

Design and Development of an Open-Architecture Telemetric Control Unit (TCU) for Automotive Data Acquisition and Remote Fleet Analytics

Ashu Tamar, Jyoti, Shivani, Kurshed Alam, Mr. Satish Kumar, Ms. Lalina

Ganga Institute of Technology & Management, Kablana

Abstract: *Modern automotive fleet management relies heavily on continuous data acquisition from internal vehicle networks. However, severe restrictions imposed by original equipment manufacturers (OEMs) or the absence of standard physical telemetry ports in specific vehicles often prevent access to vital diagnostic metrics. This paper presents the end-to-end design and implementation of an open-architecture, non-invasive Telemetric Control Unit (TCU) engineered to bypass manufacturer-locked configurations. Powered by a 32-bit dual-core ESP32 microcontroller integrated with a multi-frequency EC200U-CN 4G LTE and GPS module, the system captures critical telemetry—including engine performance metrics, fuel consumption profiles, instantaneous vehicle speeds, and high-precision spatial positioning data. Captured variables are transmitted over a secure cellular connection using HTTPS POST payloads to a cloud server, where fleet operators monitor real-time behaviors through an analytics dashboard. Experimental testing verifies low latency, data integrity, and high system reliability within electrically noisy automotive environments.*

Keywords: TCU, ECU, MCU, CAN, EMI