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.

Evaluation modalities

- The prerequisites indicated above are assessed before the training by the technical supervision of the traineein his company, or by the trainee himself in the exceptional case of an individual trainee.
- Trainee progress is assessed by quizzes offered at the end of various sections to verify that the trainees have assimilated the points presented
- At the end of the training, each trainee receives a certificate attesting that they have successfully completed the course.
  - In the event of a problem, discovered during the course, due to a lack of prerequisites by the trainee a different or additional training is offered to them, generally to reinforce their prerequisites,in agreement with their company manager if applicable.

Plan

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

Renseignements pratiques

Duration : 2 days
Cost : 1300 € HT