

# Ross Wolin

Everett, WA

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## OBJECTIVE

A firmware/software/hardware design challenge. Interested exclusively in offsite/telecommuting/virtual opportunities.

## EDUCATION AND HONORS

BS in Electrical Engineering, 1987, Rensselaer Polytechnic Institute, Troy, NY, GPA 3.6 (obtained in 3.5 years)

Eta Kappa Nu, Electrical Engineering Honor Society

Dean's List and RPI scholarship recipient, all semesters

Valedictorian, Norwich High School

## EXPERIENCE SUMMARY

Firmware: ARM, MX51/MX31, Coldfire, 68332, PPC, DSP, 80x86, PIC, AVR, 8051, 68HC11/12, Z80, EZ-USB, VHDL, GCC/GNU, MPLAB, CodeWarrior, SDS, Microtec, HiTech, Cosmic

Hardware: VHDL, Xilinx, Altera, FPGA/CPLD/ASIC, OrCAD, bringup/debug, rework, layout

Software: Linux, Unix, OSX, Android, WinCE, Windows, C/C++, Objective C, Java, Perl, Bash/Tesh Shell Scripting, device drivers, OpenGL, DSP, Cocoa, wxWidgets, MFC, COM

Misc: USB, 1394/Firewire, RS232, SPI, SCI, I<sup>2</sup>C, A/D, LCD, TCP/IP, IrDA, CAN, ICE, ICD, BDM, JTAG

## WORK EXPERIENCE

### Mobile Integration Workgroup, Software Engineer - Consultant, Bellevue, WA, 12/11-present

Adapted Ubuntu 11.10 Linux BSP, kernel and drivers, and Das U-Boot bootloader for MIW's 16 ARM (ArmBlock 16) rack mounted Linux server, which utilizes the Marvell Armada 510

### Yankee Environmental Systems, Software Engineer - Consultant, Turners Falls, MA, 11/11-present

Wrote a VHDL implementation of a Viterbi communications processor for a dropsconde receiver/monitor, using a Xilinx Spartan 3AN. Simulated/verified model.

### Mystic Engineering, Firmware/Hardware Engineer, Everett, WA, 11/11-present

Developed an ARM Coretex based digital Theremin controller mated to an FM synthesizer

- Wrote Java/Swing POC using Eclipse to prototype various MIDI code sequence options for implementing continuous pitch variations
- Wrote Java/Swing POC prototype FM synthesizer modeled after Yamaha DX7/TX7. Ported back end of prototype to C++ via NDK, to enable use on embedded system
- Designed ARM Cortex M4 based hardware to read performer hand position via capacitance to frequency conversion, with USB to PC interface for configuration, and MIDI interface for musical instrument control.
- Part selection, prototype construction, hardware bringup/debug, PCB layout
- Wrote/debugged ARM Cortex firmware for above design using C/C++.

### Centri Technology, Software Engineer - Consultant, Seattle, WA 8/11-10/11

Wrote multithreaded asynchronous socket server for iPhone in Objective-C/C++ which acts as an HTTP proxy, modifying HTTP requests and responses (chunked and non-chunked encoding), and providing a compressed data path between iPhone and Centri's server/router over 3G, to conserve cellular bandwidth. iPhone server ran in background on iOS, using Grand Central Dispatch (GCD) for high performance, and redirected all inbound and outbound HTTP traffic through multiple paired socket connections. Server designed to demonstrate Centri's compression algorithm to prospective clients. Demo exhibited at 4G World 2011 show by Symantec. Used netcat for a variety of debugging tasks.

### Discovery Bay Games, Software/Firmware/Hardware Engineer - Consultant, Seattle, WA 5/11-present

Discovery Bay Games develops iPad games and associated game controller hardware. Project was a communications bridge between a game controller and an iPad which used a piezo electric element to modulate a sound carrier in the superaudible range, to transmit data from the controller to the iPad

- Wrote iPad software in Objective-C/C++ which captured continuous audio from iPad's microphone and did realtime digital signal processing to extract digital bitstream from audio. Designed digital resonator (bandpass) filters to eliminate background noise.
- Packed iPad software into a library that can be used by third party developers to write games for DBG's hardware
- Wrote firmware in C for the Atmel AVR based communication module. Code implemented a serial over audio protocol using ASK/OOK modulation in the inaudible range.

Second generation of the product utilized a direct connection into the iPad mic input, to achieve a higher data rate

- Designed analog hardware interface from IO to iPad mic input
- Modified iPad software in Objective-C/C++ which captured continuous audio from iPad's microphone to process a pseudo higher speed digital waveform
- Packed iPad software into a library that can be used by third party developers to write games for DBG's hardware
- Wrote firmware in C for the Atmel AVR based communication module implementing a pseudo digital waveform
- Wrote Java software to generate a digital signals in a WAV file

### Mystic Industries, Software/Firmware/Hardware Engineer, Everett, WA 10/09-11/11

**Wrote a series of Android applications** (listed below) using Java, Eclipse, and Ubuntu Linux. For each application, wrote all code, organized/ran beta test, wrote help, generated website/graphics/screenshots, and handled Android Market submission. Kept all applications updated, fixing reported bugs and adding features, dealt directly with users email.

