

# Failsafe ECU through dynamic partial-reconfiguration in FPGAs

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# **1 Introduction**

Brief overview, problem statement and final outcome.

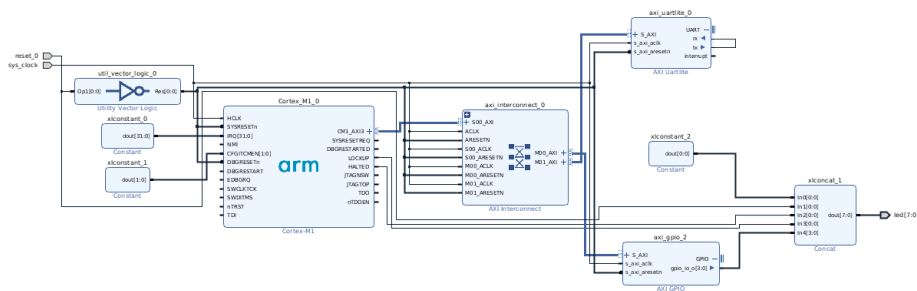


Figure 1: Block Diagram of the partial reconfiguration functionality

## 2 Cortex M1 / M3

Description of the setup of Cortex M1 and Cortex M3 Cores. [1] [2]

## 2.1 Usage of the Keil Toolchain

Link to tutorial enough? Maybe most basic steps (e.g. adaption of arty project for our needs). [3]

## 2.2 Usage of Cortex M1 in Vivado

Also trivial, follow tutorial that is provided on ARM Website and adapt to own needs.

### 2.2.1 Code via Memory Initialization File

File is bound to synthesis process, how to change it...

## 2.3 How to mbed OS

How was the Cortex M1 Project adapted to support the Mbed OS? What is gained through the usage of mbed OS?

## 2.4 Implemented Functionality on the Cortex M1

How are the UART and IIC peripherals supported in the source code, which libraries are used, interrupt based or not, performance?

Show highlights of the code?

## 3 Bus and Peripherals

### 3.1 Used Peripherals

What Peripherals were used (Cortex M1/M3 Boards, which ones).

How to program / use them (only brief).

How are they connected to the Bus?

IIC and UART here or in next section.

### 3.2 Bus

How is it set up?

Made assumptions?

Document used / invented protocol.

## 4 Partial Reconfiguration

What is partially reconfigured - Cortex, uart, IIC.

Why not use AXI?

### 4.1 Integration Overview

[4], [5] Usage of ICAP.

How is the Zynq still used - Loading images and binary blobs from sd card into DDR.

### 4.2 Packaged IP

Why is the PR IP Packaged, how was it done? [?]

## References

- [1] ARM, “Arm® Cortex®-M1 DesignStart™ FPGA-Xilinx edition User Guide,” 2018. [Online]. Available: [https://static.docs.arm.com/100211/0001/arm\\_cortex\\_m1\\_designstart\\_](https://static.docs.arm.com/100211/0001/arm_cortex_m1_designstart_)

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- [2] —, “Cortex-M1 Technical Reference Manual.” [Online]. Available: [https://static.docs.arm.com/ddi0413/d/DDI0413D\\_cortexm1\\_r1p0\\_trm.pdf](https://static.docs.arm.com/ddi0413/d/DDI0413D_cortexm1_r1p0_trm.pdf)
- [3] “Getting Started.” [Online]. Available: <http://www2.keil.com/mdk5/install>
- [4] Xilinx, “Vivado Design Suite User Guide: Partial Reconfiguration (UG909),” 2018. [Online]. Available: [https://www.xilinx.com/support/documentation/sw\\_manuals/xilinx2018\\_3/ug909-vivado-partial-reconfiguration.pdf](https://www.xilinx.com/support/documentation/sw_manuals/xilinx2018_3/ug909-vivado-partial-reconfiguration.pdf)
- [5] —, “Vivado Design Suite Tutorial: Partial Reconfiguration (UG947),” 2018. [Online]. Available: [https://www.xilinx.com/content/dam/xilinx/support/documentation/sw\\_manuals/xilinx2018\\_3/ug947-vivado-partial-reconfiguration-tutorial.pdf](https://www.xilinx.com/content/dam/xilinx/support/documentation/sw_manuals/xilinx2018_3/ug947-vivado-partial-reconfiguration-tutorial.pdf)