



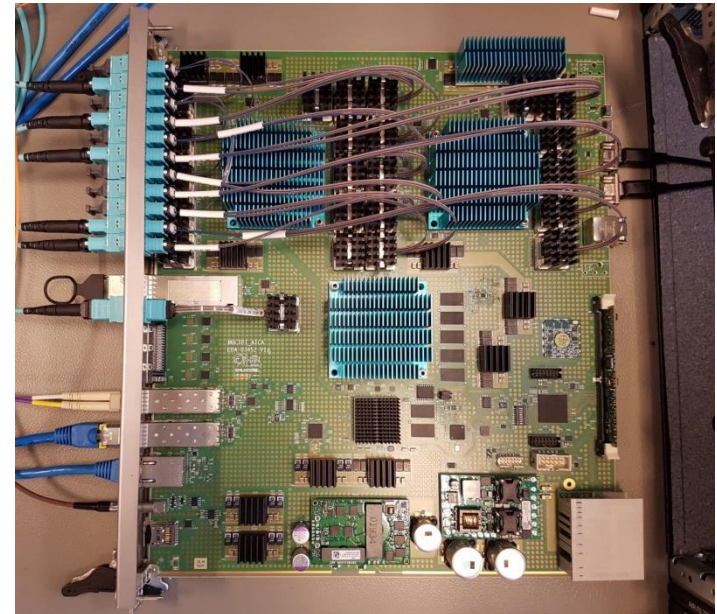
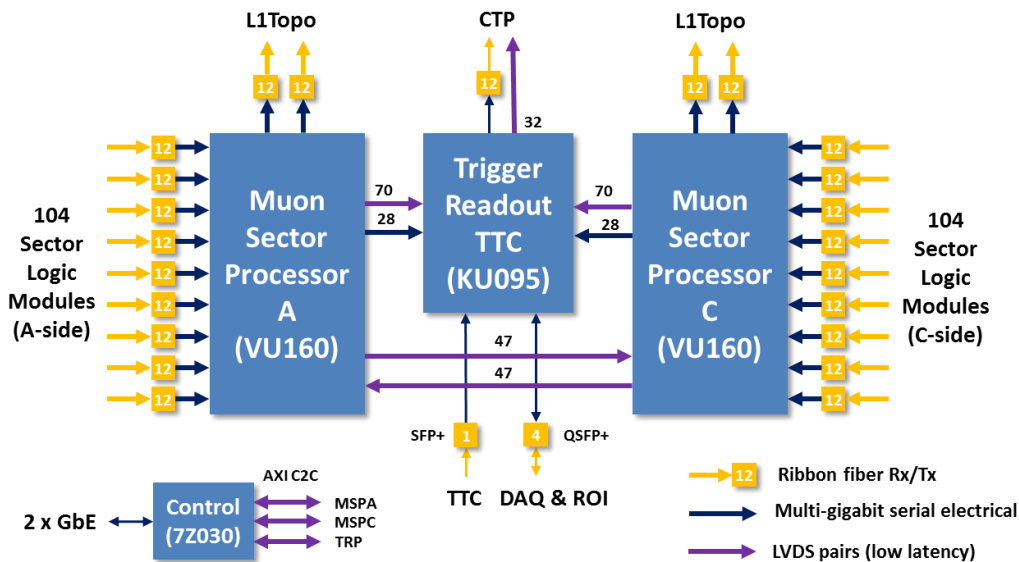
CERN IPMC MUCTPI User Report

