



## RC0 - VFP programming

**This course explains how to use VFP instructions to boost multimedia algorithms**

### Objectives

- This course has been designed for programmers wanting to develop algorithm based on hardware floating point calculations.
- Each instruction family is detailed, first at assembly level, and then at C level using macros.
- Several tricky usage of vector instructions are provided.
- The underlying cache operation as well as preload mechanisms (instruction and hardware prefetch) are detailed to explain how a processing can be pipelined .
- The course shows how DSP typical algorithms such as FIR and FFT can be vectorized and then optimized to be executed on VFP unit.
- THIS COURSE IS PROPOSED EITHER AS AN INSTRUCTOR-LED COURSE OR AS E-LEARNING.
- ACSYS has developed an optimized VFP based FFT coded in assembler language
  - performance for 1024 complex floating point single precision samples is 220\_000 core clock cycles (ARM11)
  - for any information contact [guillaume.peron@ac6.fr](mailto:guillaume.peron@ac6.fr)

*Labs are run under RVDS*

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

### Prerequisites

- Knowledge of 4T / V5TE instruction set.

### Plan

#### IEEE754 STANDARD

- Floating point number coding
- Denormalized numbers
- NaN utilization
- Rounding modess
- VFP FPEXC register

**INTRODUCTION TO VFPv3**

- Register bank, D registers, S registers
- Instruction coding, either ARM or Thumb-2
- Related system registers
- Alignment issues
- Context switching

**VECTOR vs SCALAR OPERATION**

- Length / Stride combinations
- Scalar operations
- Vector operations
- Mixed operations

**VFP LOAD / STORE INSTRUCTIONS**

- Addressing modes
- Floating point load / store
- Floating point load / store multiple
- Processor acceleration mechanisms: store merging buffers

**ARITHMETICAL INSTRUCTIONS**

- Add / subtract / absolute value instructions
- Multiply and multiply accumulate instructions
- Divide instruction
- Square root instruction
- Compare instructions
- Integer to FP and FP to convert instructions

**VFP CODING EXAMPLES**

- FIR filter
  - Converting the scalar algorithm into a vector algorithm
  - Finding the VFP instructions to encode the vector algorithm
  - Optimizing the code
- FFT (DFT)
  - Converting the scalar algorithm into a vector algorithm, understanding how circle properties can be used to process 4 angles concurrently
  - Finding the VFP instructions to encode the vector algorithm
  - Optimizing the code

**Renseignements pratiques**

**Durée : 1 jours**  
**Prix : 700 € HT**



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