- Wrote Cricket Scorepad based on existing iPhone product. Generates/stores/recalls scorepads for the darts game of Cricket. Added capability to score 3 player (cutthroat) and 4 player games. Also wrote free ad supported version
- Wrote Super Scorepad based on existing iPhone product, with enhanced features. Generates/stores/recalls scorepads for any number of players for any game where scoring involves adding/subtracting columns of numbers. Larger scorepads scroll both horizontally and vertically using drag gesture (custom.) Pinch gesture shrinks/enlarges font (custom.) Also wrote free ad supported version.

**Wrote a series of iPhone+iPad applications** (listed below) in Objective-C, C++, Cocoa and OpenGL. For each application, wrote all code, organized/ran beta test, wrote help, generated website/graphics/screenshots, shot/edited promotional video and handled Apple provisioning/submition. Kept all applications updated, fixing reported bugs and adding features, dealt directly with users email.

- Wrote Pentomino Smackdown iPad only using OpenGL+lighting. 3D touchable tabletop two player spatial relations challenge based on the classic pentominoes puzzle. Designed to be played head to head with iPad between two players on a tabletop, like an actual board game. (Can also be played in a side to side mode, like 'normal' games.)  
[www.wolinlabs.com/pentosmack](http://www.wolinlabs.com/pentosmack)
- Wrote Mystic Puzzle Stick iPhone+iPad (universal binary) using OpenGL. 3D rotatable, touch manipulable 4 cube logic puzzle. [www.wolinlabs.com/puzzlestick](http://www.wolinlabs.com/puzzlestick)
- Wrote Black to White iPhone+iPad (universal binary) using OpenGL+lighting. 3D rotatable, touch manipulable puzzle made to render like a tabletop game. [www.wolinlabs.com/black2white](http://www.wolinlabs.com/black2white)
- Wrote Cricket Scorepad iPhone+iPad (universal binary) Generates/stores/recalls scorepads for the darts game of Cricket. [www.wolinlabs.com/cricketpad](http://www.wolinlabs.com/cricketpad)
- Wrote Super Scorepad iPhone+iPad (universal binary) Generates/stores/recalls scorepads for any number of players for any game where scoring involves adding/subtracting columns of numbers. [www.wolinlabs.com/scorepad](http://www.wolinlabs.com/scorepad) Also wrote free, iAd supported trial version of the same program.
- Wrote Space Castle 3D iPhone+iPad (separate products) using OpenGL based 3D Space Shooter arcade game, inspired by the 80s classic, Star Castle. Two control modes for ship, emulating a DPAD. [www.wolinlabs.com/spacecastle](http://www.wolinlabs.com/spacecastle)
- Wrote Mystic Photo Cube iPhone+iPad (universal binary) using OpenGL. Allows user to create a "virtual plastic photo cube" with the own photos, then manipulate the cube using intuitive hand gestures. [www.wolinlabs.com/photocube](http://www.wolinlabs.com/photocube)
- Wrote 3D Slider Puzzle iPhone+iPad (separate products) using OpenGL. 3D solvable version of the classic slider puzzle, manipulated using natural/intuitive gestures. [www.wolinlabs.com/3dslider](http://www.wolinlabs.com/3dslider)

### **Windows/OSX**

- Wrote application for musician's ear training, which plays a random sequence of notes in a given key and scale mode which musician tries to mimic and also plays multiple octave up/down scales in any key/scale mode/range. Written using C++/wxWidgets, for Win32 and Mac OSX. Also wrote a 30 day trial version licensing scheme and key generator, wrote help files, and set up a website to interface w/ PayPal for purchases - [www.mysticind.com/products/riffmaster](http://www.mysticind.com/products/riffmaster)
- Ported consultant timer multiple stopwatch C++ program from MFC/Win32 to wxWidgets, then added new features.

## Hardware Development

- Circuit design, schematic capture, and PCB layout for adapter board which converts a PC/ATX power supply into a bench supply. Specified/ordered components, assembled prototypes, designed website.  
www.mysticengineering.com/atx.adapter
- Working on circuit design for Analog Devices ADuC7024 (ARM7) with Spartan 3E FPGA + MIDI + USB. Will eventually write C/C++ firmware and VHDL for several different projects.

## IT

- Set up FreeBSD 7.2 SAMBA file server, IPP print server, SVN source control server, which also runs DNS + DHCP, and a software geom RAID.

### Clausius Technologies, Firmware Engineer - Consultant, Reno, NV 4/11, 6/11-7/11

Wrote firmware in C for Freescale Coldfire based green energy device. Set up the build using CodeWarrior/Eclipse, generated build targets, memory layouts, linker files, and debug configurations for builds to run/debug from external flash and external RAM.

### Alpha Technologies, Firmware Engineer - Consultant, Bellingham, WA 8/10-1/11

Wrote firmware for a Freescale Coldfire based high current, high availability power supply in C/assembler.

- Wrote low level hardware configuration and device driver firmware for XM3 board, including clocks, timers, PWMs, RS232, IO using Processor Expert.
- Wrote LCD/pushbutton based menu system for XM3 as an extensible framework which simplifies future modification and additions
- Wrote bootloader for XM3 inverter board which does low level system h/w configuration and memory layout, and allows reprogramming the flash based application code via RS232 or via image loaded into upper half of Coldfire flash. Performs CRC verification of application code at startup, prevents unit from running corrupt code.
- Wrote bootloader for Apps board which does low level system h/w configuration and memory layout, allows reprogramming from external SPI flash. Also performs CRC verification.
- Wrote C++/Win32 PC application which modifies an S-record image by adding a 32 bit CRC to the file (used with bootloaders). Incorporated this program into the Coldfire/CodeWarrior build process, so it happens automatically on each build.
- Wrote special PWM delayed pulse driver which could be used to add short interval space to the FET turn off/turn on.
- Hands on low level bringup/debug using schematics, oscilloscope and logic analyzer.
- Performed microscope SMD rework in conjunction with debug.

