expect, tcl, gnats, DejaGnu, POSIX, pSOS, Use Cases)

Member of system architecture team defining architecture for next generation 2-way interactive digital HDTV cable infrastructure. Designed and prototyped multi-targeted cross build system. Designed automatic unit test strategy. Designed object oriented multitasking state machine implementation. Evaluated Java Virtual Machines (JVM's) for embedded system deployment. Helped design and evaluate tradeoffs in overall system architecture of 2-way digital cable system. Helped specify and design next generation MCNS cable modem and supporting infrastructure.

Lucent Technologies, Naperville IL. 1997-1998. Consultant.

(awk, C++, expect, MC68360, PPC, pSOS, Solaris, tcl, Unix)

Developed firmware to control custom ASICs for ATM switching fabric and line card interface circuitry deployed on the Globeview-2000 ATM Switch. The first system shipped was the backbone for the nuclear simulation system at Los Alamos, whose successor is the ASCI Q, the number 2 supercomputer in the world. Designed object oriented code to handle multiple versions of different ASICs with a single ROM load. Designed transparent interface of CPU firmware to VHDL circuit simulation to aid in ASIC and firmware checkout. Helped design firmware system test process. Developed portable code to work with heterogenous processors on different boards employing similar ASICs.

Audio Digital Imaging Inc, Arlington Hts. IL. 1995-1997. Consultant.

(C, C++, expect, Forth, HTML, \TeX Linux, POSTSCRIPT, Solaris, tcl, tix, tk, Unix, verilog)

Developed the on-chip firmware to control a single-chip MPEG-2 video and audio decoder ASIC. Responsible for choosing microprocessor architecture and selecting vendor for CPU design. Responsible for detailing interface requirements to other on-chip custom signal processing hardware. Wrote simulator, cross-assembler, and Forth cross-compiler for CPU to support firmware development in Forth and assembler. Participated in negotiations with vendors for CPU, and for VLSI synthesis support. Worked closely with hardware designers, and tested the above firmware in a Verilog simulation environment of the entire system on a single chip.

Zenith Electronics Corp, Glenview IL. 1995-1996. Consultant.

(C++, Chorus, CORBA, \TeX Linux, Mach-10, MC68040, MIPS, POSIX, PPC, Unix, VxWorks)

Helped develop the architecture for TSM, the Transport Stream Multiplexer. TSM is a device for cable TV operators that permits the separation of multiple MPEG-2 transport streams into their component MPEG-2 program streams, and the mixing together of these program streams back into new transport streams. With this device, cable operators may compose customized sets of program material from multiple satellite feeds. TSM is being implemented in C++ running on multiple MIPS or PPC processors on a VME backplane running the Chorus distributed operating system and a CORBA ORB. In a two-way system, the requirements have many similarities with digital telephony systems.

Panasonic Factory Automation, Franklin Park IL. 1995. Consultant.

(C, C++, CLIPS, expect, HTML, LISP, \TeX NT, Prolog, SUN/OS, tcl, tix, tk, Unix)

Spearheaded a development effort to introduce knowledge based applications to augment the factory automation software developed by this client to assist its customers in effectively utilizing the client's line of printed circuit board assembly equipment. Conducted a survey of available expert systems development tools and made recommendations to management concerning the best fit for the intended applications, taking into consideration both technical and business reasons for choosing a tool. Performed proof-of-concept development for diagnostic expert systems for these complicated electro-mechanical devices. Developed user interface questionnaire scripting language to augment rule based expert systems and maintain uniform look and feel across all knowledge based applications, and permitting support of that same look and feel under both Unix-X11 and Microsoft NT.

Motorola Cellular Infrastructure Group, Arlington Hts. IL. 1995. Consultant.

(awk, C)

Helped the client port its proprietary real-time executive from an earlier version of its cellular base station control computer to a newer version of the computer hardware by performing system integration and test. Performed source code audits and reviews, and detected numerous program logic errors by code inspection. Wrote test procedures, performed module and subsystem validation tests, and fixed problems that were detected. Was instrumental in introducing automated test procedures for validating new builds using automatic regression methods.

Loral Defense Systems, Akron OH. 1993-1994. *Consultant*

(Ada, awk, C++, elisp, FORTRAN, \TeX POSIX)

Helped the client implement CTES (Common Tactical Environment Simulator), a reusable component for DIS (Distributed Interactive Simulation) combat trainer/simulators. CTES is a virtual reality component for networked simulators that simulates a world in which humans participate. This world is mirrored on each node on the defense simulation internet (DSI) that is participating in the simulation. I led the development team that was responsible for all the executive and communications components of CTES. I personally designed the scheduling and dispatching components, and guided the design of the shared memory and Ethernet communications component, and the object instantiation component, which included dynamic binding to other objects at instantiation time.