CERN, 10. October 2018

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MUCTPI Hardware

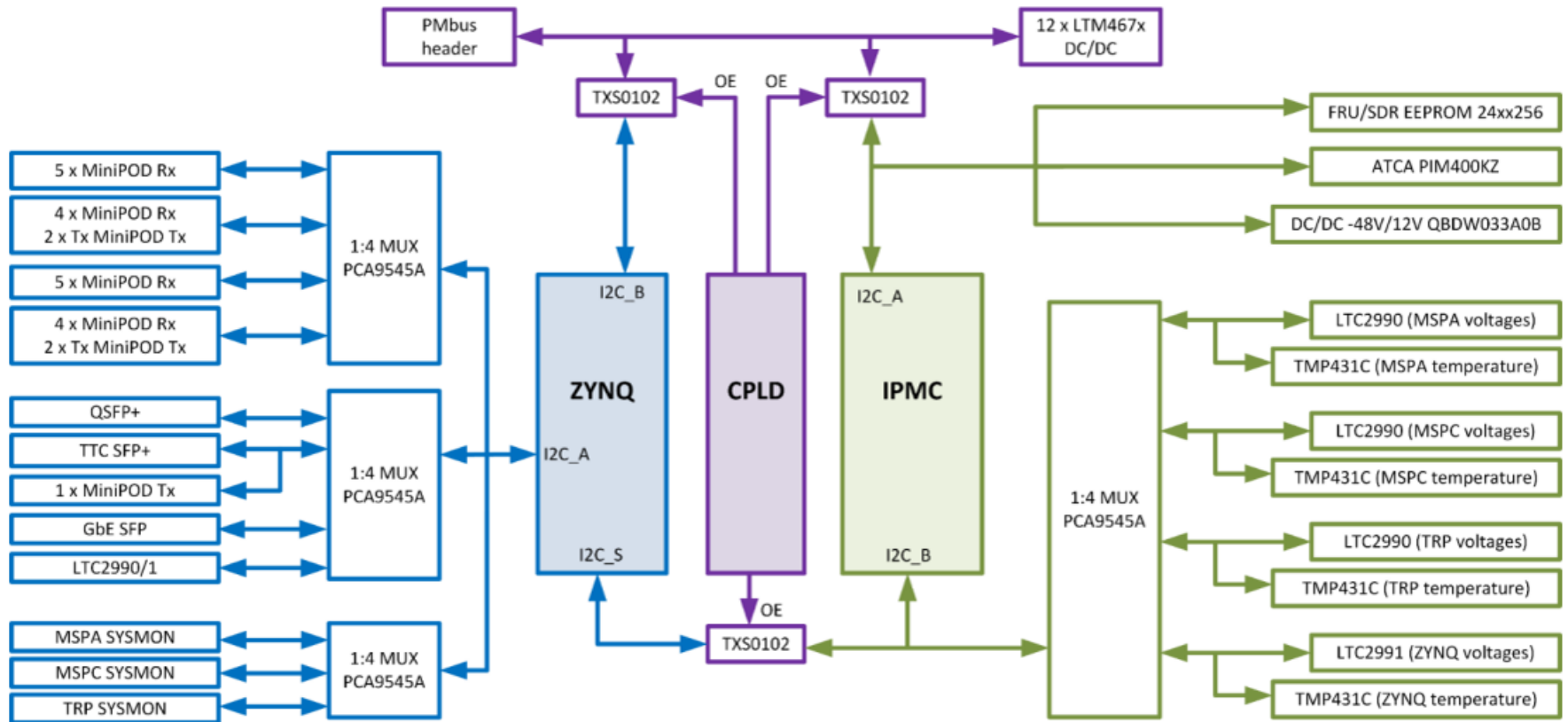
- Interfaces barrel and endcap muon trigger to CTP & L1Topo
- Single-blade ATCA system, no fabric interface, I/O via front-panel
- High-end Xilinx Ultrascale(+) FPGAs
- High-speed serial optical links via 23 MiniPOD modules
- 208 optical inputs, 64 optical outputs
- Xilinx Zynq-7000 for configuration and control through Ethernet
- 15 power supply rails



MUCTPI hardware monitoring

- **Hardware monitoring through on-board I2C network partitioned using I2C multiplexers/switches**
- **Separate I2C networks for sensors connected to Zynq-7000 SoC and to IPMC**
- **IPMC only monitors critical board parameters**
 - Power supply voltages, input current, FPGA and board temperatures
 - ~50 values, could be reduced if required
- **SoC monitors a larger set of values (~500 values)**
 - FPGA SYSMON (on-chip temperatures & voltages)
 - DC/DC converters through PMBus (voltages, currents, temperatures)
 - MiniPOD transmitters and receivers, SFP/QSFP transceivers (temperature, optical power, bias current, ...)
 - Critical sensors (power supply, temperatures) are duplicated with the IPMC

MUCTPI I2C Network



MUCTPI IPMC Status

- **Lab test setup**
 - 2 small (2-slot) ATCA shelves (Schroff) with fully populated MUCTPI blades
 - Shelf manager based on PigeonPoint ShMM-700
 - Full-size (14-slot) vertically cooled shelves on order
- **Features implemented and tested**
 - Board activation/deactivation and control of payload power working
 - Sensor drivers for all devices connected to the IPMC developed
 - Reading of sensor values through the self manager working
 - Automatic fan-speed regulation by the shelf manager based on the temperature readings from the IPMC working
 - Can be tuned by adapting the sensor thresholds
- **Work on interfacing MUCTPI on-board sensors to DCS through the shelf manager has started**
 - DCS auto-discovery working
- **Some discrete sensors still to be implemented**

