Motor driving in microTCA

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MicroTCA TECHNOLOGY LAB

DESY.

AGENDA

1. Overview
2. FMC motor driver DFMC-MD22 / MOTDRV22
3. Integration of external motor drivers
4. Live demo

Overview

Applications and operational aspects

Applications:

- Positioning of optics,
- cavity tuning, …

Aspects:

- Stepper or servomotors
- Single-, multi-axis systems
- Need for compact control unit
- External motor driver HW

FMC motor driver

Overview

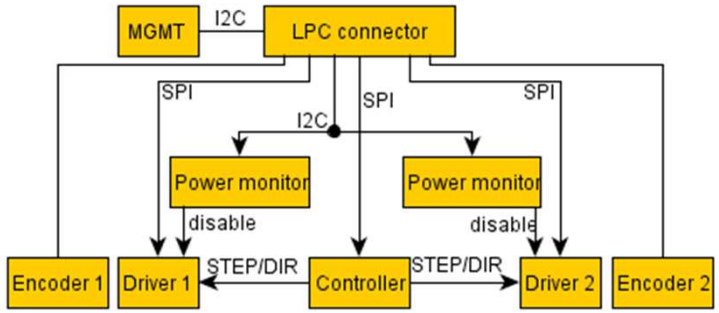
- 2-channel bipolar stepper motor driver
- 12 V, 24 V (with external supply)
- Up to 1.8 A motor load
- End switch support
- Position encoder support
- Power monitor

Functional block diagram & control

Main components:

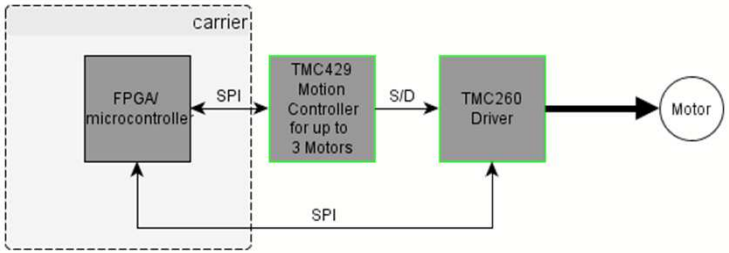
- Motion controller (Trinamic TMC429)
- Motor driver (Trinamic TMC260)
- Power monitor (LT LTC2945)

controlled from carrier through SPI/I2C.



Controlling Firmware/Software:

- On FMC carrier FPGA or
- On CPU (Interface to PCIe on FPGA)
  - MotorDriverCard library (C++, Python)



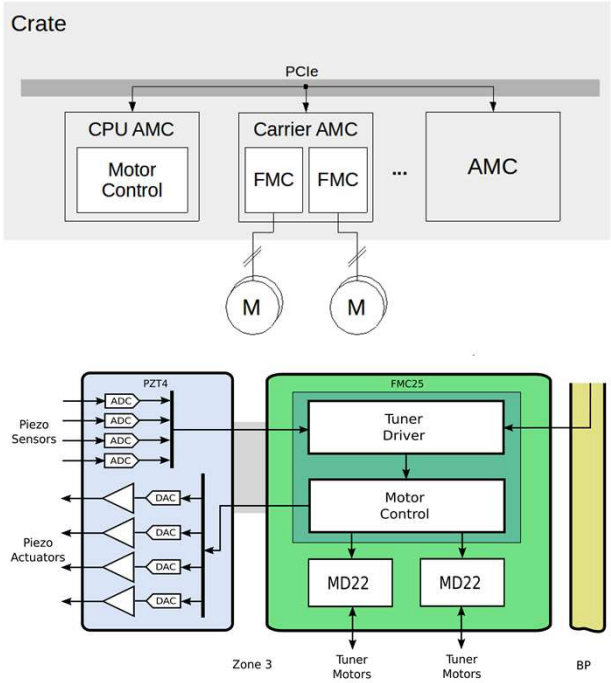
FMC motor driver

Integration into MicroTCA system

- Drive up to 4 motors per AMC slot
- Easy integration of control SW on CPU

Example: Frequency tuning of cavities

- Combination with RTM piezo driver allows fine and coarse tuning from a single slot

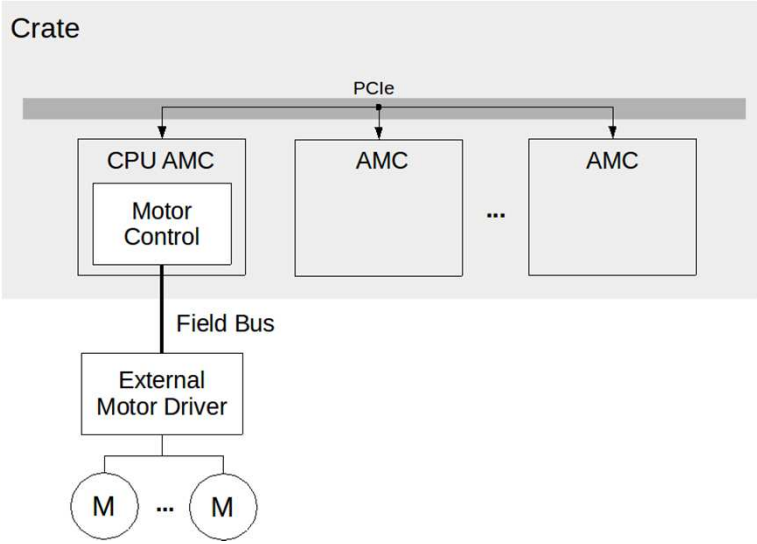


Integration of external motor drivers

Overview

Use of external motor drivers:

- Existing HW, higher power, ...
- Often networked by field bus
- Modbus TCP, OPC UA, EtherCAT, …
- Often low real-time requirements



Easy to integrate by software

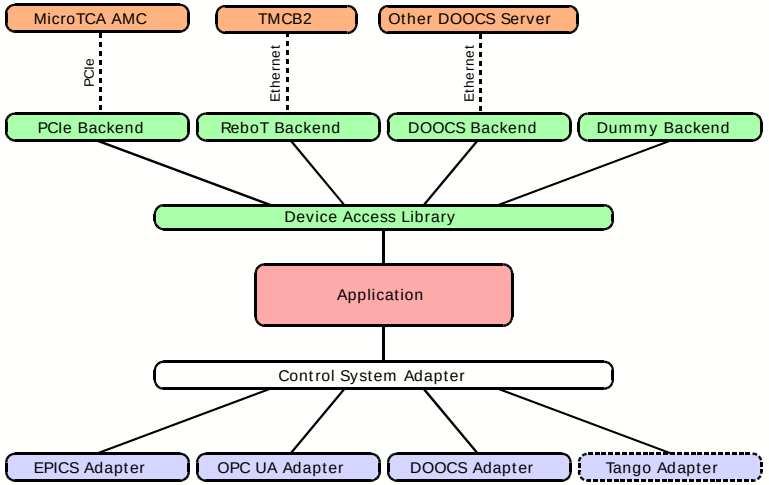
- Save AMC slots for other tasks,
  e.g. high-rate data aquisition
- Should combine well with access to PCIe

Integration of external motor drivers

Excursion to the ChimeraTK SW Framework

Library for device and control system access

- Abstraction of device registers and process variables
- Easily extensible by backends/adapters



Integration of field devices:

- OPC UA backend under development
- Modbus TCP backend possible
- Not exclusive to motor drivers

Live demo

Driving a Linear Stage

Components:

- OWIS 40 mm linear stage
- DFMC-MD22 motor driver on FMC25 carrier
- ChimeraTK-based server with DOOCS jddd user interface