Telematics Control Unit (TCU) & SanTrack Reference Design 3

The Telematics Control Unit (TCU) development platform provided by SanCloud is a reference design based around the AM335x architecture. The SanTrack cloud platform provides data collection, processing, visualisation and device management services. The open source Thingsboard project can be used as an alternative cloud platform to provide the same services.

As a TCU is responsible for collecting and processing data for sending to a remote service the use of a low cost and low power SoC is a good choice.

Hardware Components

- SanCloud BeagleBone® Enhanced Industrial/Extended (Depending on functionality required)
- SanCloud Automotive Cape (V4.3)

The current design incorporates the following features:

- LTE-Cat1 Global modem
- Global GPS/GNSS (u-blox MAX-M8Q)
- Super Cap backed RTC
- Accelerometer
- Gyro
- CAN x 2
- RS485 (Using CAN2 channel)
- Analogue Inputs x 2
- Ignition input
- Bi Directional port x 1
- Gigabit Ethernet
- IP67 enclosure with 12pin DEUTSCH DTM06-12SA (Grey) connector
- Active GPS antenna support
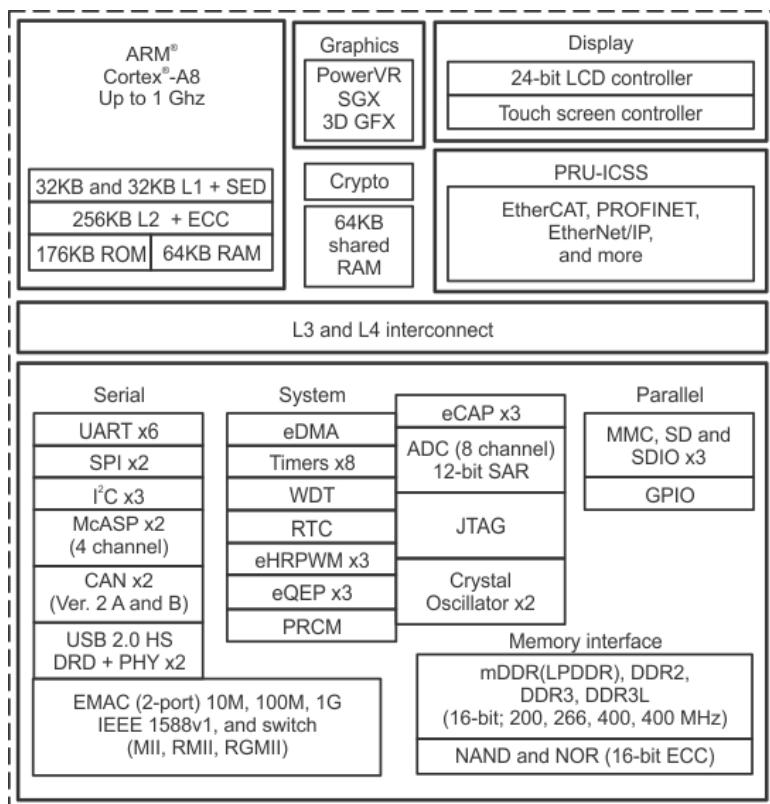- Debug/Status LED's x 6
- 6-60 V DC
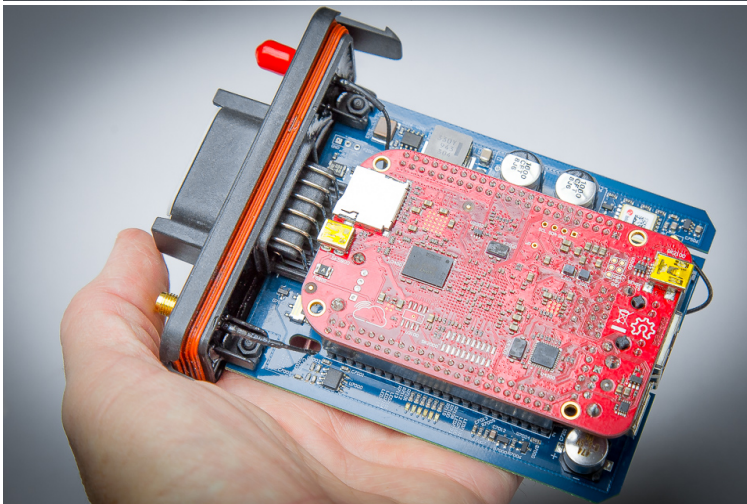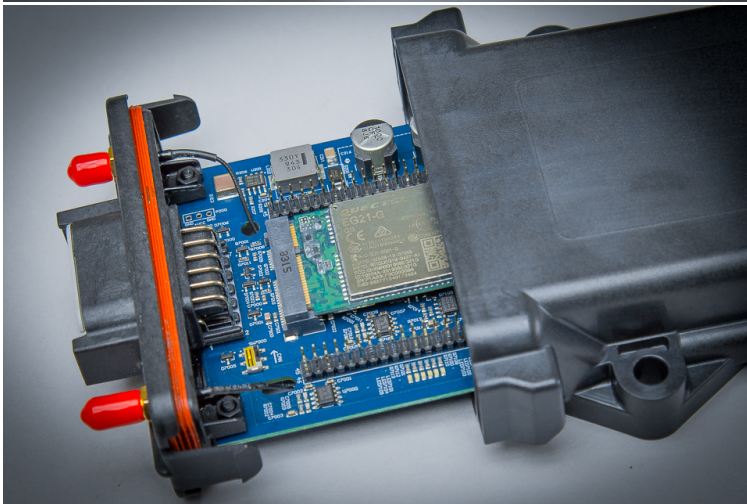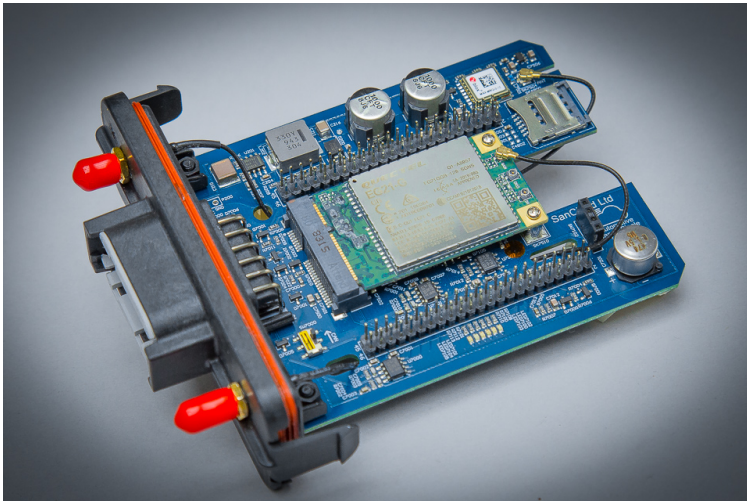
Optional addition of dual band WiFi (2.4GHz & 5GHz) and Bluetooth 5.0/BLE by using SanCloud BeagleBone® Enhanced Extended board.