Florida Drum Delta Co, Pine Bluff AK. 1993. *Consultant*

(Forth)

Helped the client extend the useful life of existing machine control software by implementing a virtual screen capability. This capability permits multiple display screen images to be saved and restored under program control. The system runs with VGA displays under 386 protect mode. Ported spytrace package to 386 protect mode.

General Electric, Inc., Cincinnati OH. 1992-1993. *Consultant*

(awk, C, C++, elisp, FORTRAN, HP/UX, \TeX POSIX, POSTSCRIPT)

Helped the client's Aircraft Engine division improve safety, quality, and productivity by assisting in the design and implementation of a new real-time jet engine computer simulator. The simulator uses a number of identical processors in a dataflow architecture communicating on a VME bus using DMA to transfer data between processor memories. The dataflow executive is my design, and forms a layer on top of VxWorks. The simulator will be used, among other things, to help controls engineers design and verify the FADEC (Full Authority Digital Engine Control) computer that controls a real jet engine's operation while it is flying. A major application of this simulator was hardware in the loop simulation for the development of the GE90 engine used on the new Boeing 777 passenger airliner. The GE90 has been the main reason for the high profitability of GE recently.

Mnemonics, Inc., Melbourne FL. 1992. *Expert Witness*

(Assembler, \TeX)

Helped the client defend against accusations of copyright infringement in a complicated case involving PCB design and layout, PAL programming, and ROM resident assembly language BIOS operating system firmware. Worked closely with the client's counsel, patent attorneys, and design engineers and technicians. This case depended heavily upon the concept of a non-protectable user interface. The Lotus v. Borland decision established this concept as law after my client's case was decided unfavorably and then successfully appealed.

Teletimer International, Inc., Boca Raton FL. 1991-1992. *Consultant.*

(Forth)

Helped the client remedy performance deficiencies reported by its customer, Bell Atlantic, in call progress monitoring and call handling for a consumer targeted voice response system. The system only showed problems after beta testing with Bell Atlantic. The problem was traced to faulty circuit board design. Since the board was vendor supplied equipment, and the vendor has not been able to fix the problem, the client had no choice but to choose a board from another vendor. This required converting the existing software to work with the new board. Developed symbolic spy tracing package to aid debugging.

Florida Drum Delta Co., Pine Bluff AK. 1991. *Consultant.*

(Forth, LISP, \TeX Prolog)

Helped client improve productivity by enhancing operator interface to manufacturing automation software used in the control of plastics part molding and inspection work cells. Improved productivity of client's programmers by implementing a lexically scoped activation variable mechanism for Forth. Investigated porting Dreams real-time object oriented programming system to metacompiled 68HC11 target, and to TILE-Forth, a UNIX based Forth system.

Cummins Electronics Co., Columbus IN. 1991. *Consultant.*

(Ada, C)

Helped client upgrade 1991 diesel engine electronic fuel control system to meet 1994 emissions requirements by converting software from an all assembly language implementation to a mix of assembler and C, with the ultimate goal of a mostly C implementation. Involved in reverse engineering effort to help evaluate control systems of competitors.

Alcatel Network Systems, Raliegh NC. 1991. Consultant.

(C)

Helped client achieve penetration of fiber optics telephony market by performing requirements analysis and top level design using CASE tools for TA-909 “Fiber To The Curb” telephony equipment using TR-303 SONET fiber optics protocol, and by performing implementation and unit test of a TR-8 compatibility extension to the client’s existing telephony equipment.

Grumman Data Systems, Charleston SC. 1990. Consultant.(C, LISP, \LaTeX)

Helped the client meet the customer’s goal of reducing the average time to acquire spare parts from 300 days to 30 days by specifying and prototyping an expert system for determining the manufacturability of small machined parts for the Navy’s RAMP project. This system was developed on a Symbolics Lisp Machine, and deployed on a Sun Sparc-II.

re:Member Data Services, Inc., Memphis TN. 1990. Consultant.

(C, FORTRAN, POSIX, Unix, VMS)

Helped the client achieve greater market penetration by allowing them to market their product and services on a larger base of less expensive platforms by conducting a feasibility and planning study to convert over one million lines of source code from DEC VMS Pascal to Unix and C.

Allison Transmission Division of GM, Indianapolis IN. 1989-1990 Consultant.

