SATHEESH KUMAR KUSUMA

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Embedded Firmware Developer | Sr Engineer with 7+ Years of Experience | Device Driver and Application Software Development | M. Tech in Embedded Systems

PROFESSIONAL SUMMERY

- **7+ years** of experience in developing embedded firmware for various embedded products
- **4** years of experience in Automotive domain
- **2 years** of experience in teaching
- Experience in end-to-end development of embedded products from requirement analysis to system design, development, documentation and testing
- Strong Programming Skills in **C** and **Embedded C**
- Very good experience in design, develop, debug & unit test of **device driver** software and embedded **application** software development.
- Solid experience in low level communication interfaces development.
- Strong experience with debugging and failure analysis on target boards
- Highly proficient in understanding new technologies accomplishing project goals on time.
- Experience with Agile development process.
- Very good individual contributor as well as good team player
- Ex-Research Scholar at University of Hyderabad, Hyderabad
- **M. Tech** in **Embedded Systems Technology** from SRM University, Kattankulathur, Tamil Nadu
- Keen interest in the areas of Embedded Systems and Embedded AI/ML
- Merit of having paper on 'An Efficient Object Orientation Detection for Machine Vision' published
- Skills in analysing & interpreting unique problems, with a combination of experience and logical thinking to find the right solutions
- A keen communicator with honed interpersonal, analytical and problem solving skills

TECHNICAL EXPOSURE

- Device driver development for BMS IC (BQ76952 from TI) in Zephyr RTOS
- Developed **driver software** for controlling High side switches, Stepper & DC motors
- Developed driver software for reading digital inputs (**SPI)**, analog inputs (**ADC**) & frequency (**FTM**) inputs
- Very good experience on serial communication interfaces **SPI**, **UART, I2C**
- Work experience on socket programming to establish a TCP/IP communication on Linux environment
- Hands on experience on cyber security threat assessment for HVAC product
- Hands on experience in writing **CAN** Driver for Automotive controller S32K144
- Work experience on **J1939** protocol
- Work experience on **boot loader**, **ISOTP**
- Good knowledge on UDS, OBD-II concepts
- Good in understand and extract critical information from technical data sheets
- Work experience in Board Bring up, Hardware Troubleshooting
- Experience in understanding embedded hardware schematics and interfaces to **microcontroller**
- Work experience in Functional and Unit Level Testing

SKILLS

- Programming Languages : C, Embedded C, Python basics
- Micro Controllers : S32K14x, STM32F4, Renesas RX64N, PIC16F877
- Peripherals : ADC, SPI, I2C, FTM, PDB, GPIO, UART, CAN
- IDE : Visual Studio Code, S32DS, STM32Cube, Eclipse, MPLAB X
- Serial Protocols : SPI, UART, I2C, RS485
- Vehicle Communication Protocols : CAN, UDS, J1939
- Test, Simulation, Analysis Tools : BusMaster, PCAN-View 3, DockLight, DCAT and In House tools
- Software Management Tools : Git, SVN, Jira
- Debugger : Multilink, Pickit – 3, St-link
- Compiler : ARM GCC Tool Chain
- RTOS : Zephyr, FreeRTOS
- Test instruments : PCAN-USB, Picoscope, Oscilloscope, logic analyzer, functon generator etc.

WORK EXPERIENCE

Gyansamhita Tech Pvt Ltd, Hyderabad **Sep'2022 – Present**
Sr Firmware Engineer

- Firmware development for battery management system
- Hardware components selection for BMS
- Assigning tasks to Jr engineers and monitor
- Train and inference AI model on STM32

Carrier Technologies India Ltd (UTC Fire & Security), Hyderabad **Nov' 2020 – Aug'2022**
Sr Software Engineer

- Maintaining existing software for HVAC systems
- Application software development, debug, unit test for new features
- Customer requirement analysis and identify impact areas
- Documentation of requirements, standard work

DANLAW Technologies India Ltd, Hyderabad **Oct' 2016 – Jul' 2020**
Software Engineer

- Handled various embedded products from scratch
- Requirement analysis and communicate with customer
- Documentation of software detail design
- Design, implement, debug & test driver software for different products
- Debug hardware schematics and suggest modifications with hardware team
- Characteristics analysis of BCU IO module.
- Software management and release
- Interact with clients
- Data Logger functionality testing & validation.
- Developed new test cases for existing & new features of Data Logger Gen2.5

GOKUL Degree College, Hyderabad **Jul' 2009 - Apr' 2011**
Lecturer

- Teaching & tutoring students as per academic curriculum, responding to all classroom queries in a spontaneous manner with a view to foster a healthy learning atmosphere
- Maintaining productive learning environment by making the students learn the concepts with practical

