

SUMMARY OF EXPERIENCE: Experience ranges from analog and digital circuit design, FPGA/CPLD/SoC and embedded microprocessor/MCU based hardware and firmware design, BLE, WiFi. Board level and PCB design, to management and executive positions. Primary focus for the last 25 years has been in embedded systems hardware and firmware design and FPGA/CPLD/SoC. Microcontrollers include ARM Cortex M0-M4, A9, etc. with TI Stellaris and Tiva, Altera SoCFPGA, Xilinx ZYNQ, Atmel, STM32, and NXP), TI MSP430, AVR, AVR XMEGA, AVR32, Renesas, x86, PIC16,18,24,32, Various 8051 derivatives and SoC based designs with Altera, Xilinx and Cypress PSoC. FPGA/CPLD design in VHDL, Verilog and schematic entry. Software development in C, some assembly, with focus on embedded firmware applications. Bare metal, Linux and RTOS based designs. Strong focus on hardware analysis and hardware/software interaction. Development of tests/diagnostics in C, Python. Applications include a variety of simple to high end embedded systems, including satellite/space equipment, AC power monitoring/analysis, electric vehicle management, threat detection/homeland security, pellet and gas fireplace controllers, automotive diagnostic equipment (OBDII), USB devices, CAN bus based systems, Bluetooth BLE (STM32, Cypress PSoC4BLE, Microchip RN487x, Nordic nRF), telecom, video, audio, LAN/networking products (WiFi modules include STM32, TI CC3100, CC3200, BlueGiga), hand held sports products, medical products, remote sensing and monitoring, motion control, POS devices, and others with recent focus on Internet of Things (IoT) for industrial and energy management applications. Experience includes battery powered portable devices. Certified Design Services Network Partner for Intel/Altera FPGAs/CPLDs, Renesas Alliance Partner, Atmel Certified Design Partner, Cypress PSoC Certified Design Partner, Silego Certified Design Partner, Approved Mentor Design House for PADS PCB, PADS Logic and DX Designer, User and developer experience in electronic CAD/CAE tools for logic, fault and circuit simulation including SILOS, ModelSim and SPICE. Schematic capture systems include OrCAD, ECS, Mentor PowerLogic and DX Designer. PCB design with Mentor PADS PCB and Cadence-Allegro. Experience in military and aerospace, secret clearance (inactive).

BUSINESS EXPERIENCE:

9/96 to Present. Consultant, Pringle Electronics Group (President)

Current 5 Years: 4/2023 to Present, In-house project for IoT (industrial, home, medical, other) based on STM32U5, AWS and STM32MP1 to create a demo/ template design for clients to investigate ideas and move to product more quickly. Project supports BLE and WiFi.

1/2023 to 5/2023, 2/2021 to 8/2021, Monterey Bay Aquarium Research Institute, Altera FPGA redesign and new overall design with PSoC for oceanic environmental monitor with spectrometer and image sensor, etc.

1/4/2023 to 1/9/2023, Texas Instruments, Large Xilinx FPGA, project funding cancelled, project confidential/NDA.

10/2022 to 12/2022, Ensco Avionics, BLE project based on PSoC, mostly done and working, project cancelled by DoD.

3/2022 to 8/2022, 9/2020 to 1/2021, Caire Diagnostics, 2 products for medical instrument, gathered and analyzed breath samples for Nitrous Oxide, complex mostly firmware, TI Tiva, Atmel ARM Cortex M3, then STM32 based second product.

2/2022 to 4/2022, Jabil, Microchip PIC32 based, firmware for breath analysis, etc. Project confidential/NDA.

1/2022 to 11/2022, Company confidential/NDA, hardware and firmware design, Microchip PIC18 based, ultrasonic for wine industry, project confidential/NDA.

6/1996 to 3/2022, Applied Control Electronics, over 100 projects/variants for hearth/Pellet Stove industry including combustion and room controls, BLE (STM32) and WiFi controls, and other projects for motorized cycles, and other confidential. Largely Atmel AVR, AVR32, TI Stellaris, PSoC, etc. Mostly firmware and acted as senior hardware consultant and some hardware design. Company sold.

11/2021 to 12/2021, Company confidential/NDA, Medical product for trauma care, motors, pressure sensors, ethernet, battery management, firmware STM32. Project on hold.

4/2021 to 8/2021, Hunter-Douglas, Hardware and some firmware design for automatic window covering products, BLE (STM32 and Microchip) and motor drives, etc. Hardware design in Altium.

