IA2 - FlexRay 2.1

This course covers the FlexRay specification version 2.1

Objectives

- The course details the hardware implementation and describes the tests required to check the compliance of an equipment.
- The communication scheme which enables both Time and event-triggered communications is explained.
- The course focuses on error recovery mechanisms.
- Implementation examples are described through NXP and Philips existing devices.

A Lecroy analyser is used to capture and display FlexRay traffic.
• A lot of traces are included in the material.
A more detailed course description is available on request at formation@ac6-formation.com

Prerequisites

- Experience of a digital bus is mandatory.

Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

INTRODUCTION TO FLEXRAY

- History, X-by-Wire
- Possible topologies
- Deterministic data transmission
- Partitioning
- Security mechanisms

COMMUNICATION SCHEME

- Time and event-triggered communications
- Synchronized time-bases on macrotick basis
- Time division, slot duration and slot number configuration
- FTDMA dynamic part of a communication cycle
- Mini-slot allocation
- Frame format
- Message oriented addressing via identifiers

- Symbol transmission

NODE ARCHITECTURE

- Bus controller
- SPI interface
- CPU parallel interface
- Node wake-up, power saving mode
- Media Access Control

TRANSFER PROTOCOL

- Fault-tolerant and time-triggered services
- Repetitive vs spontaneous message scheduling
- Dedicated online diagnosis services
- Redundant transmission channels
- Robust coding and bit recognition scheme

PHYSICAL LAYER

- Error detection and signaling
- Fault confinement in the Time Domain, Bus Guardian
- Signal level and bit representation
- Transmission medium

LINK LAYER

- Fault confinement
- Error detection and signalling
- Message validation
- Message framing
- Scheduling and access control

TRANSPORT LAYER

- Status signalling
- Frame and data handling
- Frame filtering and masking

ERROR MANAGEMENT SERVICE

- Stopping communication
- Loss of synchronization
- Degradation concept
- Immediate passivation
- Error signalling

DEBUGGING A FLEXRAY APPLICATION

- Compliance checklists
- Physical layer testing
- Protocol conformance verification