Sulav Lal Shrestha

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Education

- **University of Waterloo** — Waterloo, Canada
  Master of Applied Science - Electrical and Computer Engineering; GPA: 95.6% — *May 2021 - August 2023*
  Courses: Software Testing, Quality Assurance and Maintenance • Software Reliability Engineering • Data and Knowledge Modelling and Analysis • Operating Systems • Real-Time Operating Systems • Distributed Systems • Computer Network Security • Embedded Software

Skills Summary

- **Programming**: C, C++, Python, Bash, Design Patterns, Object Oriented Programming, Distributed Computing
- **Tools & Framworks**: GMock/GTest, Git, BlueZ, Docker, gRPC, American Fuzzy Logic (AFL), KLEE
- **Embedded Systems**: Microcontroller Programming, Embedded Linux, FreeRTOS, Azure RTOS, NetX network stack, lightweight Internet Protocol (lwIP) network stack (TCP/IP, DHCP, SNTP, Ethernet/IP), Hardware Interfaces (I2C, UART, SPI, CAN)

Experience

- **Molex - Advanced Technology Team** — Waterloo, Canada
  Research Student, Embedded Software Developer — *Sep 2022 - Apr 2023*
  - **Ethernet/IP Prototype**: Developed prototypes for Ethernet/IP stack based on Beaglebone Black (Cortex-A8) and LaunchPad AM243x (Cortex-R5). The prototypes were developed for two RTOSes - FreeRTOS and Azure RTOS. Used lightweight IP (lwIP) network stack. Successfully optimized and determined the maximum number of Exclusive Owner (EO) connections that can be supported by the chosen platform without violating the jitter requirements of <10% of Requested Packet Interval (RPI).
- **Yatri Design Studio Pvt Ltd** — Kathmandu, Nepal
  Embedded Software Developer — *Jul 2019 - Mar 2021*
  - **Vehicle Dashboard**: Developed vehicle dashboard prototype based on Raspberry Pi 4 for an electric bike. Developed WebUI, Bluez based Bluetooth Low Energy application, Mapbox-based basic vehicle positioning. Created Linux SystemD services and communicated with other services using DBUS. Integrated peripherals and sensors with I2C, SPI, CAN, interfaces. Led and completed the dashboard prototype development for startup fundraiser.
- **Harman International** — Bangalore, India
  Associate Software Developer — *Sep 2017 - Jul 2019*
  - **Vehicle Infotainment System**: Implemented Audio Presentation Layer for an Embedded Linux based OS (built using Yocto Build System) in a vehicle infotainment system. Used C++ and Franca Interface Definition Language for implementation and, GMock/GTest and Bash Scripting for testing. Successfully implemented and debugged the software stack. Reduced the bugs from 300 to 10 leading to successful delivery of the product on time. Automated tests to save two hours of testing that was done twice every week.

Projects

- **Microcontroller firmware**: As a research student in Real-Time Embedded Systems Lab, UWaterloo, implemented firmware using Azure RTOS ThreadX and NetX Duo network stack for collecting sampled analog data and publishing to Azure Edge and Hub for storage and analysis. Used MQTT for sensor data publishing and SNTP for time synchronization. Implemented a bootloader to support firmware updates using HTTPS server. (Sep 2021 - August 2022)
- **Merkle Tree Authentication**: Implemented a proof-of-concept Merkle Tree Authentication system as a course project for the course Computer Network Security. Used Ubuntu Docker Containers to simulate peers in a P2P network. Used gRPC with Python bindings to communicate with the peers in the network. (Mar 2023)
- **Nano-Satellite Firmware - Undergraduate Final Year Project**: Implemented nano-satellite firmware related to Attitude Determination and Control System (ADCS) on STM32F4-Discovery microcontroller using FreeRTOS. Implemented ADCS algorithm using CMSIS DSP library to accelerate matrix multiplication. Integrated magnetometer and GPS sensors. (May 2016 - May 2017)

Publications

- **Conference Paper - Metasploit for Cyber-Physical Security Testing with Real-Time Constraints**: 4th International Conference on Science of Cyber Security, Matsue Japan. Tech: C, Ruby, Metasploit, Linux, Controller Area Network (CAN) (Sep 2022) *Link*
- **Conference Paper - A Strategic Methodology for 2D Map Building In Indoor Environment**: 2015 1st International Conference on Next Generation Computing Technologies (NGCT). Tech: MBed LPC1768 microcontroller, C (Sep 2015) *Link*