N2 - IEEE1588 - Precise Time Protocol

This course describes the PTP protocol and provides implementation examples

Objectives

- The course explains the IEEE1588 standard and details some implementation solutions
- The BMC algorithm is described
- The course emphasizes the way to implement IEEE1588 on an Ethernet system and highlights the boundary between software and hardware
- The new features of P1588 (aka IEEE1588v2) are studied

A more detailed course description is available on request at training@ac6-training.com

Prerequisites

- Knowledge of Ethernet and switching is needed, see our course reference N1 - Ethernet and switchingcourse

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

- Objectives of the standard
- The need for synchronization
- Definitions

PTP Clock Synchronization Model

- The PTP messages
- PTP systems, acyclic graph structure
- Message filtering
- Clock properties, stratum, identifier
- Subdomain properties

PTP Protocol Specification

- Model of a subdomain of PTP clocks
- State behavior of clocks
- Protocol engine state machine

- Clock data sets, initialisation properties
- Messaging and internal event behavior of clocks
- Sync-event time-out mechanism
- Synchronization changes of the local clock
- Best Master Clock algorithm
- Clock variance computation
- Local clock synchronization
- Physical requirements for PTP implementations
- Management messages

Ethernet Implementation of PTP

- Ethernet frame type
- IP header and multicast addresses
- UDP header, assigned port numbers
- UDP payload, organization of PTP messages

NXP Implementation of PTP

- eTSEC Ethernet MAC
- Time-stamping
- Clock correction
- Trigger inputs
- Alarms

P1588 aka PTPv2

- Mapping to DeviceNet and Ethernet layer-2
- Prevention of error accumulation in cascaded topologies
- Rapid network reconfiguration
- Extensions to enable implementation of redundant systems
- Optional shorter frame