Connectivity in MTCA Crates

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Outline

- Backplane – basic information
- Connectivity
- MTCA.4 crates available on the market
- How to select right backplane for your application
Backplane: Definitions

- COMMON OPTIONS REGION
- FAT PIPES REGION
- EXTENDED OPTIONS REGION
- CLKs, TRGs, INTERLOCKs
Port Definition (1)

- **P0-P1**: Ethernet
  - 10/100/1000BASE-T signals
- **P2-P3**: SATA
  - Serial communication
  - Gigabit links (p-p)
- **P4-P7**: PCI Express (x1, x2, x4)
  - Gen.1: up to 250MB/s per lane (PCIe x4 - 1GB/S)
  - Gen.2: up to 500MB/s per lane (PCIe x4 - 2GB/s)
  - Gen.3: up to 1GB/s per lane (PCIe x4 - 4GB/s)
- **P8-P11**: Redundant PCI Express (p-p)
Port Definition (2)

- P8(12)-P15 : Custom
  - Gigabit links (p-p)
  - from Mb/s up to 10 Gbps
- P16 : CLK
- P17-P20 : Clocks, Triggers, Interlocks
  - M-LVDS

* all point-to-point connections works over 10 Gbps
Backplane, 12-slot, 2-MCH
Backplane, 12-slot, 2-MCH

Custom
Backplane, 12-slot, 2-MCH

from MTCA.4 specification
Backplane, 12-slot, 1-MCH
Backplane, 12-slot, 1-MCH
Backplane, 12-slot, 1-MCH

Dual star, AMC5-12 to AMC3
AMC5-12 to AMC4

Custom
Backplane, 12-slot, 1.5-MCH
Data transport: PCIe

DAQ System

PC

PCIe x 4, Gen.3 → 4 GB/s
PCIe x 8, Gen.3 → 8 GB/s
PCIe x 16, Gen.3 → 16 GB/s

MCH
PCIe Switch

PCle x 4, Gen.2
2 GB/s

AMC

AMC

AMC

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Data transport: PCIe and LLL

Control System
Low Level RF@XFEL

Low Latency Link (LLL) 2 differential pairs, TX/RX, up to 10 Gbps

PCle x 4, Gen.3, 4 GB/s
ELMA, 6-slot

Source: www.elma.de
ELMA, 12-slot

Source: www.elma.de
Schroff, 7 and 12-slot

Source: www.schroff.de
Criteria for Backplane Selection

- Number of slots (1..12)
- Redundancy model
- Connectivity
Redundancy

- 99.999% availability BUT only for fully redundant system: (12) 6-slot+6-slot+2-MCH+2(4)PS

- Power Modules
  - Power Supplies - 1,2,4

- Management MCH
  - 1 (1.5)
  - 2
Connectivity

- P0-P1 : Ethernet
- P4-P7 : PCI Express
- P8-11 : PCI Express (redundant)
- P8-P15 :
  - Point-to-point, TX/RX
  - Star configuration (low latency)
  - Dual star configuration (low latency)
  - Daisy chain (higher latency, flexible)
Final remarks and summary

- Ports P8-15 allow to implement low latency connections between slots
- Several crates, different size and different backplanes available
- High throughput
- Backplane suitable for control and DAQ systems
- JTAG pins available, but no standard for interconnection
Thank you for your attention