ACADEMIC DETAILS

- Research Scholar at University of Hyderabad, Hyderabad from Jan 2016 to Sep 2016
- M. Tech in Embedded Systems Technology from SRM University, Kattankulathur, Tamil Nadu with **7.95**/10 CGPA in 2013
- M.Sc. in Electronics from Andhra University, Visakhapatnam, Andhra Pradesh with **68.33**% in 2008
- B.Sc. (Mathematics, Physics, Electronics) from Kakatiya University, Warangal, Telangana with **77.88**% in 2006
- 12th from Shantiniketan Junior College, Hanamkonda, Telangana, BIE Andhra Pradesh with **84.50**% in 2003
- 10th from Sri Vivekananda Vidyalam, Kesamudram, Telangana, Board of Secondary Education, Andhra Pradesh with **79.50**% in 2001

PROJECTS HANDLED

Project 1: Battery Management System

Organization	: Gyansamhita Tech Pvt Ltd
MCU/Platform	: STM32F4
Language	: Embedded C
IDE	: Visual Studio Code
Tools	: DCAT, USB to CCN converter, Renesas E1, Microsoft threat model
RTOS	: Zephyr RTOS
Team Size	: 5

Description: Battery management system (BMS) is technology dedicated to the oversight of a battery pack, which is an assembly of battery cells, electrically organized in a row x column matrix configuration to enable delivery of targeted range of voltage and current for a duration of time against expected load scenarios. 48V to 64V battery pack of Li-ion cells.

This product monitor the battery cells for faults such as over voltage, under voltage, over current etc, performs cell balancing and calculate SoC, SoH. These parameters are show on display.

Scope of the project: Proof of concept in house product.

***Role & Responsibilities*:**

- Hardware components selection BQ76952, STM32F4
- Setup Zephyr RTOS environment in Visual studio code
- Firmware development, debug and unit testing
- Assigning tasks to Jr engineers and monitor

Project 2: SystemVu

Organization	: Carrier Technologies India Ltd
MCU/Platform	: Renesas RX63N Group
Language	: C
IDE	: Renesas HEW
Tools	: DCAT, USB to CCN converter, Renesas E1, Microsoft threat model
RTOS	: EMBOS
Team Size	: 6

Description: SystemVu is a controller of the Roof Top Unit. It controls the Mechanical/Electrical devices such as compressors, heaters, ventilators, outdoor fan, indoor fan based on cooling, heating algorithms. Compressors are the main core component in HVAC which is used to provide heat and cool. Based on sensors/thermostat inputs, demand will be calculated i.e., cool or heat. Based on the demand calculation and requirement compressors, heaters, damper etc will be turned ON/OFF and speed of the indoor fan or outdoor fan will be controlled through PWM generated from SystemVu board.

Software Architecture: The software is designed based on TOMCAT Client and Server design structure. All applications(client) will use the system resource (which is considered as server).

One of the system resource i.e., DB (database). Each and every application will share the data using this DB. DB will provide the required API's to create, write, read data from DB. In case any application has to share the data, it has to create object (structure with data, functions) i.e., data dictionary(DD) element using the API's provided by DB. Each application is made independent of another using the DB concept. All variables, configuration parameters are declared using the DB.

Scope of the project: Complete product development from system design to product selling. Requirement analysis, mechanical, electrical and software design, development. Functionality validation and production.

***Role & Responsibilities*:**

- Understanding SYSTEM LEVEL REQUIREMENTS and writing SOFTWARE SPECIFIC REQUIREMENTS
- Application development for mechanical HEAT with two compressors
- Software development and unit testing
- Requirement documentation in confluence
- Analyse requirements gaps and discuss with equipment team.
- Collaborate with cross functional teams in global locations
- Threat assessment using Microsoft threat model for the product and support cyber security team.

Project 3: SystemVu Connectivity

Organization	: Carrier Technologies India Ltd
MCU/Platform	: Renesas RX63N Group
Language	: C
Tools	: VVDN Wi-Fi device, Sierra ethernet device, Wi-Fi Router, DCAT, USB to CCN, Bus Monitor
RTOS	: EMBOS
OS	: Linux
Team Size	: 2

Description: It is an IoT proof of concept project, connecting SystemVu to cloud. So that customer can connect to the Roof Top Unit (RTU) through a web page from anywhere. SystemVu will post the collected data such as configuration, alerts, telemetry from RTU to the cloud periodically. Customer can monitor RTU and schedule the occupancy remotely.

Sierra ethernet device acts as an IoT gateway which is running on linux. It provides a rich set of IoT API in a secure, embedded application environment that integrates tightly with the cloud. Data from Sierra can be pushed to the cloud using

4G SIM. A third party device (VVDN) is connected to the SystemVu over RS485. VVDN will communicate to the Sierra Through a TCP handshaking mechanism over Wi-Fi.