### BSquare, Sr Software Engineer - Consultant, Bellevue, WA 6/08-9/09

**Auto entertainment/navigation system** - based on Freescale MX51 and WinCE/MSAuto Bristol (Ford Motor Company)

- Wrote MSAuto (Talladega+Bristol) NAND flash driver, based on three different drivers and datasheets
- Wrote MSAuto Bristol 1394/Firewire driver for Fujitsu MB88388A supporting IP over 1394, audio, and video streaming
- Wrote 1394 speed benchmark app, EOL tests for audio over 1394, and IP over 1394.
- Designed MMS hardware mod which reroutes 1394 audio channels on test fixture board, as part of the EOL fixture.
- Wrote parts of bootloader
- Wrote various diagnostics and 1394 EOL tests,
- Hands on hardware debug, hardware design modification, and microscope rework.

**Ethernet audio router**, based on Freescale MX31 (Microsoft)

- Wrote LED driver
- Modified KITL code to support both active (interrupt driven) as well as passive (polled) modes
- Modified KITL code to support USB KITL as well as ethernet KITL

**Mystic Industries, Firmware/Electrical Engineer, Everett, WA 3/09-11/09 (off+on, part time)**

- Designed hardware for a Microchip PIC 16F877A based altitude display for a MiG-29. Displays altitude in 10 ft increments based on encoder standard pressure RS232 altitude stream and corrects for barometric pressure based on rotary encoder input.
- Wrote/debugged firmware for altitude display using C/HiTech.
- PCB layout
- Assembled and tested prototypes
- Updated hardware and firmware design for 16F887 PIC

**Microsoft, Software Engineer - Consultant, Redmond, WA 3/08-5/08**

- Fixed bugs and added features for Mobile Outlook in WinCE/WinMobile 7.0 release using C++.
- Built whole CE platform images, including entire operating system
- Wrote Perl tools for monitoring WinCE platform build

**YES Inc, Firmware/Hardware Engineer - Consultant, Turners Falls, MA 4/04-12/07**

**CEILOMETER/LIDAR** - a LIDAR is a weather instrument that measures wind speed & direction at various altitude profiles using a laser, while a ceilometer measures cloud ceilings using a laser. The digital electronics for both instruments are very similar.

- Designed Atmel ARM7 based system with dual channel 12bit A/D, 16M SRAM, Altera CPLD, USB, RS232, and pushbutton/LCD user interface, performed PCB layout, some assembly and debug.
- Wrote co-operative tasking operating system and device drivers in C/Rowley Crossworks for ARM7 to sample to SRAM and communicate w/ PC via USB.
- Wrote C++ Windows application to communicate with and drive the ARM7 system.
- Designed Xilinx FPGA daughter card with 32M SDRAM and high speed A/D interface, PC/104 interface, pushbuttons and LCD interface, and general purpose I/O for a COTS ARM9 SBC, performed PCB layout, some assembly and debug.
- Wrote FPGA VHDL for dual SDRAM controller, 85Mhz dual channel A/D interface, input FIFO, PC/104 register-based communication interface, and DCM based clock generator.
- Wrote C++/GCC Linux drivers for FPGA based PC/104 devices
- Wrote C++/GCC Linux based system monitor for manipulating system for verification and testing.

**SODAR** - a miniature, low cost weather instrument which measures wind speed & direction at various altitude profiles using acoustic energy

- Designed high gain multistage microphone preamp circuit with 4th order op-amp bandpass filter, performed PCB layout, assembled, and debugged board.
- Designed piezo speaker array around PIC16F876 microcontroller based row and column phased beam-steering, performed PCB layout, assembled, and debugged board.
- Designed A/D and DSP based processing board
- Wrote firmware in C/assembler for PIC16F876 to accomplish beam steering by phasing 8 channels.
- Developed a proof-of-concept prototype around an office class PC running Debian Sarge (Linux) with a 2.4.24 custom kernel. PC used 8 channel pro audio sampler and a combination of open source and my custom written application software to experiment with various sensor configurations and geometries. Prototype performed filtering and FFT frequency determination using various DSP techniques with Linux software written in Perl and C++

**Microsoft, Firmware/Software Engineer - Consultant, Redmond, WA 2/04-5/04**

- Wrote firmware in C for a laptop auxiliary LCD display and input device based on the Cirrus EP7312 (ARM7) using IAR tools.
- Wrote C++/Win32 library to interface with USB bridge "network cable" for Longhorn migration

**Tex-Cal, Hardware/Firmware Engineer - Consultant, Beaumont, TX 1/04-4/04**

- Designed a portable inventory control computer prototype based around the Cirrus EP9315 (ARM9) processor.
  - Built custom Linux kernel for Cirrus EP9301 using the GCC ARM9 port.
- Evaluated several other microprocessors for this project, including a Cirrus EP7312, NeoMagic NMS7210 and VG240 (x86)

**Keynote Systems, Electrical/Firmware/Software Engineer - Consultant, Seattle, WA 11/03-2/04**

Keynote's project involved reverse engineering the LCD controller and keyboard protocols of a Blackberry cell phone/PDA, then building an FPGA circuit to allow a PC to control the phone's keyboard and read the display back into the PC.

