# ROY WATSON

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**Timeline of some of my projects from about 2010 forward:**

Note: I have performed contract software development professionally for years. This list is limited to some of the projects I have worked on since about 2000. There were other projects for a few clients (both legacy and new clients) interspersed among the below projects.

**2024 – 2025 – Auddia – Contract Senior C/C++ Developer**

C/C++ Library for realtime audio fingerpring.

Developed a very large audio processing library in C/C++ using the to optimize performance and memory footprint. The library performed sophisticated DSP functions including Fourier Transforms to create MEL spectrograms used to fingerprint and analyze incoming audio to achieve high-speed server based and on-device voice recognition. The analysis included matrix math which I was able to optimize by employing hardware acceleration via the NEON instruction set in most modern Arm processors. The code fell back to software matrix math in the absence of these hardware capabilities. To ingest the audio data I cross compiled a custom suite of FFmpeg libraries.

**2024 – Previous Client – Senior C/C++ Developer**

Custom Http Client and Server Classes

Developed custom C++ Http protocol classes to parse URL's and make and receive requests via TCP/IP sockets.

**2022 – 2023 Davis Instruments – Contract C/C++ and Android subject matter expert.**

Integrate embedded Android with proprietary hardware.

Provided C/C++ NDK/JNI in Android subject matter expertise to a firm using a proprietary embedded Android device for the first time. Assisted them in untangling their code. Provided

architectural guidance and mentored developers on C/C++ NDK/JNI interoperation with Kotlin, coroutines and Android internals.

**2020 – 2022 Help-On – Contract Senior C/C++ and Android Developer.**

Proprietary VPN-like service for location-shifting video streaming clients.

Developed and maintained VPN like services in C/C++ that allowed for streaming devices to location shift to bypass geo-restricted services. I also developed C/C++ client libraries that ran in iOS/AppleTV and Android/GoogleTV/FireTV devices to enable the location shifting. The client server comms were all raw sockets based. Maintaining the project required constant monitoring of the packet comms with Wireshark.

**2018-2020 – InterModl – Senior embedded C/C++ Developer**

IoT Logistics and fleet management system for Intermodal Rail Yards.

Developed Node.js/PostgreSql based servers to accept fleet positioning and status data via Android devices used for data collection and telemetry. Included was a web-based app for fleet status visualization by management. Developed two Android apps; one for vehicle and position collection and reporting and another app for mobile on-yard fleet and data visualization and management.

**2018 – Major Retailer Parent Company – Embedded Linux C/C++ Developer**

IoT Retail Digital Signage Appliance

Developed an embedded C/C++ linux digital signage appliance for a SoiC based single-board-computer. I built a custom bootloader and Linux distro to support the device. On top of that I built a system that displays videos and still images and responds to customer stimulus through pushbuttons and other user interface methodologies. The system currently supports automated over-the-air content updating and infrastructure for internet based updates.

**2017-2018 – Startup Client developing a Consumer Pet Care Device**

Custom bootloader and Wifi drivers

Developed a PIC32MX bootloader that incorporates Wifi connectivity using Atmel (now Microchip) Winc1500 wifi module. My bootloader code enables remote Over-The-Air (OTA) firmware updates for both the device and the Winc module. Other code I developed allows wifi telemetry of device performance and health and for remote centralized command-and-control of the device. Also developed the OTA servers, the telemetry server, and the command-and-control server prototype. I also developed Android and Windows based bootloader companion apps that allow for serial firmware updates and for wifi manipulation of the device.

**2016 – IBM'sThomas J.Watson Research Lab**

Enable OpenCV vision for Android devices to prototype autonomous vehicle navigation.

Developed and evolved an OpenCV vision capture and machine learning system on which autonomous vehicle development is based. My development in the project involved using OpenCV C/C++ library in embedded Android NDK and other embedded devices to form a wireless network to acquire and share data using multiple sensors and computer vision enabled systems.

**2014–2018 – Goodyear Tire and Rubber, Inc**.

IoT based system to optomise Vehicle movement.

Designed and developed a client/server system to manage the fleet of vehicles that service large localized operations. The system uses in-cab Android devices to report position and telemetry to a server, in real-time, via cellular networks. The system aides in maximize production while minimizing the consumption of fuel, as well as brake and tire wear. The system provides real-time feedback to the drivers to encourage optimum behaviors. Administrators can remotely view vehicle specific data in real-time on a web based map display and monitor driver performance.

**2012-2014 - ITW – Slime – Contract C++ Developer**

CAN bus driver for OBD-II decoding

Developed hardware and firmware to acquire and decode CAN-Bus data from a motor vehicle's OBD-II port. Data is analyzed and presented to the user via HUD and mobile device display.

**2009-2012 – Contract Lead C/C++ Developer**

Mobile Navigation for Maritime and Aeronautical applications.

Developed mobile nautical and aeronautical navigation systems in C/++ to decode relatively complex file formats and implement high performance graphics display algorithms. Utilized sensor data such as GPS and compass for location and orientation information.