MUCTPI Sensors in DCS

Module Panel Scale Help

English, US [en_US.iso88591]

Atca Content	Name	Sen#	Name	Value	Thresh	Type
Chassis						
Shelf1	1	21	TRP MGTAVCCAUX	1.798850	-	FLOAT
Shelf Managers						
ShelfManager1	Shelf Manager ACB-V	22	TRP 3.3V MGMT	3.333000	-	FLOAT
ShelfManager2	Absent/Non-Intel	23	TRP LTC TINT	32.500000	-	FLOAT
Power Supplies						
None-Found	Non-Intelligent	24	ZYNQ VCCINT	0.995250	-	FLOAT
Power Entry Mods						
PEM1	Power Entry Module	25	DDR3 VCCIO	1.348050	-	FLOAT
PEM2	Power Entry Module	26	1.8V PAYLOAD PWR	1.798850	-	FLOAT
Fan Trays						
FanTray1	1	27	2.5V PAYLOAD PWR	2.480500	-	FLOAT
FanTray2	2	28	3.3V PAYLOAD PWR	3.280000	-	FLOAT
Slots						
Slot1	MUCTPI	29	12V PAYLOAD PWR	11.921000	-	FLOAT
Slot2	Absent	30	LTC2991 TEMP	29.500000	-	FLOAT
Custom Sensors						
Shelf/16/Fru0	Carrier_FRU	31	3.3V MGMT PWR	3.333000	-	FLOAT
Shelf/18/Fru0	Carrier_FRU	32	PIM400 V_HOLDUP	71.645000	-	FLOAT
Shelf/32/Fru0	PPS BMC	33	PIM400 IOUT	1.034000	-	FLOAT
Shelf/32/Fru1	ShelfFRU1	34	PIM400 M48V_AF	48.100000	-	FLOAT
Shelf/32/Fru2	ShelfFRU2	35	PIM400 M48V_BF	47.775000	-	FLOAT
Shelf/32/Fru3	SAP Board	36	PIM400 TEMP	34.280000	-	FLOAT
Shelf/90/Fru0	Fan Tray	37	QBDW033A VIN	48.250000	-	FLOAT
Shelf/90/Fru2	PEM	38	QBDW033A VOUT	11.892000	-	FLOAT
Shelf/92/Fru0	Fan Tray	39	QBDW033A IOUT	3.500000	-	FLOAT
Shelf/92/Fru2	PEM	40	QBDW033A TEMP	32.000000	-	INT
Slot1/Fru0	MUCTPI	41	MSPA TMP431 TEMP	30.500000	-	FLOAT
		42	MSPA FPGA TEMP	30.000000	-	INT
		43	MSPC TMP431 TEMP	29.500000	-	FLOAT
		44	MSPC FPGA TEMP	29.500000	-	FLOAT
		45	TRP TMP431 TEMP	31.500000	-	FLOAT
		46	TRP FPGA TEMP	30.000000	-	INT
		47	ZYNQ TMP431 TEMP	32.000000	-	INT
		48	ZYNQ FPGA TEMP	36.000000	-	INT

CERN IPMC User Experience (1)

- **Customizing the IPMC firmware for a new ATCA blade is relatively straightforward**
 - Main effort is in developing new sensor drivers (if needed) and writing the sensor data records
 - Initially somewhat difficult, has been simplified significantly with auto-generated templates and better documentation
- **Haven't migrated to XML configuration for SDRs**
 - Still using header files PigeonPoint INF format
 - Remote compilation also tested: works
- **Sensor drivers developed for MUCTPI board have been included in the IPMC git repository**
 - Some have also been used by eFEX developer
- **Customizing the IPMC is now much better documented**
- **No issues with communication with the shelf manager or the sensors**

CERN IPMC User Experience (2)

- **Plan to also test reading payload controlled sensors through the IPMC**
 - Send sensor readings from the on-board Zynq SoC to the IPMC using the payload interface UART port
 - Examples: MiniPOD temperatures, POL DC/DC converter currents, ...
- **Lessons learned**
 - Connect the IPMC UART to the payload and/or USB-UART
 - Very helpful for debugging
 - Serial-over-LAN works, but problematic if the IPMC does not boot
 - Additional UART available on user I/O pins, to be tested
 - Connect the Ethernet interface of the IPMC to a jack if possible
 - Foresee JTAG connector on the blade to reprogram IPMC FPGA firmware using MicroSemi programmer (not absolutely required)
 - Connect dedicated power management pins (e.g. PowerGood_A/B) if possible