- Using a logic analyzer and oscilloscope, reverse engineering the LCD controller connections, control signals and communications protocol of RIM Blackberry Cell Phone/PDA.
- Wrote VHDL on Xilinx Spartan FPGA to capture LCD controller command and pixel data, compress data, and send data to PC via USB. VHDL also receives USB commands from PC and translates them to Blackberry keyboard presses.
- Perl programs to 1) dump Agilent 54622D Analyzer waveform data, 2) filter the data into LCD command and pixel writes, 3) render the command and pixel writes into a Windows bitmap representing the PDA screen
- Wrote Java program on Blackberry to perform graphic writes on keyboard command, such as pixel at x,y location, rectangle of width, height at x,y location, etc.

**Metron Systems, Electrical/Software Engineer - Consultant, Snoqualmie, WA 8/03-10/03**

- Designed/simulated/debugged Xilinx FPGA VHDL to perform image processing on camera data stream and glue logic in 3D laser scanner real-time embedded system
- Wrote C++ Win32/MFC/OpenGL based multithreaded data acquisition/viewer application. Data acquisition receives control commands via TCP and data packets via UDP from single or multiheaded 3D laser scanner system. Viewer displays these points as acquired, or recalled from a saved file. Viewer rotates/zooms/pans 3D model using OpenGL, using a "virtual trackball."
- Wrote perl programs to simulate data from a single or multiheaded 3D laser scanner, and to analyze saved binary file's structure.

**Hudson Valley Music, Electrical/Firmware Engineer - Consultant, Highland, NY 6/03-8/03**

- Designed a digital MIDI metronome based on PIC16F628, using OrCAD Capture. MIDI (musical instrument digital interface) metronome keeps time using a series of LEDs.
- Wrote/debugged PIC16F628 firmware in C/assembler
- Design PCB layout for MIDI metronome using OrCAD Layout

**SunStar Timers, Electrical Engineer - Consultant, Woodinville, WA 5/03-8/03**

- Designed h/w for wireless and sound modification to base timer circuit
- Designed h/w for wireless and sound capable remote switch
- Reverse engineered schematics from Gerber board layout files for an 8096 based suntan bed timer system and created new schematics with OrCAD capture
- Modified reset and power supply circuitry to increase reliability
- Wrote Perl scripts on Linux to manipulate/sort/condense netlists and other schematic information.

**YES Inc, Software Engineer - Consultant, Turners Falls, MA 1/02-4/03**

Wrote software for a real-time embedded Linux based Intel PC LIDAR project. A LIDAR is a weather instrument that measures air turbulence at various altitudes using a laser. All software written on Linux using GCC C/C++.

- Wrote Linux application software for data acquisition, display and analysis.
- Wrote Linux device driver for a high-speed data acquisition card with onboard DSP. Device driver downloaded DSP firmware as well as read processed data packets.

**Myotronics, Software Engineer - Consultant, Tukwila, WA 12/02**

- Wrote Win32 test program to connect and performance test the USB/HID interface of an 8051 based dental device.
- Consulted with client on various other options to increase performance, including writing a custom WDM USB buffering device driver.

**Sunfire, Firmware/Hardware Engineer - Consultant, Snohomish, WA 2/01-6/02, 12/02-2/03**

- Wrote/debugged 68332 based firmware for a high end home theater audio/video processor. System included a front panel with knobs, buttons and VFD display, STV5730 OSD (On Screen Display), AM/FM tuner, Motorola 56366 DSP, multiple IrDA remote controls, volume controls, flash, Xilinx PLD, and nvm serial eeprom. All devices accessed via SPI using external decoding and bank selection. System capable of firmware download via serial port or data encoded within a CD audio sample. Wrote code in SDS C/assembler
- Wrote/debugged 68332 based operating system using a cooperative time based threading/tasking system
- Wrote/debugged a text based, table driven menuing system
- Wrote/debugged a dialog based, object oriented UI system, similar in function to Windows dialog manager
- Brought up and debugged system hardware using 68332 BDM and logic analyzer/scope.
- Debugged and corrected hardware problems.
- Performed surface mount prototype rework using Metcal and microscope to test hardware fixes.

**YES Inc, Software Engineer - Consultant, Turners Falls, MA 6/02-10/02**

- Wrote Linux application software and device drivers for an 80486 PC104 based wireless packet sniffer.
- Created a custom embedded Linux distribution starting from small disk space, small memory footprint GPL'd distribution
- Created custom kernel for small memory footprint.

**E\*swing!, Firmware/Hardware Consultant/Mentor, Seattle, WA 2/02-4/02**

Consulted with developer of a golf swing analyzer which uses infrared and ultrasound sensors to measure club angle, velocity, and track, to predict drive distance.

- Debugged PIC16F877 assembler and Microsoft VB application
- Debugged and corrected digital and analog hardware problems, include infrared and ultrasound sensor circuits.
- Performed prototype rework.