2/2021 to 7/2021, DeepFreeze, Hardware design for BLE (Microchip) based transmitter and receiver for sport fishing, Design in OrCAD and PADS, later translated to Altium for customer.

12/2020 to 3/2021, Company confidential/NDA, TI based Zigbee design for commercial building automation, firmware, mainly Zigbee implementation.

2/2020 to 10/2020, Company confidential/NDA, Hardware design for balanced input to USB output audio monitor board for multimedia industry, Design in OrCAD and PADS.

2/2020 to 4/2020, Misco, Create BSP code package for product (confidential).

11/2019 to 1/2021, Company confidential/NDA, Industrial IoT product for machine monitoring, TI MSP 430 and DART ARM, mainly node embedded firmware and host communication (Serial, BLE, WiFi) to DART. TI-RTOS and Embedded Linux.

8/2019 to 12/2019, Company confidential/NDA, Hardware and firmware for fitness industry product, confidential. Design in OrCAD and PADS.

2/2018 to 6/2019, FrontRow, Hardware and Firmware design of 2 generations of professional audio product for classrooms. TI DSP and Altera 10K, general control, communication some DSP audio processing, Design in OrCAD, PADS, Altium and DipTrace. Altera design in Quartus.

Summary of all projects:

6/2014 to Present: Various Industrial control, IoT, Medical and other products based on Intel/Altera and Xilinx FPGAs, various ARM based MCUs, BLE, WiFi, etc. Bare Metal, RTOS and Embedded Linux. Some specific projects include: Medical devices based on STM32 for trauma care and Nitrous Oxide content, DSP project (communication, Filters, FFT, summing and gain control, etc.) based on Intel/Altera Max10 FPGA (originally TI TMS320C674x) for distributed commercial audio PA/Recording/Paging system, Home Automation/Security product with Nordic nRF52 BLE/Realtek WiFi/proprietary camera, Intel FPGA (Altera) SoCFPGA project for medical laser controller with VGA LCD touch screen running Linux, Redesign of TI CC3200 P2P (WiFi Direct) for HVAC test instrument including hardware analysis and code upgrade (FreeRTOS based app), Bluetooth BLE (Bluetooth Smart) project for commercial secured access product based on Microchip RN487x and PIC24 and simple Android test app, TI Tiva/MSP430 based project with TI-RTOS for medical product, IoT project for remote energy management based on NXP LPC1768 with Telit cellular module and Ethernet/powerline modem. Recent TI TIVA based project for remote fleet management with Skywire/Nimbelink cellular module, CC3100 WiFi module and wired Ethernet. Bluetooth Smart (BLE) project for remote home appliance control using Cypress PSoC4 BLE and included development of Android app. IoT project for home automation/control industry, project includes development of embedded control end hardware and firmware based on TI CC3200 with IoT Cloud deployment, custom web application with

web services on Microsoft Azure Cloud. Xilinx Spartan6 FPGA project in Verilog, for DNA analysis equipment. Also, several Atmel AVR project updates for HVAC industries.

6/2011 to 6/2014, Altera CycloneV project with PCIe, DDR3 and multiple NIOSII cores (Verilog for FPGA fabric and C for NIOSII), Embedded WiFi H/W and S/W project with embedded web server, Mesh networking project with Synapse 802.15.4 wireless modules, SNAP OS and Linux host, Altera SoCFPGA project with CycloneV SoC using QuartusII/QSys/SoCEDK for Linux based industrial control application. Xilinx ZINQ project with ISE/SDK/Platform Studio, primary responsibilities were for the ARM Cortex A-9 cores side including secure boot/operation and Multi-Processing with Linux and RTOS asymmetrical cores. FPGA side development in VHDL, project included AXI bus interconnect of various IP modules. Firmware development for ST Micro STM32 (ARM Cortex M-3) project for power monitoring industry using IAR EWARM tools. Custom bootloader supporting web based firmware updating for AVR Mega. Development of hardware and firmware for two products transitioning from PIC based designs to TI Stellaris (ARM Cortex M-3) using OrCAD, PADS-Flow and Keil ARM tools. These were for electric vehicle industry. Another project was for Ag vehicles, Windows XPe image build for product based on an Intel Atom based single board computer with USB, CAN bus, touch screen, etc. Also, consulted on a hand held threat detection (explosives, drugs, etc.) product based on Atmel AVR32. Worked on LCD graphic display code and hardware verification. Develop DVT plan and perform test/verification for medical product implementing Bluetooth 2.1.

