



# AMC/RTM/MMC development aspects.

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IEEE RT2018, MTCA pre-workshop

- ▶ Jan Marjanovic (@janmarjanovic)
- ▶ **FPGA Developer at MicroTCA Tech Lab** at DESY  
→ presentation later today

- ▶ 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



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

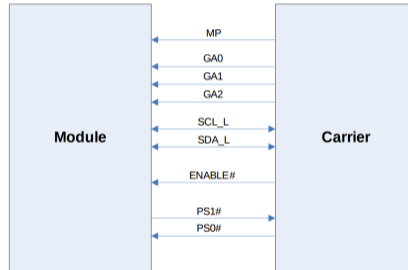
Documents are available at:

[https://techlab.desy.de/support/zone\\_3\\_recommendation](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



## Tasks of the MMC:

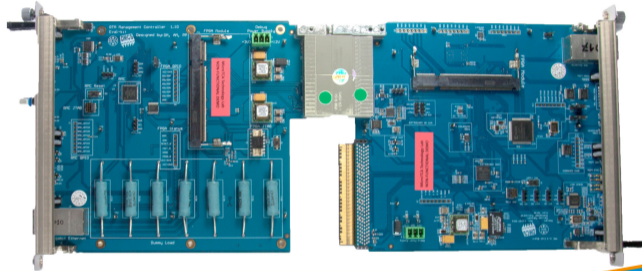
- ▶ Communicate on IPMI over I2C (IPMB)
- ▶ Provide FRU and SDR
- ▶ Control on-board power supplies
- ▶ Monitor on-board sensors (temperature, voltage, ...)
- ▶ Generate events (hot-swap, over-temperature, ...)
- ▶ Enables/disables FPGA drivers to RTM
- ▶ Remote FPGA firmware upgrade - HPM.1
- ▶ (USB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

## IPMI specs:

<https://www.intel.com/content/www/us/en/servers/ipmi/ipmi-home.html>

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/mmc_v100)

[https://techlab.desy.de/products/mmc/starter\\_kit](https://techlab.desy.de/products/mmc/starter_kit)

26k LOC, 11k LOComments

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!