

SKILLS

- **Programming:** C, Embedded C, Linux device driver development, Linux system programming, Buildroot, Shell Scripting, DSP (Basic Knowledge), Bare Metal, ARM Cortex-M (Basic), RTOS
 - **Build Systems:** Makefile, Cmake, Manual Makefile Writing
 - **GNU & Debugging Tools:** GCC, GDB, KDB
 - **OS Platforms:** Ubuntu Linux on x86, FreeRTOS
 - **Protocols:** MQTT, HTTP, SIP, UART, I2C, GPIO, SPI, Ethernet, WLAN (802.11)
 - **Version Control:** Git
 - **SoC & MCU:** Broadcom BCM2711B0, STM32F100C4T6B, AM3358, ESP32, Neoway N58, STM32MP157A
 - **Architecture:** ARM Cortex-A7 (STM32MP1), Cortex-M4 (STM32F4), ARMv7-A
 - **Multimedia:** Audio streaming using ASoC, SPI display drivers, framebuffer video playback
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WORK EXPERIENCE

Dialtronics Systems Pvt Ltd (May 2023 - Oct 2024)

Responsibilities:

- Development and maintenance of software solutions from BareMetal to application-level.
- Device driver development, porting, and kernel module implementation.
- Application protocol integration (MQTT, SIP, RTP, HTTP).

Projects:

1. IP Phone Development

Description: Developing and designing a custom VoIP phone with integrated LTE module.

- **Hardware:** STM32MP157a-DK1, STM32MP135F-DK, Push Buttons, 20x2 LCD, ILI9341 SPI TFT, PCF8575 IO Expander, LTE Module (62060 – Robu.in)
- *** Kernel & Drivers:**
- Integrated **CS43L22** and **CS42L42** audio codecs using ALSA ASoC framework; configured I2C, I2S, and clocking via Device Tree
- Verified audio playback using aplay, alsamixer; modified DAI links and machine driver bindings as needed
- Adapted existing **ILI9341 SPI framebuffer driver** for STM32 SPI+DMA; added DT support and tested with fbi
 - Allocated DMA-safe framebuffer using dma_alloc_wc()
 - Implemented fb_ops.fb_mmap using dma_mmap_wc() for zero-copy user access
 - Triggered screen refresh using spi_async() with spi_transfer and DMA-enabled SPI controller
- Configured **GPIO keys and PCF8575** expander for interrupt-driven input; verified using evtest
- Developed custom **PJSIP application** with features like call forwarding, conferencing, and call barging

2. Embedded Audio Processing Unit (STM32F4 + CS42L22 & CS42L42)

Description: DMA-based audio processing unit for **low-latency** audio handling.

- **Objective:**
 - Use DMA to handle **I2S Audio Codec & I2C configuration** to minimize CPU overhead.
 - Initial development on **STM32F4 Discovery**, final target: **STM32F4 Blackpill**.

3. Opus Codec Integration for Audio Streaming

Description: Developing an **Opus-encoded real-time audio streaming system**.

- **Input:** I2S Microphone → STM32F4 (Opus Encoding)
- **Output:** STM32F4 (Opus Decoding) → MAX98357 I2S Amplifier
- **Communication:** Raspberry Pi exchanges Opus-encoded data with STM32F4 over a network.

4. Linux Device Driver for BeagleBone Black (3.5-inch TFT Display)

Description: Developed a **custom driver using the FBTF framework** for a **3.5-inch SPI TFT Display** on BeagleBone Black.

- **Kernel Version:** 4.19.94-ti-r42 (FBTF support dropped in newer kernels)
- **Display:** [QuartzComponents TFT](#).
- **Implementation:**
 - Adapted FBTF framework for BeagleBone Black.
 - Configured device tree and frame buffer parameters.

5. Integrated MQTT/HTTP Server on IPPBX E600

- Developed **custom MQTT client library** for handling JSON-formatted messages.
- Implemented **threaded message exchange mechanism** for PBX systems.
- Integrated an MQTT-based **broadcast mechanism** for VoLTE gateways (32 ports).
- Contributed **Call Barging Mechanism** using **ChanSpy** and **custom call handling**.

6. Jail Box Communication System (Voice & Video Calling for Prisons)

- **Hardware:** Neoway N58 LTE Module, Raspberry Pi 4, Raspberry Pi Touchscreen.
- **Software:**
 - Implemented **voice calling system** using LTE libraries.
 - Integrated **Jitsi-based video calling** system with **MQTT** messaging.

7. CI/CD System Development & Maintenance

- Introduces Github + Github Action CI pipeline.
- Introduced **GitTea + GoCD-based CI/CD** for managing firmware and software releases.
- Implemented automated **pull request management, build reports, and tests**.

Volary Softech Solutions Pvt. Ltd. (Sep 2022 – April 2023)

- **Project: Akashroopa (FOTA):** Developed **firmware over-the-air update system** for a multi-client server model.
- **Custom Shell Development:** Created a **secure shell** with custom command handling.
- **BeagleBone TFTP Bootloader Integration:** Configured **secure TFTP boot** for BeagleBone Black.

Non -Relevant Experience: (March 2019 – Feb 2020)

- Concentrix Daksh Services India Private Limited (Post Sales International Flight Department)

PERSONAL PROJECTS

1. Home Automation System (Web-Based)

Description: Developed a home automation system using **4 ESP32 & 2 ESP8285 modules**.

- **Features:** Control **lights, power equipment, sensors** via a local web-based UI.
- **Communication:** HTTP & REST API (No MQTT/ESP-Mesh).
- **Integration:** Connected to a **Wi-Fi router** for local network access.

2. Linux Device Drivers for Peripherals

- **GPIO Driver for 16x2 LCD Text Display** (Kernel APIs).
- **I2C Driver for BMP280 Temperature Sensor** (Regmap API, Device Tree).

3. Embedded Firmware Projects

- **Custom MQTT Client Application** (Forked from [MQTT-C](#)).
- **Custom MQTT Broker** (Forked from [Mongoose](#)).
- **RC522 RFID Sensor Firmware** on STM32F103 (FreeRTOS + OpenCM3).

4. Bare-Metal Drivers for STM32F103 & STM32 Discovery Boards

Description: Implemented low-level drivers without RTOS or HAL for common peripherals.

- **Drivers:** UART, SPI, I2C, GPIO, Timers, ADC, PWM.
- **Framework:** Developed in OpenCM3 and CMSIS.

EDUCATION

- **B.Tech in Electrical Engineering** – Camellia Institute of Technology (CGPA: 8.0, 2021)
- **Diploma in Electrical Engineering** – Siliguri Government Polytechnic (67.8%, 2016)
- **10th Standard (CBSE)** – Royal Academy (CGPA: 7.0, 2011)

COURSES & CERTIFICATIONS

- **Linux System Programming, Kernel Programming, Device Driver Development**
- **Embedded Linux - TechVeda (Sep 2021 - May 2022)**

Languages Known:

- English (Proficient), Bengali, Hindi