



STR1 - STR71xF implementation

This course covers STR7 ARM-based MCU family

Objectives

- The course details the hardware implementation of the STR71x microcontrollers.
- The boot sequence and the clocking are explained.
- The course focuses on the low level programming of the ARM7TDMI core.
- The course provides examples of internal peripheral software drivers and explains how to interact with the software package provided by ST.

- Note that ACSYS does not sell emulation probes and IDEs. Consequently this course has not been designed to convince attendees to buy a particular IDE. The unique objective consists in providing sufficient knowledge to attendees so that they can successfully design a system based on STR7.

- This course has been delivered several times to companies developing embedded systems, such as voltage counters.

A lot of programming examples have been developed by ACSYS to explain the boot sequence, the vector table and the operation of embedded peripherals.

- They have been developed with 2 different IDEs : Keil and IAR.
- Consequently for on site course, it is up to the customer to select the IDE under which labs will be run.

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

Prerequisites

- This course provides an overview of the ARM7TDMI core. Our course reference course [R1 - ARM7/9 implementation](#) details the operation of this core.
- The following courses could be of interest:
 - USB Full Speed High Speed and USB On-The-Go, reference course [IP2 - USB 2.0](#)
 - CAN bus, reference course [IA1 - CAN bus](#)

Environnement du cours

- Cours théorique
 - Support de cours au format PDF (en anglais) et une version imprimée lors des sessions en présentiel
 - Cours dispensé via le système de visioconférence Teams (si à distance)
 - Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique
- Au début de chaque demi-journée une période est réservée à une interaction avec les stagiaires pour s'assurer que le cours répond à leurs attentes et l'adapter si nécessaire

Audience visée

- Tout ingénieur ou technicien en systèmes embarqués possédant les prérequis ci-dessus.

Plan du cours

INTRODUCTION TO STR71XF

Overview

- ARM core based architecture
- APB internal busses
- The main three blocks : platform, core and input / output peripherals

THE PROCESSOR CORE

ARM7TDMI CORE

- Presentation of the core, architecture and programming model
- Operating modes : user, system, super, IRQ, FIQ, undef and abort
- Pipeline
- ALU data path
- ARM vs Thumb instruction sets, interworking
- Access to memory-mapped locations, addressing modes
- Stack management
- Branch instructions, implementation of C call and return statements
- Benefits of condition set capability in ARM state
- C-to-Assembly interface
- Exception mechanism, handler table
- Debug facilities

PLATFORM

INFRASTRUCTURE

- APB Bridges, individual peripheral reset control, individual peripheral clock control
- Memory organization, linear 4 GB mapping
- Internal 64 kB SRAM, dynamic remapping capability
- Flash memory, bank and sector mapping, burst mode
- Program and erase sequences
- Interrupt controller
- ISR header and footer routines
- External interrupts Unit
- System timers : Real Time Clock, Watchdog timer

HARDWARE IMPLEMENTATION

- Power supplies, external 3.3V, internal generation of 1.8V, related pins
- Low voltage detectors
- Clocking
- Reset causes
- Start-up sequence, fetch of the first instruction
- Boot configuration register
- Low power modes
- External Memory Interface
- Description of the programming interface related to the 4 external chip-selects

INTEGRATED I/Os

NON COMMUNICATION ORIENTED INPUT / OUTPUT PERIPHERALS

- Timers
 - 16-bit timers, block diagram, clock selection and prescalers
 - Output compare and input capture capabilities, force compare modes
 - Output PWM mode, on-the-fly modification of the duty cycle
 - Input PWM mode, pulse measurement
- Analog-to-Digital Converter
 - High impedance-analog input configuration
 - ADC features : 12-bit resolution, 0 to 2.5 V range
 - Round-robin or single channel mode
 - Clock timing
 - The Sinc decimation filter
 - Gain and offset errors

COMMUNICATION CONTROLLERS

- I2C interface
 - I2C protocol basics
 - Slave mode vs master mode
 - Transmit and receive sequences
- Buffered SPI
 - SPI protocol basics
 - Queue mode operation
 - Transfer sequence
- UART
 - Queue operation mode
 - Time-out mechanism
 - SmartCard asynchronous protocol
- CAN controller
 - CAN protocol basics
 - CAN controller organization
 - Message objects
 - Filtering received messages
 - FIFO mode management
 - Configuring the bit timing
- USB slave interface
 - USB protocol basics
 - Buffer description block, buffer descriptor table
 - Double buffer usage to support isochronous and high throughput bulk transfers
 - Endpoint initialization
- HDLC controller
 - HDLC protocol basics
 - Address decode
 - DPLL use for clock recovery
 - Abort sequence generation
 - Transmit and receive sequences