(Ada, Assembler, C, elisp, Forth)

Assisted client in penetrating new market niche by implementing a computerized control system for a new automatic transmission for small trucks and buses. Increased the productivity of software engineers in the department by designing and implementing an interactive programming system to interface logic analyzers to the software development system. Enhanced the maintainability and performance of transmission controllers by designing and implementing a multitasker. Studied tradeoff between FFT and sliding window integer DFT for real-time torque measurement.

Belfort Instruments Corp., Baltimore MD. 1989. Consultant.

(C)

Saved the client 3 months of wasted expense for several engineers by showing that the schedule for delivery of a proposal was unrealizable, causing the client to cancel plans to submit a bid.

Sygnatron Protection Systems, Timonium MD. 1988-1989. Consultant.

(C, Forth)

Improved productivity 30 to 1 by changing the client’s software development technology. Met delivery requirements by redesigning firmware for a device controller. Salvaged a sensitive government project by recommending a replacement real-time executive when the one being used was determined to be inadequate for the job.

Vanex/MIDC, Ft. Lauderdale FL. 1987-1988. Consultant.

(C, Forth)

Helped the client obtain venture capital funding by developing the software technology for a new medical product—an automated blood cell counter. Designed sequencing network software³, signal processing software, and graphical display software. Specified digital hardware configuration.

Magnavox Government & Industrial Electronics Co., Ft. Wayne IN. 1987. Consultant.

(Ada)

Helped the client meet requirements for the Army’s ETAS project by implementing software for sensor input, networked computer communications, and touch screen graphics operator interface.

Smith’s Industries, SLI Division, Florham Park NJ. 1987. Consultant.

(C)

Helped the client meet quality and delivery requirements for the Navy’s F14 Stores Management System by performing software test and validation. The Sparrow missile in this system was first used in combat in the Persian Gulf War’s Operation Dessert Storm.

³See the *TENS* paper listed under publications.

World Precision Instruments Inc., Baltimore MD. 1987. *Consultant.*

(C, Forth)

Saved the client 6 months of wasted development expense by conducting detailed performance analysis and laboratory evaluation of a vendor supplied optical disk drive, determining that it was not capable of meeting real-time requirements for a proposed new product. Since the marketing requirements could not be compromised, the project was canceled.

ITT Aerospace/Optical Division, Ft. Wayne IN. 1986-1987 *Consultant.*

(Ada, C, FORTRAN, Forth)

Helped the client generate new business by prototyping an audio transcription system for a proposed NSA electronic surveillance receiving system project. Involved in compressive receiver signal processing, and MODAC algorithm for detection of spread-spectrum and LPI transmissions. Designed and implemented software for NSA COMSEC and INFOSEC equipment. Designed a 68000 based embedded Ada COMSEC system. Helped meet quality and productivity goals by designing a simulator and emulator for the GOES weather satellite scan control system permitting software and hardware development, test, integration, verification, and validation.

Teletimer International, Inc., Boca Raton FL. 1986-1987. *Consultant.*

(Forth, Prolog)

Helped the client obtain venture capital by authoring the patent for the system that permits them to supply their service of energy management. Met beta site test goals by developing the real-time software for this system⁴ and supervising the development of the expert system that aides its configuration.

International Business Machines, Inc., Boca Raton FL. 1986. *Consultant.*

(C)

Helped the client advance their technology base by performing research on motion control and force sensing algorithms for robotic systems. Signals from a pair of 3-axis strain gauges were digitally filtered to remove mechanical rumble, and then used to control manipulator dynamics. This robot was later used to manufacture the IBM Pro-Printer products.

Elijah Laboratories Inc., Warsaw KY. 1986-2011. *Vice President.*(awk, C, C++, DOS, expect, Forth, HTML, Linux, LISP, \TeX , perl, POSTSCRIPT, Prolog, tcl, Unix)

Mr. Brown's primary responsibility is assisting client companies with consulting services. He also advances the technology base of his own company by performing internal research and development.

- He designed and implemented a prototype of the Dreams⁵ real-time object oriented programming system.
- He worked on MOOSE, a portable UNIX based simulation of a virtual machine intended to be realizable in hardware that has special hardware provisions for dynamic binding object oriented programming. MOOSE, the Machine for Object Oriented Software Execution, is designed to achieve very high speed context switches to facilitate the object oriented implementation of demanding real-time systems. Moose will provide hardware assist for many features of the Indego dialect of Forth, which is based on Dreams.
- Another related project is FISH, Forth In Silicon Hardware, a Harvard architecture CPU core optimized for very fast looping and dot-product operations as used in signal processing and neural network applications.
- Mr. Brown also acts as the system administrator of www.elilabs.com, an Internet service with multiple servers and co-located servers that currently archives several mailing lists, serves numerous home pages for various organizations, hosts several interactive conferencing systems, and supports about 50 users around the world with email and UNIX shell access.
- He developed Stegafax, a covert messaging system to permit messages to be securely exchanged between parties without detection by hostile evesdroppers.
- He performed requirements definition and development of a business plan for www.faxmefood.com, a multi-vendor e-commerce application.
- He designed and implemented the VITO ("Visualizing Internet Traffic Online") network monitoring system.

