



Development of Renault-Nissan IP layer for CAN Communication Software

The combination of the “Interaction-Presentation Layer”, “Data Link Layer” and “Network Management” forms the basic software related to the CAN communication. The “Data Link Layer” and “Network Management” do not depend on the application software for which they provide “generic” CAN communication services.

The IP-Layer increases the portability of application software modules by defining common software communication interfaces and behavior for communication between networked vehicle nodes. And also responsible for processing Signal based frames of the application, Key Monitor Frames of Indirect NM and Transport Protocol Layer (TP).

The IP-Layer implements a communication protocol for a system of control units connected through a CAN network. Access to IP-Layer services is only possible via the specified Application Program Interface (API). This specification ensures that IP-Layer implementation can run on many hardware platforms. The implementation shall require only a minimum of hardware resources, therefore different levels of functionality are provided.

The IP-Layer software component shall also provide services to support Indirect Network Management.

Environment: C, MC9S12DG256, Star12 Metrowerks 5.0.24 compiler, Analyzer

Development of Exterior Lighting Head Lamp Control Module for Ford Mondeo Platform Model

EL CD345 HCM is to control Headlamp Leveling, Swiveling and static Bending Lights, depending on configuration. Its main purpose is to improve the night visibility compared to vehicles equipped with regular headlamp units.

HCM store static information like vehicle ECU identification, feature configurations, calibration parameters and diagnostic information in NVROM.

It controls reading of the hardwired analog and digital input signals including debouncing, filtering, referring (against battery voltage), and range determination.

It translates CAN and LIN messages into input signals for application including fault detection strategies (message timeout etc) where applicable.

Translate application and diagnostic output signals designed for modules connected to HCM over CAN or LIN bus into respective network messages.

Environment: FRED, C, NECV850, Renesas IAR compiler, NEC Emulator



Development of EuCD COM Software Communication Component

COM Component is an integral part of all the ECUs connected on the vehicle network. This COM specification increases the portability of application software modules by defining common software communication interfaces and behavior for communication between networked vehicle nodes.

The COM component is responsible for processing signal-based frames of the application, Network Management (NM) and Diagnostic Kernel (DK). The COM component is intended for the medium speed (MS), high speed (HS) CAN network and LIN networks with signal level Gateway. The COM component implements a communication protocol for a system of control units connected through a CAN network or LIN network. Access to COM services is only possible via the specified Application Program Interface (API).

COM implementation can run on many hardware platforms. The implementation shall require only a minimum of hardware resources, therefore different levels of functionality are provided. The COM software component shall also provide services to support direct Network Management.

Environment: OSEK, C, simulators and emulators IAR – DG128, SeaHau HC12, C Cross Compilers, Green Hills Compiler, IAR compiler, Metrowerks Code warrior, Cosmic Compiler, Multi ICM emulator, Seahau HC12, KD 3083, PD30MF Debugger, In-Circuit Emulators (Intel8031), Win IDEA 2005, C SPY.

Development of AUTOSAR COM Software Component

AUTOSAR COM Software Component is the interface between the Run Time Environment and the PDU router in the AUTOSAR Software architecture. AUTOSAR COM inherits all requirements of OSEK COM 3.0.3. With specified additions and deviations from OSEK COM 3.0.3

AUTOSAR COM Software Component addresses the following main features:

- Provision of signal oriented data interface for the RTE
- Communication transmission control (start/stop of I-PDU groups)
- Sending of signals according to transmission type as specified in the VFB specification.
- Guarantee of minimum distances between transmit signals
- Monitoring of receive signals (signals timeout)
- Filter mechanisms for incoming and outgoing signals
- Different notification mechanisms
- Provision of Init-Values and Update-Indications
- Packing and unpacking of AUTOSAR signals to I-PDUs to be transmitted
- Bus specific replication of send request on an AUTOSAR COM by the RTE toward the I-PDU Router, as well as realization of some bus specific timing.

Environment: OSEK, C, simulators & emulators, IAR – DP256, SeaHau HC12, IAR compiler 2.25.



Development of EuCD CAN Network Management Software

Network Management Software, which can be used for Electronic Control Units in vehicles. The Network management software provides comprehensive system functionality for network under consideration. Such functionality requires many management tasks, which are based on compatible behavior of all nodes and network wide negotiations.

The Network Management Software provides the following features:

- Start-up and shutdown of the communication on the network
- Handles communication failures (Transmission and Reception errors)
- Configuration checks using node monitor algorithm
- The status, absent or present, of each node is monitored

Thus, application can check with appropriate service if all stations required for operation are present on the network.

