



## FM3 - eTPU programming

This course covers eTPU code generation and simulation

### Objectives

- The course explains the CPU-like TPU architecture.
- CPU-to-TPU interface is detailed.
- The course highlights all channel operation modes.
- The course focuses on various fields of the instructions enabling concurrency.
- The scheduler priority algorithm is detailed in order to estimate the worst case latency for channel service.
- Micro-coding and debugging an application composed of several states is explained through practical examples.
- This course has been delivered several times to companies developing automotive systems.

*A lot of programming examples have been developed by ACSYS to explain the eTPU operation.  
-They have been developed with Ashware tools.*

*A more detailed course description is available on request at [info@ac6-training.com](mailto:info@ac6-training.com)*

### Prerequisites

- Basic knowledge about microprocessor architecture, hardware timer and assembler instructions and directives.

### Plan

#### INTRODUCTION TO TPU

- Locating the TPU in different components proposed by Freescale
- Objectives of a such approach
- Quick presentation of standard functions

#### TPU ARCHITECTURE

- The various modules and interactions between them
- Micro-engine
- Ram
- Host interface
- Rom
- Channel
- Scheduler

**CHANNEL DESCRIPTION**

- Features
- Block diagram
- State at Reset
- Configuring a channel
- Transition event
- Match event
- Full default modes study
- Channel link

**RAM PARAMETER**

- Mapping
- The addressing modes
- Timing
- Coherency

**SCHEDULER ARCHITECTURE**

- Sources of service requests
- Requests hierarchy
- Preemptivity
- State selection

**TPU MICROCODE OVERVIEW**

- VLIW machine
- Instruction format

**MICRO-ENGINE PROGRAMMING MODEL**

- Registers list
- Execution unit hardware
- Code condition latch
- Channel selection
- Loop
- Arithmetic instructions
- Multiply and Mac instructions

**FLOW CONTROL INSTRUCTIONS**

- Pipeline
- Branch chart
- Conditional branches
- Flush pipe or not
- Repeat capabilities
- Call and return instructions

**THE ENTRY POINTS**

- Entry table chart
- Scheduler behavior, inner channel priority management
- Entry directive
- Entry points general format

## THE SCHEDULER OPERATION

- Sources of service request
- Service requests priority
- Selected state address generation
- Priority scheme

## CHANNEL SERVICE WORST CASE LATENCY

- Threads switch timing
- Taking into consideration other requests
- Access concurrency delay

## IMPLEMENTATION

- This part may be tailored to customers needs during on-site trainings.
- For instance developing a UART function with parity generation / checking can be used to understand all the previous topics.

## Renseignements pratiques

**Duration : 3 days**  
**Cost : 1650 € HT**