**WD Machines, Firmware/Hardware Consultant, Kirkland, WA 11/01-12/01**

- Wrote/debugged PIC 16F876 firmware for handheld wireless device used to measure relative or absolute angular displacement in a patient. Developed a simple, robust wireless protocol based on CPCA modulation.
- Wrote/debugged PIC 16F873 firmware for wireless receiver based on the Linx receiver which received messages from the receiver and passed them on to a host PC. The receiver performer error checking on the received messages and was also able to respond to a variety of configuration commands from the host PC.
- Designed, brought up and debugged receiver prototype hardware using PIC ICD and logic analyzer/scope.
- Layed out receiver PCB using OrCAD layout.
- Debugged and corrected hardware problems.
- All firmware written in C and assembler using HiTech ANSI C compiler

**MicroEncoder/Mitutoyo, Hardware Consultant, Kirkland, WA 5/01**

Design review for 100Mhz DSP/PIC 16F877 and Altera FPGA based 2D subnanometer precision measuring system.

**Lucks Co, Firmware/Hardware Consultant, Seattle, WA 2/01**

- Wrote/debugged firmware for a PIC 16F877 based oven controller using HiTech C. System monitored multiple thermocouples using onboard A/D and external analog mux arrangement. System communicated with other modules via CAN controller.
- Brought up and debugged hardware, using MPLAB, Microchip ICD setup, and scope. Made rework modifications to prototype.

**MicroEncoder/Mitutoyo, Firmware/Hardware Consultant, Kirkland, WA 8/00-12/00**

- Designed two Altera 7K series FPGAs and redesigned OrCAD board schematics for a 100Mhz DSP/PIC dual processor measurement system using a CMOS camera and dual ported SRAMs. Application is a real-time embedded subnanometer precision measuring system which samples images from a CMOS camera array/pulsed laser combination in real time at 30fps and generates precision measurements through image correlation.
- Wrote/debugged DSP firmware in TMS320C5402 assembler and PIC 16F877 firmware in HiTech C/MPLAB for above system.
- Performed board bringup/debug, made design modifications, and did rework to prototype using microscopic soldering techniques. Solved cable ringing problems for laser readhead assembly, reset and other issues..
- Redesigned measurement system for smaller PCB layout. Performed initial board bringup/debug.
- Wrote Win32 Console and MFC serial programs for testing.

### DECA Design, Software Consultant, Manchester, NH 6/00 - 8/00

Wrote software for an embedded Linux, StrongARM based touch-screen tablet device with wireless comm used by major package delivery service. All code written on Linux in C/C++ and StrongARM assembler.

- Adapted touch screen device driver to specific hardware and compensated for hardware shortcomings.
- Wrote device driver for proprietary wireless comm device.

### DBC Avionics, Firmware/Hardware Consultant, Everett, WA 7/00-8/00

- Designed low cost hardware using OrCAD and constructed prototype for an embedded altitude encoder tester/display. Prototype read gray code from aircraft altitude encoder and displayed altitude on a 4 digit seven segment display.
- Wrote firmware in PIC16C62A assembler

### Microsoft, Firmware/Hardware Consultant, Redmond, WA 2/00-5/00

- Member of Xbox peripheral development team
- Designed/built prototype 8M flash memory card with high speed USB interface around Anchor EZ-USB development board.
- Designed/wrote firmware using Keil 8051 C compiler. Firmware able to dynamically adapt to 8M-32M flashes. Firmware responds to SCSI command subset (RBC) to making flash card a USB Mass Storage class Bulk-Only device. Prototype functions as a removable drive with Win2000 built-in USB/SCSI/filesystem drivers, able to be formatted, read, written, etc...
- Evaluated various USB micros for memory card, including Anchor EZ-USB, ScanLogic SL11R, and Atmel AVR. Wrote various speed/architecture/USB bandwidth use comparison white papers.
- Wrote Win32 console program to drive PVG120604 LCD controller with PC parallel port. Program displayed monochrome bitmaps on LCD.

### SeaMED, Firmware/Hardware Consultant, Redmond, WA 2/98-1/00

SeaMED is a contract designer and manufacturer of medical embedded system devices, practicing ISO9000 compliant design processes.

#### **Heart Pump Monitor**

- Using Cosmic C and 68HC11 assembler, designed and wrote object oriented coprocessor code for a 68HC11E9 in a heart pump monitor. 68HC11 code was heavily interrupt service routine based and used the PA, SCI, SPI, and RTI interrupts. At times C code was debugged in 68HC11 assembler using a 68HC11 EVB with the BUFFALO monitor. 68HC11 displayed blood flow rate and motor RPM on a 7 segment display. Flow is obtained via a serial link to a Transonic flow board, while motor RPM was measured using the pulse accumulator. In addition, the SPI was used as a com link to the 68332 processor, to enable the independent processors to cross-check each other.
- Wrote Software Design Description document
- Prototyped several small circuits around a 68HC11 EVB to be able to start firmware before hardware was available.
- Initial bringup and debug of target hardware.
- Using Win32 and MFC, designed and wrote a flow board simulator. Simulator uses a PC serial port and impersonates a Transonic flow board. Simulator also allow setting flow values as well as injecting faults in the responses, for testing.