- The new node can be introduced or removed from the network without explicitly notifying other nodes on the network
- The data Exchange functionality allows transfer of application data via the NM infrastructure
- Algorithm for global operation mode like network wide sleep mode

Functionality to disconnect the node when power supply voltage is high enough again

Environment: OSEK, C, DG128, SeaHau HC12, Cosmic Compiler

Development of EuCD Software Download Component

The SWDL consists of Flash Bootloader (PBL) and Downloadable Bootloader (SBL). PBL will reside in the flash memory of an ECU and will get activated soon after system is powered on. PBL in-turn will interact with a PC-based flash tool to download SBL into RAM and the SBL consisting of program/erase drivers to enable downloading operations. Prior to its usage, SWDL component needs to be configured as per the ECU specific details.

The PBL will be in non-configured state with CAN parameters initialized to default values. The user has to configure the PBL to their requirement using "WriteDataByIdentifier" Service, Vehicle Manufacturer Specific (F101) for PBLConfiguration. To invoke the Write Data By Identifier" service, SBL has to be downloaded since this service is supported only in SBL.

Alternately the PBL configuration data and the other WriteOnce configuration parameters (except F18C ECUSerialNumber) could be flashed directly when the PBL is flashed. PBL software component includes port specific CAN driver and generic/reusable Network Layer, Diagnostics, Bootmain and Timer modules. SBL software component includes port specific CAN driver, Program/Erase modules and generic/reusable Network Layer, Diagnostics, Bootmain and Timer modules.

Environment: OSEK, C, simulators and emulators IAR – DG128, SeaHau HC12, C Cross Compilers, Green Hills Compiler, IAR compiler, Metrowerks Code warrior, Cosmic Compiler, Multi ICM emulator, Seahau HC12, KD 3083

Comms Testing on DCX and Ford platforms

Understanding the test scope for comms testing. Capturing test requirements, designing tests, writing scripts, review and analysing results.



Comms testing is categorised in following types :

1. Diagnostic Testing
2. Diagnostic Content Verification
3. Comms IO testing
4. Can Hardware DV testing

Environment: Merlin, Smart Interface Box, Bench Wizard, Matlab, CANoe, Ford Diagnostic Utility

Development of Phone and Power Moding Module of FORD GAP MY07 Radio

The Phone module of Ford GAP MY07 Radio infotainment system is responsible for operating a phone in the vehicle. This module provides provisions to use cellular phone or Discrete also known as after market Phone. Cellular phone uses vehicle bus (CAN is this case) and discrete phone uses a hardwire signal for operation. This module interacts with other modules of audio architecture like with Audio module for connecting/disconnecting audio bus and with Display module to display the dynamic phone information etc. The power moding module is responsible for operating radio in different power modes.

Environment: C, 200C Non preemptive RTOS, NEC V850 Processor, CodeWright IDE Tool, and Emulator

Adaptive Cruise Control for AUDI and Volkswagen

The adaptive cruise control is a new feature in the AUDI A10, scheduled to be released in Mid 2004. For this module, the entire software, right from handling the input from the Sensor to handling of diesel injections was done.

This involved developing the Specifications, and Prototype with constant interaction with customer from AUDI. It also involved -

- Development and testing of the Adaptive Cruise control module
- Handling of communication between ACC ECU and Engine ECU over CAN
- Vehicle testing at the customer site in Vienna
- Defect Reporting and Tracking using the Defect Tracking System.

Environment: UNIX, Windows NT 4.0, C development on UNIX platform, CANalyser, CAPL programming, Rational Clearcase, Framemaker, Simulation testing using INCA

2.4L DOHC Engine+AT W-car for GM (Instrument Panel Cluster)

The Instrument Panel Cluster (IPC), or Vehicle Dashboard, is one of the few devices with which the vehicle communicates to the driver. Devices such as a driver information center and heads-up display are considered subsystems or add-on devices to the IPC. The IPC module takes signals from various sensors and communicates with almost all the other modules in the vehicle to get relevant information and status about the vehicle. The IPC processes data and provides information in an appropriate form to the driver.



ACCA for GM (Adaptive Cruise Control with Alert facility)

ACCA is Adaptive Cruise Control with Alert facility. It accepts set speed and headway from driver and tries to maintain them. It utilizes a radar sensor mounted at the front of the vehicle to detect objects in the host vehicle's path as well as range, range rate etc of those objects and continuously tracks them. It predicts host vehicle's path and selects primary in-path targets. It utilizes Throttle control and Limited Braking to adjust the speed of the host vehicle based on target speed to maintain the set headway. It alerts driver when, to avoid collision, corrective action is needed. It provides cruise control in all weather conditions, host/target lane changes/cut-in/cut-out situations.

HVAC for GM (Heating, Ventilation, and Airconditioning Control)

HVAC is basically Heating, Ventilation & Air conditioning used in the automobiles. This system maintains desired temperature and humidity level as per the passenger requirements in the Automobile. Infineon C161 Microcontroller was used to implement the HVAC Application. RtoS used for this application was private to the program. This Testing group was very well appreciated by our counterpart.