Scope of the project: It is proof of concept. Requirement analysis, software development, web hosting.

***Role & Responsibilities*:**

- Understanding the requirements
- Learning network concepts
- Developing TCP hand shaking mechanism (Legato application) using linux system call.
- Communicate with third party vendor (VVDN) to resolve issues and make it compatible with SystemVu
- Demo to global team.

Project 4: Body Control Unit (BCU)

Organization	: Danlaw Technologies India Ltd
MCU/Platform	: S32K144
Language	: Embedded C
IDE	: S32 Design Studio
Tools	: PE Micro, Pico Scope, Multimeter, Bus Master
Team Size	: 8

Description: BCU is responsible for controlling the different functions of automotive body system like wiper control system, controlling room lamp, controlling side indicators, controlling window motors, driver seatbelt reminder, passenger seatbelt reminder and fuel level monitoring system.

Scope of the project: Requirement analysis. Design, development & validation of driver software which will be integrated with client's application. Bootloader design & development.

***Role & Responsibilities*:**

- Design, develop, debug & unit test of IO module driver software.
- Requirement analysis and communicate with customer
- Developed SPI interface to read digital inputs status
- Developed SPI interface to control digital outputs through high side switch
- Developed ADC interface to read sensors data & FTM interface to read frequency inputs
- Developed GPIO interface to detect wakeup inputs
- Developed I2C interface to read/write RTC
- Characteristics analysis of BCU IO module
- CAN driver bug fixing. Bootloader modifications
- Documented software detail design
- Explained J1939 concepts to team mates

Project 5: Heat Pump Controller

Organization	: Danlaw Technologies India Ltd
MCU/Platform	: S32K144
Language	: Embedded C
IDE	: S32 Design Studio
Tools	: PE Micro, Pico Scope, Multimeter
Team Size	: 6

Description: The Low Temperature Heat Pump Controller is responsible for controlling heat, ventilation, defrosting, dehumidification and air conditioning of the automotive system. It should also implement various safety measures and basic diagnostic service for troubleshooting.

Scope of the project: Requirement analysis. Design, development & validation of driver software which will be integrated with client's application. Boot loader design & development.

***Role & Responsibilities*:**

- Design, develop, debug & unit test of driver software.
- Developed SPI interface to control stepper motor.
- Developed SPI interface to control DC motors with position feedback.
- Developed PWM interface to control blower motor.

Project 6: Amber Data Logger

Eclipse, ESP32,

Organization	: Danlaw Technologies India Ltd
SoC/Platform	: ESP32
Language	: Embedded C
IDE	: Eclipse
Tools	: USB-to-UART converter, Flash tool, Diagnostic tool
COMPILER	: GCC RENESAS
Team Size	: 6

Description: A telematics device for vehicle tracking, collect OBD data, generate OBD events based on the thresholds and report to server using MQTT protocol. Also report vehicle DTCs. It reports OBD data and events to a mobile app via Bluetooth.

Scope of the project: Requirement analysis. Complete product development, hardware & software design, development. Functionality validation. Mobile app design & development.

***Role & Responsibilities*:**
Implemented EOL(End-Of-Line) testing software that provides low level interfaces to diagnose the hardware like Modem, BT, CAN Transceiver, GPS, IO, Sleep current.

Project 7: Data Logger

Organization	: Danlaw Technologies India Ltd
Tools	: Gen 2.5 Data Logger, OBD simulator, TeraTerm, J2354, In house tools
Bug Tracking	: Jira
Team Size	: 12

Description: A telematics device works on OBD-II protocol, also supports other protocols used in heavy vehicles. Collects OBD-II data, generate OBD events and alerts, vehicle tracking, vehicle DTCs, Device DTCs, On demand GPS location report to the server. Reports trip data and trip end summary. Also support OTA to update firmware and configuration.

Scope of the project: In house project. Complete product development from requirement analysis to product validation.

***Role & Responsibilities*:**

- Functional level requirement testing for Data logger Gen2.5
- Developed test cases for new & existing features
- Tested and verified different functionality features like OBD events, OBD speed events, Communication, OTA, J1939, TCP Commands, DTCs etc

PAPER PUBLICATION

- Published a paper with title 'An Efficient Object Orientation Detection for Machine Vision' in International Journal of Scientific Research Journal in volume 2, issue 4, having impact factor of 0.33 in April 2013

PERSONAL DETAILS

Date of Birth	:	11th February 1986
Languages Known	:	English, Telugu & Hindi
Passport No	:	M3294773
Current Address	:	SRT-885, Sanath Nagar, Hyderabad – 500018, Telangana, India
Permanent Address	:	2-49, Ameenapuram, Kesamudram, Mahbubabad – 506112, Telangana, India