#### **Home Patient Monitoring Station**

- Designed and wrote display and DSP device drivers for a WindowsCE embedded PC home patient monitoring station based on the MediaGX chipset using C++. Some prototype work for these drivers was done in a test environment developed with the DJGPP port of GCC.
- Wrote Software Design Description documents
- Using C++, designed and wrote background packet based sound record/play system for WinNT based on top of the Direct Sound COM interface and encapsulated in a DLL. System compressed sound for transmission over telephone lines, using ADPCM. Sound was also conditioned with a digital filter and interpolated in some cases.

#### **Heart Muscle Drill**

- Wrote motion safety lockout firmware in PIC16C62A assembler using MPASM for a medical device used for drilling holes in heart muscle.
- Wrote Software Design Description document
- Prototyped a test circuit and did some hardware debugging.

#### **Coronary Rotary Oblation Remote Display**

- Wrote calibration firmware for 68332 embedded system in a coronary rotary ablation machine remote display.

### **Prostate Oblation Machine**

- Wrote video driver firmware for 68332 embedded system in prostate oblation machine. Video driver initialized and controlled an SMOS SED1353 graphics controller and custom LCD panel, implementing bitblts to display text and graphics at the lowest level. Routines were originally written and optimized in C, then additional optimizations were made in 68332 assembler. Code was written with conditional compilation to allow compiling and testing on a PC (with an SED1353 evaluation board and external LCD panel) or compiling directly into the 68332 embedded system.
- Wrote a host of Win32 MFC and console applications to aid in development, including: application to rasterize True Type fonts to any resolution and save as Windows BMP, program to convert Windows BMPs to custom firmware BMP format, application to simulate LCD panel display (allowing another engineer to lay out user interface screens before real hardware was available), and application to test video driver on Win95 with a SED1353 evaluation board.
- Assisted in making circuit modifications and debug to add SED1353 and LCD panel into original prostate oblation embedded system.

### **Misc**

- Wrote realtime firmware and debugged hardware for a PIC16C71 embedded system handheld accelerometer (G meter.) Also debugged circuit design and reworked prototype hardware. Firmware written in PIC assembler
- Designed and prototyped hardware and wrote firmware for a PIC16C62 based digital cuckoo clock. Firmware written in PIC assembler
- Wrote Win32 application to intercept FKeys and insert macros into the keyboard buffer. Familiarity with Microtek C compiler, Cosmic C compiler, MPASM, MPLAB, TEKScope, digital oscilloscope

### **Allied Signal/Avionics, Software Consultant, Redmond, WA 2/97-10/97**

Wrote a diagnostic and maintenance program for the Enhanced Ground Proximity Warning System (EGPWS) avionics embedded system. This Win95/WinNT program was written using C++/MFC. The application communicates with the EGPWS over RS232 using a totally asynchronous protocol and has both a terminal and continuous blast data display mode. Custom controls were written for these modes.

### **Traveling Software, Software Consultant, Bothell, WA 7/96-1/97**

- Using C++ and OOP techniques, wrote the communications engine for a high performance, multithreaded, multiuser, socket based email acceleration server running on Windows NT for Microsoft Exchange enhancement. Server used Winsock sockets in conjunction with I/O completion ports, mutexes, and event thread synchronization objects to achieve a totally asynchronous communications server with a reasonable thread count. Server communicated with clients via a propriety protocol of my design and talked to Exchange via MAPI.

### **Emulex, Software Consultant, Bellevue, WA 2/96-6/96**

- Wrote a Win95 VxD implementation of DEC's LAT protocol over Novell's IPX, providing a file I/O interface to work as a network transport for Reflections, Kea!, SmartTerm, and Kermit 95 terminal emulators. File I/O interface emulated Meridian's SuperLAT specification.
- Wrote a spy debugging VxD (LATSPY) which intercepts and displays commands intended for a VxD's device control procedure, before and after processing. VxD communicated with a small console application which displayed the LAT command calls in a window and optionally wrote them to a file.
- Wrote a small status display panel for LAT VxD parameter display and configuration, using MFC and VC++.
- VxDs were written in C using Vireo's VtoolsD and debugged with NuMega's SoftIce.

### **Microsoft, Software Consultant, Redmond, WA 5/95-10/95**

- Developed parts of multithreaded fax gateway for Exchange Server (newest Email/Messaging system.) including a general interprocess communication object, preprocessor, and modem provider DLL. Product compilable on Win95, Win NT, and Win16. Experience with Extended MAPI, OLE2, Exchange, Unicode, SLM and localization techniques.
- Wrote C++ extractor/import DLL to decrypt and import Lotus cc:Mail post-offices into Microsoft Exchange Server (without a spec for Lotus' file format.)
- Designed UUCP gateway for Microsoft Exchange

### **Starwave, Software Consultant, Bellevue, WA 3/95-5/95**

- Using Windows NT, VC++/32, Winsock, and TCP/IP, designed a distributed, dynamically scalable, networked server cluster for a multiplayer interactive network children's game which was a next generation graphical MUD. The option to port to Solaris was a design goal. Used object oriented design.
- Wrote asynchronous socket SMTP and POP3 mail client objects which will be intergrated into the game client's mail system.

**Sun Microsystems/PC Networking Applications, Software Consultant, Chelmsford, MA 7/94-1/95**

Wrote a Win32s news reader client which used NNTP protocol (RFC 977) with XOVER extensions over Winsock/TCP/IP to retrieve USENET news. The application was written in a cockpit (client) and engine (server) architecture. The engine handled all news acquisition and processing while the cockpit presented the GUI. The engine was a DLL supporting my NewsReader API. The engine contained a CNewsServer object wrapped with a C exported interface which could be reused with other "cockpits" written in C++, C, or Visual Basic. Code written in C++/MFC (using VC++ for Windows NT) and developed on Daytona and WinNT 3.1. Built and set up an INN Server on FreeBSD1.1 to aid development and testing.