12/2009 to 6/2011, acted as senior member of OS firmware engineering team for a large POS equipment company. Firmware development for a proprietary Linux derivative Operating System. Tasks included development of drivers, Application Program Interfaces (APIs), and general code modules in C language. Low level interface to hardware and resolution of hardware/software inter-related issues. Significant focus on USB (device classes, enumeration, endpoints, TD allocation, bus traffic analysis, etc.) and Ethernet drivers. Code development under PVCS software revision control systems and Agile product life cycle management systems in a large team environment. Products were hand held electronic payment processing terminals supporting magnetic strip, smart card and contactless cards with RS232, USB, Bluetooth, Ethernet and wireless connections to point of sale equipment. Units were ARM9 and ARM11 secured processor powered, with tamper protection and other security. Also, hardware architecture for USB connected peripheral project which housed thermal printer, USB host device, Ethernet, UART and modem based on ARM Cortex-M3 processor.

3/2008 to 12/2009, Projects were a large FPGA (Altera) redesign to add diagnostics, testability and features in a CCA for high end threat detection system. Also, large hardware/ firmware architecture and design project for a medical product based on Renesas SuperH family processor running uCOSII real time OS and large Altera CPLD. Project included precision control of BLDC motor and Stepper motor, CAN bus/CAN OPEN, RFID and large amounts of I/O. Other projects included automotive and fireplace/stove controllers.

11/ 2006 to 2/2008, primarily retained by large client, projects included 2 large Altera FPGA projects (one with SoC) and 2 Atmel AVR/AVR32 based controller projects. Projects were for digital control of microwave frequency hopping synthesizers and threat detection for homeland security. Projects encompassed architecture, hardware and firmware design.

2003 to 11/2006, 40+ projects with FPGA/CPLD and/or microcontrollers including SoC. Projects included fireplace controllers (pellet, gas), specialty network products for LAN/Wifi, custom USB products, automotive diagnostic equipment (CAN, OBDII), audio, complex sensing and control systems, specialty microwave system controllers, surveillance, RV Leveling systems, memory and bus control FPGAs and FPGA designs which integrate several subsystems in custom applications. FPGA and CPLD projects were based upon Altera and Xilinx families.

1996 to 2003, 70+ projects with FPGA/CPLD and/or embedded processors. Projects included fireplace controllers (pellet), RV products, music products, medical/dental, remote environmental monitoring, factory control, video routing/distribution and vehicle security. FPGA and CPLD projects were based upon Altera, Atmel and Xilinx families. Processor technologies included AVR, x86, PIC, Mitsubishi and 8051 derivatives.

6/95 to 9/96, Silicon Graphics, Inc. Mountain View, CA

Member of Technical Staff/Senior Process Engineer, Digital Media Systems/IMSD

Acted as senior engineering member and advisor to manufacturing engineering group. Primary responsibilities included working as part of a large ASIC (500K + gates) design team, primarily adding design for testability (internal SCAN, etc.) and test vectors, working on a product manufacturing release team, and (from 1/96), working as lead diagnostics software developer for group. Products are high end, UNIX based, graphics workstations and supercomputers based upon MIPS RISC architectures.

1/91 to 6/95, Auburn Electronics Group, Auburn, CA/El Dorado Hills, CA

Chairman of Board/Director of Engineering 5/94 to 6/95, President/CEO 8/92 to 4/94, Vice President, Business Development 1/91 to 7/92

Co-founder of research and development/consulting company. Responsibilities included engineering (concept, product and circuit/chip level), corporate business and financial management, sales and marketing.

Company specialized in chip, board and product level design, printed circuit board design, EMI (including FCC) and manufacturability consulting. Products developed include telecom, computers, embedded systems, motion control, video and consumer electronics.

1/90 to 1/91, Synesis Corporation, Fremont, CA/Rocklin, CA

Director of Engineering, Rocklin Design Center

Founding position in startup company. Primary responsibilities included management/direction of Rocklin design automation/engineering center and hands on design projects including microprocessor based medical products.

2/88 to 1/90, Unisys/Convergent, Roseville, CA

Senior Staff Engineer, Custom Products

Primary responsibilities included conceptual and circuit level design/ redesign of customer specific products, with emphasis on quick-turn, quality and manufacturability. Many projects were PC/AT plug in cards for telecom applications.

EDUCATION:

Sierra College, Rocklin, CA
A.S.E.T. (Electronics) 1975

California State University, Sacramento, CA
Electrical/Electronic Engineering 1982

Member IEEE

*For references, additional experience and education and professional activities, etc. please contact.