⁴See the *Algorithm for Large Priority Queues* paper listed under publications.

⁵See the *Dreams* paper listed under publications.

- He developed Gumbo's SE WI River Report, a real-time information service for fishermen, including an advertising banner system that tracks advertising performance statistics in real-time, and a real-time interactive chat and web log ("blog") capability.
- He authored the web publication A Catalog of Spey and Dee Flies, which provides photographs and recipes for over five dozen fishing flies used for salmon and steelhead.
- He designed and implemented The Glucographer, a web-based blood glucose charting tool for diabetics.
- He designed and implemented The Shadow, an automatic network backup system that daily makes and keeps online exact images of each file system of every computer on the network. These images are instantly accessible as read-only files from protected computers on the network as a part of their normal view of their filesystem.
- Designed prototype for a web-based stock portfolio tracking system utilizing proprietary algorithm to determine optimal time to sell a stock. System alerts the user via alpha pager, cell phone text messaging, or email when a stock satisfies sell conditions. Stock prices are sampled in near real-time (every 5 minutes).
- He developed MyWord KJV, a web based Bible viewing tool that makes use of "hot text" to clickably interface to English, Hebrew, and Greek dictionaries, Encyclopedia articles, and the *Treasury of Scripture Knowledge*. Ultimately, various commentaries and other Bibles study reference notes will be added. Besides being a useful tool in its own right, this work is a study in user interface design. The goal is to have the most usable freely available Bible tool on the internet.
- He is currently working on code_graphs a graphical tool for the visualization of various structural aspects of computer programs, as elucidated by static analysis of source and object code, as opposed to dynamic analysis of the actual execution of such programs.

Perry Offshore, Inc. Riviera Beach FL. 1984-1986. *Computer Scientist.*

(Ada, C, FORTRAN, Forth)

Helped expand the company's market in robot submarines (ROVs) by designing the computer control system and software for the new TRITON series of products. Satisfied customer's design goals for dive and steering plane computer control system for the Navy's LSV-21 project.

Associated Data Consultants, Inc. Boca Raton FL. 1983-1984. *Director of Research and Development.*

(Basic, Forth, Pascal)

Mr. Brown is a part owner and the founder of Associated Data Consultants, Inc. Helped generate new business by writing proposals for energy management and process control systems. Satisfied customer requirements by performing feasibility study, specification, and installation of these systems. Enhanced company's technology base by performing firmware design for microprocessor systems used as energy controllers. Responsible for in-house computer center operations. Supervised computer center personnel and contractors performing customer installations.

Foresight, Inc., Hollywood FL. 1981-1983. *Systems Engineer.*

(Assembler, COBOL, FORTRAN, LISP, Pascal)

Helped generate new business by meeting with consulting clients, writing proposals, and prototyping demonstrations of proposed systems. Salvaged a client's development project delivery schedule by writing a cross macro assembler, EPROM programming software, and firmware to control a robotic cutting tool that operated inside of buried pipeline using force-feedback techniques.

Modular Computer Systems, Inc., Ft. Lauderdale FL. 1980-1981. *Software Analyst.*

(Assembler, Coral, FORTRAN, Pascal)

Satisfied customers by providing telephone and on-site support of compilers, database management system, networking, and operating systems.

RCA Service Company—AUTECH, Andros Bahamas. 1979-1980. *Systems Analyst.*

(Assembler, FORTRAN)

Reduced maintenance expense and enhanced the Navy's capabilities by assisting in the conversion of a military command, control, and tracking system from outdated hardware and software to new hardware and software that permitted tracking up to 128 airborne, surface, and under-sea targets by radar and hydrophones using Kalman filter techniques and providing real-time projection color graphics display.

Systems Engineering Laboratories, Inc., Ft Lauderdale FL. 1977-1979. *Member of the Technical Staff.*
(Assembler, Basic, FORTRAN, Pascal)

Satisfied customers' special requirements by designing and implementing custom operating system enhancements, graphics software, custom device drivers, extensions to time-sharing system, and performing system integration and test.