**Sun Microsystems/PC Networking Systems, Software Consultant, Chelmsford, MA 10/93-6/94**

(Note: All windows programs were written with Visual C++ and MFC. Wherever possible, development was done on Windows NT, using the Win16 subsystem. I designed my objects/classes with reusability in mind, and all programs shared many common classes. All programs used the Winsock interface, with the exception of Netstat)

- Wrote a Win 3.1/WFW version of a Unix style LPD (Line Printer Daemon) Print Server. Printer Server resides between TCP/IP port and Print Manager, spooling jobs (LPR), deleting jobs (LPRM), and providing queue status (LPQ). Because Printman has no interface to obtain queue contents/status, developed a DLL to notify LPD of queue modifications. If Printman crashes, LPD is able to requeue any remaining jobs at reboot.
- Wrote Windows Syslogd server which receives system error via a UDP socket and routes them to a display window, a file, and/or a udp socket on another host. Mimics a unix syslogd.
- Wrote Windows Netstat client similar to Unix netstat. Program displays statistics about network interfaces, memory usage, protocols, routing, sockets, and arp table and entries. Developed custom text display object and generic system/method for converting DOS apps to real Windows apps (nicer than QuikWin.)
- Wrote Windows RSH/REXEC client which executes commands on a remote server. Uses asynchronous sockets and allows additional input for commands that require it. (i.e. csh, mail, etc)
- Wrote Windows Finger client which retrieves information using the Finger User Information Protocol (RFC1288) and is able to penetrate a firewall. Program is generic enough to retrieve user information or service responses from "vending machines."
- Wrote Windows combination "DOS to Unix" AND "Unix to DOS" file conversion program. GUI allows file selection through modified COMMDLG file open box or through click and drag.
- Added "Slip on Demand" and dial/connect functionality to a DOS Slip device driver written in assembly.
- Wrote Windows GUI to program and control the slip device driver. Used DPMI functions to communicate with this real mode driver from a Windows protected mode program.
- Wrote Windows GUI for DHCP (Dynamic Host Configuration Protocol) to display and modify lease status. GUI had a custom (subclass) listbox control which always has one item selected and keeps this selection when items are added.

**Mystic Software, Software Consultant, Binghamton, NY, 5/94-7/94**

Using Visual C++ for Windows NT, wrote a graphical Unix File Transfer Program (FTP) for Windows NT over Winsock/TCP/IP, supporting drag and drop interface from other drag originators to File Manager (custom.) Developed many reusable classes, including a drag/drop listbox class.

**Mystic Software, Software Consultant, Binghamton, NY, 11/93-1/94**

Wrote Windows Screen Saver using Visual C++. Screen saver uses a maze object which bounces as it draws itself, then solves itself. Screen Saver setup allows user to alter maze construction in a variety of ways and allows choice between BitBlt() and ScrollWindow() animation. Because Visual C++ debugging requires medium model, yet screen savers must be small model, architecture was a small model front end which calls a medium model DLL.

**XLI Corporation, Software Consultant, Woburn, MA 6/93-8/93**

Using Microsoft Visual C++ and MFC, wrote a Windows for Workgroups Client/Server GUI to control a print queue manager. GUI client communicates with server via DDE and NDDE (network DDE). GUI contains custom click & drag interface, toolbar, and various custom controls. GUI capable of locked mode (no task switching allowed). GUI can lock separate Winexec'd application through my window subclassing DLL. Implemented pseudo server to test client GUI. Project contains numerous C++ base and derived classes, including several DDE objects.

**Digital Equipment Corporation, Software Consultant, Littleton, MA 4/93-5/93**

Designed and wrote C/Windows NT multi-threaded TCP/IP client/server application for controlling various workstations participating in a performance demo for the Comdex trade show. Master module communicated with Excel via DDE and with slave modules via Winsock/TCP/IP. Developed C++ communications modules for network DDE (NDDE). Jointly developed communications modules for Berkeley (Unix) sockets and DECMessageQ. All development done in Windows NT. Slave code was portable to Intel (Microsoft), Alpha, and MIPS compilers.

**Galactic Industries Corporation, Software Consultant, Salem, NH 10/92-2/93, 4/93-5/93, 10/93, 1/94**

- Wrote, modified and enhanced C/MS Windows programs.
- Wrote 80386 assembly language drivers for a Scientific Software company.
- Wrote C++ and assembly file conversion programs.

**Dun & Bradstreet Software, Software Consultant, Framingham, MA, 3/93 - 4/93**

Designed IBM 3270 mainframe application screens for MS Windows GUI. Involved capturing 3270 screens with a PC/mainframe connection, turning screens into GUI panels, and writing sequence code to drive the mainframe transactions. Wrote Windows 3.1 DLL in C++ to extend Flashpoint functionality. Used Flashpoint development tool and Soft-Ice for Windows debugger.

