MicroTCA Technology Lab.
Jan Marjanovic for MicroTCA Tech Lab team
2020-10-14

22nd IEEE Real Time Conference
Vendor Product Presentation
TRANSFER MTCA TO RESEARCH AND INDUSTRY

- Development: Hardware, FPGA, Software
- High-end test & measurement services
- System configuration & integration
  - LLRF turn-key-solution
  - Real-time image processing - (10) GigE Vision

MicroTCA Basic and Advanced training courses (focus on experimental physics):
https://techlab.desy.de/services/training/
Module Management Controller implementation
- High-performance FMC+ carrier (Zynq US+ MPSoC)
- Cost-optimized FMC carrier (Zynq 7000)
One of most important features of MicroTCA is out-of-band management interface.

MicroTCA Carrier Management Controller (MCMC) (part of MicroTCA Carrier Hub - MCH) connects to Module Management Controller (MMC) on Advanced Mezzanine Card (AMC) over IPMB-L

for more information: http://www.rehlich.com/MicroTCA_IPMI_management
 MMC Stamp

- Module Management Controller on a single board (SoM), ready-to-use, based on ARM Cortex-M4
- Full IPMI handling (LEDs, Power, PMBUS)
- FMC, RTM and FPGA control
- Tested with N.A.T. and Vadatech MCHs
- In future: Automated IPMI test suite
- HPM firmware update: MMC, FPGA flashes
- USB virtual COM port for MMC and FPGAs
- Solder-on component, firmware preprogrammed
- SDK available
- Firmware deployed to hundreds of boards at DESY and worldwide

https://techlab.desy.de/products/module_management_controller/mmc_stamp/

DMCS (University of Technology Lodz) also contributed to the development
Advanced Mezzanine Card (AMC.0), compatible with MicroTCA.4

Xilinx Zynq UltraScale+ MPSoC
XCZU11EG: 653k logic cells, 2928 DSP

52 transceivers (32 GTH, 16 GTY, 4 GTR)

Quad-core ARM® Cortex-A53 and
dual-core ARM® Cortex-R5

4GB DDR4 (PS) + 1GB DDR4 (PL)

White Rabbit support

PCIe Gen3 x4, x8 in supported systems, can be used as a PCIe root complex

DisplayPort and USB to front panel

Variant with XCZU19EG

https://techlab.desy.de/products/amc/damc_fmc2zup/
Includes FPGA part (Vivado project) and Yocto Linux.
Contact us for more information/access: mtca-techlab@desy.de
Most MicroTCA crates support PCIe x4, some also support x8

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<th>CPU</th>
<th>Mem</th>
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FMC and FMC+ (400 Gbps)

- **FMC+ slot**
  - full LA and HA banks
  - DP[0:15] to GTY
  - DP[16:23] to GTH
- **FMC slot**
  - full LA and HA banks
  - DP[0:7] to GTH

Test with an FMC+ loopback card

25 Gbps

Bit Error Rate lower than 1E-14
White Rabbit

one GTH connected to the Front Panel (special cable needed)
or connection over FMC-4SFP+
With **flexible clocking architecture**, both on the card itself and in crate, we can distribute clock and triggers to other cards.

**jitter = 16.8 ps, meas time = 1.5 h**
Applications

**ADS54J60EVM**
- 1 GSPS, 16-bit ADC
- 2 channels
- JESD204B (at 10 Gbps)
- subclass 1 for sync

**DFMC-DSx00**
- 500/800 MSPS, 12-bit ADC
- 2 channels
- LVDS interface
- very low latency

Latency comparison of ADCs with different interfaces,
https://indico.desy.de/indico/event/25669/session/2/contribution/52
Advanced Mezzanine Card, compatible with MicroTCA.4

Xilinx Zynq-7000 SoC (XC7Z030, XC7Z035 and XC7Z045)

48 bidirectional IOs: 3.3V and true 5V

FMC slot (full LA bank, 2/4 MGTs)

PCIe x2 Gen2 (x4 optional)

Dual core ARM processor

HDMI and USB to front panel

Zone 3 Class D1.1

https://techlab.desy.de/products/amc/damc_fmc1z7io/
In development, contact us for early access: mtca-techlab@desy.de
Applications

**DRTM-AD84** - Rear Transition Module
- 8 channel 10 MSPS, 16 bit ADC
- 4 channel 1 MSPS, 16 bit DAC

**DRTM-PZT4** - Rear Transition Module
- 4 channel piezo driver

**LISA phasemeter EGSE**
- LISA = Laser Interferometer Space Antenna
- ground support for phasemeter (40 ch readout)
- Collaboration with University of Hamburg

Based on MicroTCA.4.1
RF backplane is used to distribute pilot tone and ADC clocks
Thank you

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Come visit our booth (live demos):
https://us02web.zoom.us/j/99778824656
 pwd=cVVuUU5mdmorS3FzbHIvWUdON1Zpdz09