Reuters News Service. New York NY. 1975-1977. *Systems Programmer.*
(Assembler, RSX-11/M)

Helped expand company's markets by developing system for providing computerized news service to cable television companies, and designing and implementing programs that were part of a real-time stock and commodity information retrieval system. Together, these systems have produced annual revenues of around 50 million dollars.

Periphonics Corporation. Ronkonkama NY. 1974-1975. *Systems Programmer.*
(Assembler)

Helped company expand its product line of communications front-end systems by developing software for 3270 & 3780 bi-sync, voice response, switched line allocation, and proprietary memory expansion hardware.

Potter Instrument Company, Inc. Melville NY. 1973-1974. *Associate Engineer.*
(Assembler)

Helped company expand product line by developing error correcting coding algorithm for 6250 BPI tape drives, testing and debugging interfaces, writing bootstrap loader, application program loader, debugger, assembler, interrupt management package, and device drivers.

Hazeltine Corp. Riverhead NY. 1971-1973. *Electronics Technician.*
(Basic, FORTRAN)

Helped company become the leader in CRT display terminals by performing production test and troubleshooting of the Hazeltine-2000. Performed system and board level test. Designed test fixtures for subassemblies. Taught new technicians how to troubleshoot the system.

Litcom Div. of Litton Industries, Inc. Melville NY. 1971. *Electronics Technician.*
(FORTRAN)

Helped the company meet its commitment to the Army by performing test, alignment, and troubleshooting of analog frequency synthesizer boards and sub-systems for a spare parts contract.

New Jersey Bell Telephone Co. Newark NJ. 1970. *Junior Programmer.*
(Autocoder, BAL, Cobol)

Helped the company bring its data processing up to date by helping the conversion of customer billing programs from IBM 1401 Autocoder to RCA Spectra 70 COBOL.

Maxson Electronics Co. Great River NY. 1968-1969. *R&D Lab Technician.*
(FORTRAN)

Helped the company design a new landing radar system for the 747 jet. Designed digital timing and control logic board. Supervised prototype wiremen in the layout and construction of boards. Wrote IBM 1130 Fortran program to generate test cases for the system. Performed system level integration and checkout for video section and sweep generators of radar.

Credentials

Education

Bachelor of Arts in Mathematics from Dowling College in 1973.

Graduate studies in Mathematics and Computer Science at Florida Atlantic University between 1983 and 1986. ⁶

⁶Published the *Inference Engine*, *Neural Network Experiment*, and *Committee Networks* papers as a result of these studies.

Awards

Mathematical Association of America Award. ⁷

National Science Foundation Scholarship. ⁸

Affiliations

The American Association for Artificial Intelligence.

The Association of Old Crows.

The Forth Interest Group.

The Mathematical Association of America.

Patents

U. S. Patent Number 4,847,781 for an “Energy Management System.” ⁹

Publications

Dreams: A Message Passing Object Oriented Metaphor for Forth. *The Journal of Forth Application and Research*, Vol. 6 No. 4. 1994.

A Timed Event Network Scheduler. *Dr. Dobbs Journal*, February 1989.

Committee Networks: What they can and cannot do. Proceedings of the 1987 Rochester Forth Conference, *The Journal of Forth Application and Research*, Vol. 5 No. 1.

An Efficient Algorithm for Large Priority Queues. *Dr. Dobbs Journal*, June 1987.

An Artificial Neural Network Experiment. *Dr. Dobbs Journal*, April 1987.

The Boca Raton Inference Engine. *Dr. Dobbs Journal*, April 1986.

Papers Presented

The Dreams Metaphor. Tenth Annual Rochester Forth Conference, Rochester, NY, 1990.

The Dreams Implementation. Tenth Annual Rochester Forth Conference, Rochester, NY, 1990.

Nonlocal Exits & a Tree-Structured Stack. Tenth Annual Rochester Forth Conference, Rochester, NY, 1990.

Committee Networks: What they can and cannot do. Seventh Annual Rochester Forth Conference, Rochester, NY, 1987.

Seminars Conducted

Neural Networks for Adaptive Controls. General Motors Corporation, Allison Transmission Div. Indianapolis, Indiana, August 1989.

The Practical Advantages of Threshold Logic. Institute for Advanced Manufacturing Sciences, Special Interest Group on Artificial Neural Networks, Cincinnati, Ohio, August 1989.

⁷Avon Old Farms College Preparatory School, Avon, Connecticut, 1969.

⁸Dowling College, Oakdale, New York, 1972.

⁹Assigned to Associated Data Consultants, Inc.

Unpublished White Papers

See <http://www.elilabs.com/~rj/papers.html>