**Optical Technology Devices, Software Consultant, Elmsford, NY, 2/93 - 3/93**

Developed a C++/MS Windows program with GUI to control and collect data from a fluorometer in real time. Instrument communication was over RS232 serial port, with background data collection possible. Incoming data was displayed using a DLL custom, intelligent graphing control.

**Mystic Software, Software Consultant, Binghamton, NY, 11/92-1/93**

Developed a C++/MS Windows graphical application to render and rotate/animate a wire-frame model in 3 dimensions. ROTATE contains a DLL custom drawing control for smooth animation. Developed a C++/MS Windows data graphing application. Program reads points in ASCII X,Y format and figures out how to best display them. GRAPH also had a DLL custom control to scale and display the X,Y points.

**Microdyne, Senior Software Engineer/Project Leader, Westford, MA 4/92 - 10/92**

Using Microsoft C/C++, wrote a graphical Unix File Transfer Program (FTP) for Windows 3.1 over Sockets/TCP/IP, supporting custom (but MS standard) click and drag interface and coexisting/communicating with the Windows File Manager. Program consisted of a GUI layer and a FTP Engine, which ran over a Winsock API/DLL. Assisted with Winsock DLL/Network driver development and debugging. Attended Win32/Windows NT conference to determine impact on future software projects. Helped junior software engineers learn C/Windows programming, Windows DLL writing and debugging techniques.

**Galactic Industries Corporation, Senior Software Engineer, Salem, NH 8/90 - 4/92**

- Wrote MS/Windows 3.1 Program Editor, using C, with assembly language string searches, scrolling, etc for increased performance.
- Wrote MS/Windows 3.1 Install/Setup program for a multi-disk, script driven product installation, including custom controls and icon/bitmap creation.
- Developed and documented real-time 80386 assembly language programs and device drivers in the IBM PC/AT environment for a scientific software company.
- Wrote interrupt-driven device drivers to communicate with/control spectrophotometers and chromatographs through RS232 and proprietary interfaces.
- Wrote and updated other programs in 80386 assembler, Borland/Microsoft C/C++ and Array Basic. Extensive experience with Microsoft & Borland debuggers and dual monitor debug system.

**Yankee Environmental Systems, Software Consultant, Groton, MA 11/91 - 3/92**

- Wrote IBM PC/AT 80386 assembly language, memory resident program (TSR) to process serial port interrupts and log sensor data to disk. Operation is in background and totally transparent to the user.
- Wrote Windows application (in C) to configure and test the sensor.

**Ultra Systems, Firmware/Hardware Consultant, Westford, MA 5/91 - 7/91**

Modified firmware and microprocessor circuitry of a Z80 based currency counter to convert from counting American dollars to Indian rupees. Main circuit board contained Z80, Zilog support chips, and analog sensors. Performed various mechanical design tasks.

**Wang Laboratories, Hardware Engineer, Lowell, MA 6/87 - 8/90**

- Member of VS8000 Mainframe (IBM 370 Architecture) 4 person design team which produced an LMA10K CMOS ASIC version of 3 board VS7000 Mainframe CPU set. Designs included the Address Generation Unit, high speed 3 port adder, and decimal add/subtract correction circuitry.
- Designer of an LMA9K CMOS ASIC, responsible for design, functional & fault simulation, and layout/placement. Chip performed ATU (address translation unit) function.
- Member of next generation computer design team. Designed and simulated a memory cache controller and microsequencer. Wrote assembler for cache microsequencer in UNIX/AWK pattern scanning language.
- Wrote C programs (in a Unix and Windows/Dos environment), Unix scripts, and VS microcode programs.

**Grotech, Firmware Consultant, Groton, MA 4/90 - 6/90**

Wrote embedded, real-time code for 68HC11 microcontroller based weather monitoring system. System contained master and slave controllers connected by a high speed RS422 async and RS485 sync serial links. Remote sensor used pulse accumulator and A/D inputs on 6811. Evaluated 8051.

**Middlesex General Industries, Software Consultant, Woburn, MA 10/88-11/88**

Wrote real-time 80286 machine language interrupt driven VT240 emulator for an IBM AT. Program initiated C calls and called C subroutines. Used to display status from a 68000 oil bath controller.

**EG&G Electro-Optics, Design Consultant, Salem, MA 5/88 - 8/88**

Prototyped, tested, and debugged hardware model of an ASIC; tested actual ASIC by interfacing to a computer; tested ASIC with analog I/O devices and external circuitry which make up a kidney dialysis substitute. Experience with Xilinx gate array.

**Paperless Accounting, Hardware/Firmware Consultant, Troy, NY 1/87 - 5/87**

Designed Z80 based computer and Z80 assembly code to communicate with a personal, miniature memory element and user. Device similar to an automated teller machine.

**IBM, Plotter Engineering Co-op, Kingston, NY 1/85 - 8/85**

Wrote embedded microcode for an 8088 based IBM PC card; repaired plotters; modified interface test programs for RS232 and IEEE488; designed microprocessor circuits.

## **PUBLISHED ARTICLES**

"Build a Variable Voltage Supply for Cheap" - Seattle Robotics Society Encoder, 11-12/01

"Add RAM to your 68HC11 Development Board" - Seattle Robotics Society Encoder, 11/00

"RS232 Debugging Cheatsheet" - Seattle Robotics Society Encoder

## **HOBBIES**

Mountain Biking, Cycling, Snowboarding, (Water/Dirt) Windsurfing, Flying, Tinkering, Reading