**2012 – Neya Systems – Senior C/C++ Developer**

Low latency – Low bandwidth real-time video streaming.

Developed a library that streams "zero latency" real time video and audio for military applications. The app encodes video using H.264 video compression using the open source x264 video encoder. Streaming is accomplished using the Live555 open source library. Incoming video is decoded using the FFmpeg library which is also open source. All the open source libraries were ported to Android using the Android NDK (Java's JNI) for C/C++ development.

The video encoding used advance features of the h.264 standard to create a low and consistent (flat) bandwidth for transmission over slow media (ie long range RF and underwater sonic transission).

**2010-2013 – Lead C/C++ Developer**

Data Analysis and Presentation/Visualization for a field usable Absorption Spectroscopic device.

I maintain and enhance the data collection, analysis and visualization software that controls a field usable, absorption spectrograph used for discriminating both gaseous and particulate in long line-of-site paths. The device can be used for environmental, homeland security, or defense purposes. The software is written in C/C++.

**2008 – 2009 Century 21 and Era Real Estate Networks**

C/C++ high performance high availability back end and network services

Developed and enhanced back end services for the websites for the largest real estate agent networks in the world. Enhanced and added internal reporting for these same websites. Extensive C/C++ involved in the backend and middleware. Advanced PHP 4/5 on the front end for the UI portions.

**2007 – 2008 Medical Device Industry clients – Lead C/C++ Developer**

Protocol driver stacks for medical device communications.

I worked for a couple of clients teaming up in the medical device industry. I was responsible for architecting/developing implementing protocol driver stacks for the IEEE 11073 which is the IEEE Standard for Medical Device Communications. This was designed and implemented as an embedded Linux system and as a universal library.

**2005 – 2007 Jackson National Life Insurance Company – Special Projects Senior Developer**

Middleware between ethernet and mainframe apps.

I was responsible for developing and maintaining software for use by users within the company. I have been involved in large and small development teams that are responsible for systems related to document capture/storage/retrieval, Policy administration, and web/mainframe middleware. My work included Visual Basic, C, and mainly C++ under both Windows and various flavors of Unix/Linux. I have taken responsibility for several applications written in Visual C++ using MFC. I have enhanced and maintained all of these.

**2004-2005 - Confidential/Undisclosed Client – Senior C/C++ Developer**

Library to import and correlate GIS data into usable databases.

I developed an extensive software library to import, organize, co-relate and export massive amounts of Geographic Information System (GIS) data from various sources. Data included Digital Elevation data, TIGER line data representing political divisions, transportation features (i.e. roads, rail, ferries, etc), land usage and hydrography. Additionally, FAA data was overlaid to create highly accurate 3-D navigation data.
The project consisted of a central Windows/MFC application written in C++. The application dynamically incorporated plug-ins/codec's (dll's) that enabled the coding/decoding of various file formats comprising the universe of all possible data. The codec's were also developed in C++ with MFC.

The data was first warehoused in a MySQL database. When MySQL was not providing sufficient performance, the data was migrated to a SQL Server database. Significant portions of the relational logic was embedded in the database (stored procedures) to allow future platforms (i.e. Java, VB, .NET) to manipulate the data without re-coding much of the relational rules.

**2000-2004 - ThermoFisher Scientific Corp (Formerly Thermo Scientific; Formerly Thermo Electron Corp) – Lead C/C++ Software Developer**

Radiation detection software for Homeland Security and nuclear energy industry.

I did a series of projects for ThermoFisher during this time period.
My first project for ThermoFisher was to develop the embedded software in a revolutionary portable Intelligent Radiation Measurement System trademarked as HandECount. This system broke new ground by embedding many of the algorithms that are used by health physics professionals directly in the measurement device. The device uploaded all of its data to a Windows based PC. I wrote both the Windows based transfer software and the Windows based management software used to analyze/archive the uploaded data as well as manage and calibrate the instrument. The instrument's embedded software was all written in C. The transfer software and desktop application were developed in C++ using MFC. The system is used heavily at the Dept. of Energy's national labs ( Los Alamos, Sandia, Savannah River, Oak Ridge, etc), at military installations, defense contractors and several nuclear power plants.

Another project I worked on for ThermoFisher was as a technology consultant for their re-entry into the nuclear power plant supervisory, monitoring and control systems. In this capacity I advised them on various hardware, software and toolchain products that would allow them to build reliable and scalable products while bringing them to market efficiently.

The most recent project I completed for ThermoFisher was the prototype for a Spectroscopic Radiation Detection Portal. This portal analyzes the spectrum of energies of the targets' emitted

particles and determines the makeup of the offending radioactive material. It can discriminate complex combinations of numerous isotopes and reliably report the constituent materials. The software that managed the multiple detector portion of the instrument was coded in C++ on an embedded Linux platform. The raw data was fed via TCP/IP to a windows server who ran the analytics engine. The Windows communications