There is also the ability to have a USB expansion port.

Optional support for Micron Authenta via SPI-NOR.

The processor (AM335x) has the following architecture:

The platform is currently supported by the AGL build system and an earlier variant was used during demonstrations at CES using the telematics profile.

Software Components

TCU Software

The TCU software image will be based on the AGL Telematics Profile.

The `agl-telematics-demo-recorder` app will be used to collect telematics data and send it to a SanTrack or Thingsboard instance via the MQTT protocol. This app may be extended to add any extra functionality which is required.

Cloud Software

The SanTrack IoT Web Platform provides the following features which will be used in this reference design:

- Device management: The status of each registered device can be monitored using the cloud interface. Devices can be assigned to a particular end user or project to aid organisation and to delegate administrative responsibilities.
- Data collection: SanTrack includes an MQTT server which will accept data from TCUs. MQTT data may be sent over an SSL connection for increased security.
- Data storage: Once received via MQTT, data can be stored in a PostgreSQL, Cassandra or Timescale database. These backend databases can be queried, backed up, etc as required.
- Data analytics: SanTrack provides data query tools, data visualisation and a rule engine which can be used to automate data analysis. Alarms can be configured so that the administrator is notified on important events.

The Thingsboard open source project may be used as an alternative to SanTrack to provide similar features.

Reference Design Storyboard

This story board walks the evaluator through the expected experience when operating the reference design. It also acts as a story for delivering the demonstration to evaluators for live or recorded events.

Device Commissioning and Provisioning

How the device will be up and running with local network, AGL telematics stack starts gathering data from vehicle and provisioning to the cloud;

Device throughput for local operation

Data can be streamed locally to an MQTT agent for investigation and parsing if required.

Cloud operator experience

Once TCU is configured and operating properly, SanTrack or other cloud dashboard will show in a dashboard selected data coming from the TCU at the configured refresh rate.

Configuring tune-able parameters

Data acquisition parameters will be initially configured on the device side.

Operating without connectivity (recorder)

When the TCU is offline data is cached locally and will be transmitted to the cloud service once data connection is resumed.