

EDUCATION

Bachelor of Science in Electrical Engineering

The Pennsylvania State University

University Park, PA, United States

Master of Science in Embedded Systems and Internet of Things (Merit)

Newcastle University

Newcastle-upon-Tyne, United Kingdom

SKILLS

Programming Languages: C, C++, Python, R, Assembly, Embedded C, VHDL, Verilog

Communication Protocols: I2C, SPI, UART, TCP/IP, RF Design

Embedded Systems: ARM Cortex-M Development (STM32), Low-Power Embedded Design, Peripheral Drivers, Interrupt Handling, Linux Shell Scripting

Hardware: FPGA Design, Computer Architecture, Microcontroller Programming (Arduino, PIC, ARM), SoC Design, Analog and Digital Circuit Design, PCB Design

IoT & Wireless: MQTT, ZigBee, LoRa, Bluetooth, Wi-Fi, M2M Communication, Sensor Interfacing and Calibration, WSNs

Tools: MATLAB, ModelSim, Vivado, Multisim, PSPICE, Signal Tap Analyzer,

Testing & Debugging: Oscilloscopes, Logic Analyzers, Multimeters, Signal Integrity Tools

Cybersecurity: Incident Response, Security Frameworks and Controls, SQL, SIEM Tools, Network Security Management, SOC Operations

Other: Conflict Resolution, CRM Software, Quality Assurance, Team Collaboration

WORK EXPERIENCE

London North Eastern Railway

Feb 2022 – Nov 2024

Customer Solutions Engineer | Newcastle-upon-Tyne, United Kingdom

- Provided system-level technical support and troubleshooting for digital interfaces, utilizing analytical tools to resolve 20,000+ complex queries, improving reliability by 30%.
- Analyzed customer interaction data, identifying patterns that led to a 40% improvement in response time through process optimization and automated solutions.
- Excelled in communication and client relationship management, conducting detailed situational analysis and resolving 99.7% issues at the first point of contact.
- Improved customer satisfaction through effective financial compensation strategies with a 97% success rate.

PROJECTS

Real-Time Monitoring System for Aircraft Fundamentals using ARM Chipsets

- Developed a real-time embedded monitoring system using RISC-V microcontrollers and multiple sensors (temperature, humidity, force) to monitor critical aircraft parameters
- Integrated multiple sensors including temperature, humidity, and force sensors, interfacing them with the RISC-V microprocessor using I2C, SPI, and UART protocols and Embedded C for reliable data communication
- Developed analog-to-digital converters (ADC) to process real-time sensor data, which was subsequently uploaded to the cloud via a Raspberry Pi gateway using the ThingSpeak IoT platform for visualization and analysis.

IoT Smart Home Automation Using Raspberry Pi and Node-RED

- Designed a scalable IoT smart home automation system using Raspberry Pi for temperature control, humidity monitoring, and remote LED control, leveraging DHT11/DHT22 sensors for accurate monitoring.
- Implemented Node-RED for real-time data visualization and control, while integrating the MQTT protocol to efficiently handle data communication between the sensor nodes and the user interface and uploading the collected data onto ThingSpeak IoT Server for further visualization
- Secured the system by incorporating hash-based password protection, ensuring only authorized users could access and control the smart home devices, enhancing the system's security layer.

Finite State Machine for Robot Navigation System

- Designed and implemented a finite state machine for a robot navigation system using discrete logic circuits, showcasing cost-effective and hardware-efficient solutions.
- Utilized LabVIEW for code generation and interfaced with myDAQ to output signals to a circuit board, ensuring precise control and seamless operation.
- Programmed the PIC16F877A microcontroller using MPLAB software to realize the finite state machine, transferring code via PICkit3 hardware for accurate microcontroller operations.
- Simulated the system in Multisim to verify circuit behavior and optimize performance before hardware deployment, ensuring robust and error-free functionality.

Receiving NOAA Satellite Images using Software Radio

- Created a Python library (EasyWeather) capable of receiving and processing signals from NOAA weather satellites in real-time using Software Defined Radio (SDR) hardware.

- Implemented signal demodulation and APT decoding to convert analog RF signals into high-quality digital images, including a custom error correction algorithm to mitigate noise and Doppler effects.
- Integrated the system with GQRX and SDR Sharp for real-time signal acquisition and processing, ensuring smooth operation and image generation during satellite passes.

FPGA-Based Hardware Design and Signal Processing Using VHDL

- Developed communication modules between the CODEC WM8731 and the Cyclone-V FPGA using VHDL, focusing on serial-to-parallel and parallel-to-serial data conversions for audio signal processing and conducted behavioural synthesis.
- Designed and implemented a FIR filter on Cyclone-V FPGA using VHDL, improving audio signal quality by 30% while debugging functionality with ModelSim and Signal Tap Logic Analyzer.
- Conducted a detailed performance analysis, ensuring proper timing and functionality of the FPGA-based system.

TTCS Scheduler with Periodic Tasks and Overrun Protection

- Developed a Time-Triggered Cooperative Scheduler (TTCS) on an ARM-XILINX development board with a single ATMEL AT91SAM9261 microcontroller using Embedded C, managing eight periodic tasks that were executed based on time intervals to optimize resource utilization.
- Implemented Pulse Width Modulation (PWM) to control LED brightness, utilizing a sawtooth generator with a 20ms period to achieve smooth and gradual changes in LED brightness, enhancing user visibility and control accuracy.
- Designed and integrated overrun protection mechanisms, including simple fault detection and dynamic task queue reordering, ensuring that failed tasks were handled appropriately while maintaining execution of other critical tasks.
- Modeled the scheduler using a Finite State Machine (FSM) with clearly defined states (e.g., sleep, update, dispatch), optimizing task management and system responsiveness, which enabled efficient multi-task handling on embedded platforms.

Baxandall Tone Control/Karaoke Circuit

- Designed, built and implemented a two-stage active tone control circuit which included – Mixer/Karaoke, Bass/Treble Control, Volume Control, Volume Display and Attenuator/Output Driver on Multisim and breadboard
- Created PCB layouts using Multisim and KiCAD, minimizing electromagnetic interference (EMI) and ensuring compliance with electromagnetic compatibility (EMC) standards for high-speed digital circuits.
- Tested the circuit's performance under various conditions using oscilloscopes, verifying signal integrity and operational efficiency.

Implementation of Five-Staged Pipeline CPU using Xilinx package for FPGAs

- Designed and implemented a five-stage pipelined CPU architecture (Instruction Fetch, Decode, Execute, Memory, Write Back) using Verilog for efficient instruction execution.
- Utilized Xilinx Vivado for synthesis and functional verification, employing inter-stage registers for concurrent processing, thereby improving system throughput.
- Addressed data hazards through forwarding mechanisms and control stall implementations, optimizing data flow and ensuring accurate execution across the stages.

CERTIFICATIONS

Google Cybersecurity Professional- Google, 2023

ARM Cortex-M Architecture and Software Development – ARM, 2024

German A2 (CEFR) – Goethe Institut, 2016