Introduction

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- FPGA Developer at MicroTCA Tech Lab at DESY
  → presentation later today
This talk is about...

- Development of new AMC and RTM boards
- Assuming MTCA infrastructure (crate, power supply and MCH) is COTS
- Some overlap with presentations from earlier today
- Development of high-end digital and analog boards is another topic
Components

RTM
Rear Transition Module

AMC
Advanced Mezzanine Card

MMC - Module Management Controller
For more information (including AMC.0 R2.0 Short Form Specification):
https://www.picmg.org/openstandards/advanced-mezzanine-card/

Interconnect ("Backplane connector") on AMC contains:

► System Management Interface (3.3V, I2C, Geographic Address, Presence)
► Power/Ground (12V, max 6.6A)
► AMC Clock Interface
► JTAG Test Interface
► Fabric Interface
Fabric Interface - AMC.0 specifies protocol-agnostic interconnect with other standards defining the protocols (AMC.1, AMC.2, ...)

Typical port assignments (for MTCA.4):

- Port 0, port 1 - Gigabit Ethernet (1000BASE-X) → AMC.2 Type E2
- Port 4-7 - PCIe x4 → AMC.1 Type 4
- or Port 4-7 and 8-11 - PCIe x8 → AMC.1 Type 8
- Port 12-15 - Point-2-Point Links (connected to MGTs in FPGA)
- Port 17-20 - M-LVDS lines (trigger and interlocks)

PCIe gen 3 (8 MT/s) requires attention to Signal Integrity
Specified in MTCA.4 specification; at least one EEPROM and I2C GPIO extender* are required on management side.

RTM board connects over Zone 3 connector. Several years ago BoF group came up with:

- Zone 3 Connector Pin Assignment Recommendation for Digital Applications for AMC/RTM Boards in the MTCA.4 standard
- Zone 3 Connector Pin Assignment Recommendation for Analog Applications for AMC/RTM Boards in the MTCA.4 standard

Documents are available at: https://techlab.desy.de/support/zone_3_recommendation

*I2C GPIO extender is not specified by standard, it is implementation specific solution
MicroTCA it is a managed system → separated management plane

Figure 3-2 Management interconnects between Carrier and Module

From AMC.0 R2.0 Short Form Specification
MMC - Module Management Controller

Tasks of the MMC:

- Communicate on IPMI over I2C (IPMB)
- Provide FRU and SDR
- Control on-board power supplies
- Monitor on-board sensors (temperature, voltage, ...)
- Generate events (hot-swap, over-temperature, ...)
- Enables/disables FPGA drivers to RTM
- Remote FPGA firmware upgrade - HPM.1
- (USB on front-panel)

IPMI specs:

IPMI commands are extended with PICMG-specific commands
MicroTCA Tech Lab offers MMC Framework and MMC Starter Kit (AMC and RTM).

Links:
https://techlab.desy.de/products/mmc/mmc_v100
https://techlab.desy.de/products/mmc/starter_kit

26k LOC, 11k LOComments
Taking advantage of modular electronics

When you want to solve an issue with MicroTCA:

1. Maybe an AMC or RTM for your application already exist
2. Maybe only the FPGA firmware needs to be changed
3. Maybe there is a suitable AMC and only an RTM needs to be developed
4. Maybe an FMC carrier with FMC mezzanine can be used
5. Develop new AMC → consider using existing MMC
Thank you for your attention!