

µRTM Design for MTCA.4 FPGA Modules



• • Company Background

TEWS TECHNOLOGIES is a leading solutions provider of embedded I/O and CPU products



based on open architecture standards

(i.e. IndustryPack, PMC, XMC, CompactPCI, standard PCI, PCIe, VME, AMC, and FMC).

Our modular hardware designs are coupled with extensive software drivers and support for major real-time and server operating systems (i.e. VxWorks, Windows, Linux, Integrity, QNX)



















- 2 Power supplies (MP+PWR) -> Do not mix them
 - Use MP only for management
 - Use PWR only for your payload
- Implementation of µRTM management is not defined in MTCA.4
 - AMC Vendor specific implementation



• • • FPGA I/O

- All FPGA I/Os are equal ?
 - Not for high speed designs
- FPGA has differential types of I/O pins:
 - Normal I/O pins
 - Regional Clock pins
 - Global Clock pins
 - Multi-Gigabit Transceiver



• • • I/O Pins

- Are grouped in I/O Banks. Each bank has a common I/O voltage for its pins.
- Can be configured for different I/O standards that are supported by the bank I/O voltage
- Support single-ended and differential I/O standards
- Are related to a FPGA internal clock region



• • • Regional Clock Pins

- Drive special clock nets that connect to the I/O logic of the FPGA
- Restricted to a FPGA clock region
 - Lowest skew
- Ideal for source synchronous data capture







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• • • Global Clock Pins

- Drive global clock nets that can connect to all FPGA logic resources
- Optimized for low skew
- Ideal for system clocks
- Not suitable for source synchronous data capture



• • • Multi-Gigabit Transceiver (MGT)

- <u>No</u> normal I/Os
- Dedicated reference clock input
- AC-coupling
 - No DC-signaling possible





• • • Example: High Speed ADC





• • • Signal Path

µRTM Signal path:

- IC Package
- µRTM PCB
- Zone 3 Connector

AMC Signal path:

- Zone 3 connector
- AMC PCB
- FPGA Package on AMC





• • • Signal Integrity

- The impedance of the µRTM and AMC routing should be well matched
- Implement the Transmitter/Receiver termination recommended by IC vendor
- Different Signal Speeds for
 - IC Package
 - PCB
 - Connector
- Signal integrity simulation is necessary for high Speed interfaces (IBIS)



• • • Consequences for µRTM Designers

- µRTM Designer needs knowledge about the FPGA and the AMC
- The FPGA programmer has to be involved Lively Communication between µRTM-Designer and FPGA Programmer is needed
- Talk with your AMC vendor about signal flight times and impedances on the AMC

Photo: SLAC



• • • Last but not Least

- A good AMC vendor will do a cross-check of your µRTM Zone 3 Interface Schematic
- If you do not want to develop the µRTM by your own, ask TEWS TECHNOLOGIES for a customer specific µRTM



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