

## Vehicle electronic instrument Project

### Client Background and Business Requirements: :

The client is a professional vehicle consumer electronics manufacturer. It has close relationship with some large Japanese auto makers such as Toyota and Nissan.

Beyondsoft customizes a vehicle-mounted electronic device, which can collect and analyze data stream while car running via CAN/LIN Bus and OBD protocol, so that some important parameters of vehicle condition such as air pressure, oil-control valve, water temperature, revolving speed, car speed, oil pressure, oil temperature, etc. will be displayed dynamically through vehicle-mounted electronic device. Drivers can timely monitor the vehicle status.

### Beyondsoft Solution :

- According to the requirement analysis, Beyondsoft customizes a vehicle-mounted electronic device for the client.
- The product has two parts including data collection (OBD-BOX) and status display. The connections are as shown below :
- OBD-BOX module is used for collecting vehicle data including air pressure, oil-control valve, water temperature, revolving speed, car speed, oil pressure, oil temperature, etc via CAN/LIN Bus interface. Those data are displayed by MFD.
- MFD module is used for displaying status data in real time, with a 2.8-inch OLED LCD screen and STM32 32-bit SCM, which ensures display effect and also reduces the cost.
- The core and challenge of this product lies on the software development. It features low-cost embedded system and more fashionable display effect, so it sets a high demand of its framework and algorithm for software development. In addition, the security and reliability of vehicle electronics are also strictly controlled.
- Above, a software frame diagram. The major modules and functions are specified below:
  - ✓ Control module: core of the software, receiving and processing the modules' messages and responding to various interrupt;



- ✓ UI interface module: receiving and processing keyboard orders and generating UI action messages according to current system state;
  - ✓ Vehicle data control module: collecting vehicle data and saving the database via CAN/LIN Bus interface;
  - ✓ LCD display module: according to UI operating command, accessing real database of external Flash; adopting Framebuffer mechanism to refresh LCD display pages;
  - ✓ Serial communication module/USB control module: connecting system with external PC interface; accepting PC debug commands to transmit the vehicle data to upper computer.
  - ✓ Interrupt handling module: receiving and sending all the external interface data. This module is a key point of the whole system design.
  - ✓ This product is characterized by its appearance and UI design. Through close cooperation and timely communications with the client, the product fully reflects Japanese consumption habits
- Carried out tests on different types of vehicles of different brands; collected vehicle data on a large scale, setting up databases of vehicle condition and implemented analysis/calibration test, so as to ensure the generality and reliability of the product.

