

Embedded C Training: Programming Methods and Tools for Embedded Applications

This training focuses on the hardware-near C-programming of 8, 16 or 32 bit microcontroller architectures. You can identify and avoid the pitfalls and stumbling blocks related to C programming. You learn how to program a HW abstraction layer according to an architecture model. Operating system mechanisms and services are explained by programming a scheduler. You get an overview of the whole lifecycle of a product - from the idea to project planning, software development process, test planning, quality planning, acceptance, commissioning, operation and decommissioning.

Objectives

This training focuses on the hardware-near C-programming of 8, 16 or 32 bit microcontroller architectures.

You learn how to program a HW abstraction layer according to an architecture model. Operating system mechanisms and services are explained by programming a scheduler.

You get an overview of the whole lifecycle of a product - from the idea to project planning, software development process, test planning, quality planning, acceptance, commissioning, operation and decommissioning.

You are able to efficiently develop programs for an embedded system in "C" according to the guidelines of modern software engineering.

You are familiar with using pointers, function pointers and structures.

Based on your knowledge of programming/coding guidelines and software quality features, functional and non-functional requirements as well as internal quality and generate software that is reusable, extendable and easily tested.

In addition, you know all stages of a software development process, from the idea to system acceptance.

Participants

Software developers, software architects

Requirements

A good understanding of ANSI-C and microcontroller architectures.

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Content

Essentials of Hardware-near C Programming

- Data types
- Pointers, function pointers
- Structures, linked lists
- Circular buffer, queues, FIFO, LIFO
- Programming rules and guidelines
- Pitfalls and stumbling blocks in C

Software Architecture

- Selection of a layered model based on requirements
- Communication between layers
- Synchronous and asynchronous interfaces

Driver Programming

- HW abstraction, driver programming: access to HW registers in "C"
- Interfaces, callback interfaces, queues
- Interrupt handling / service routines, callback function

Using Pointers, Function Pointers and Linked Lists

- Example: scheduler programming
- Task management as linked list

Programming a Finite State Machine FSM

- Philosophy and implementation of an FSM in C

Locating Code and Data in (μ C) Memory (Flash, RAM Address Space)

- Sectioning (.text, .data, .bss)
- Linker description file

Library Management

- Adapting standard library functions to HW
- User library creation and management

Overview: Real-time Operating Systems (RTOS)

- Types, services, selection criteria

Outlook: OOP Techniques

- Advantages and issues of object oriented programming
- Most important UML diagrams

Introduction: Structured Methods for Project Planning

- Preliminary study, project start, project plan, project implementation

Software Development Process Models

- V-model, spiral model, RUP, COPES
- Interactive-incremental
- Agile software development, XP

Quality of Embedded Systems

- How to design and develop quality
- Overview: Standards (MISRA, IEC61508)

Overview: Software Test Process for Developers

- Test phases and test methods
- Static test, dynamic test
- Review, whitebox test, blackbox test

MicroConsult Plus: Extensive Exercises on a Target Hardware

- Programs are developed with Keil μ Vision and Arm RealView tools or with IAR Workbench and tested on Arm-7 or Cortex[®]-M3 based HW.
- For onsite trainings, the tools and hardware platforms to be used will be coordinated individually with the customer.

Trainings

Date	Price *	Duration
28.10.2019 – 31.10.2019	1.960,00 €	4 days
13.01.2020 – 16.01.2020	1.960,00 €	4 days

* Price per attendee, in Euro plus applicable VAT.

Training code: E-EMB-C

Coaching

Unsere Coaching-Angebote bieten den großen Vorteil, dass unsere Experten ihr Wissen und ihre Erfahrungen direkt in Ihren Lösungsprozess einbringen und damit unmittelbar zu Ihrem Projekterfolg beitragen.

Für Ihre Anfrage oder weiterführende Informationen stehen wir Ihnen gern zur Verfügung.