



CERN-IPMC: Update status

xTCA Team Meeting

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General overview

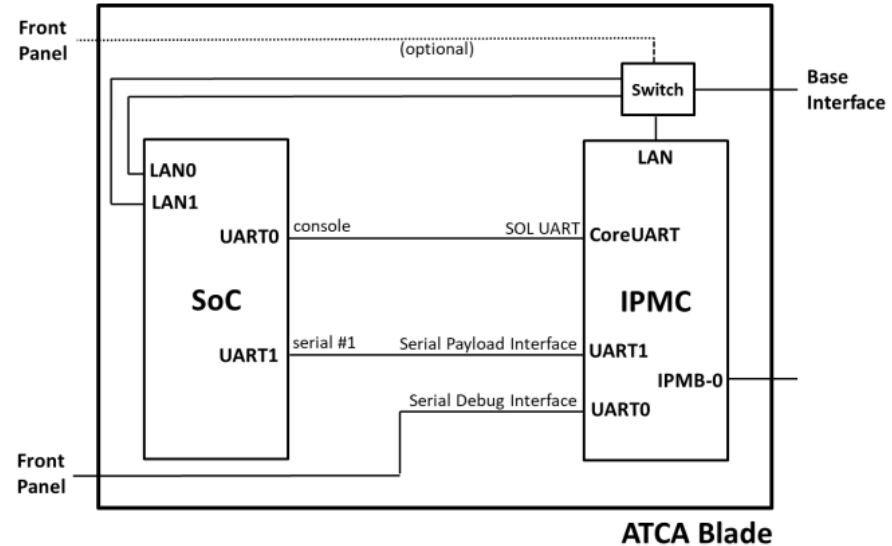
- New hardware designed in 2019 (vers. 4)
 - **Compliant with original connector specification**
 - Add a third UART interface on pins 58 (Tx) /61 (Rx)
 - Frame contract established and qualified
 - Up to 1000 modules can be produced until end 2022
 - **Produced and qualified in Q4 2020 via the frame contract**
- Software moved to the latest version from Pigeon Point
 - Porting from version 1.2 to 1.3



Hardware vers. 4

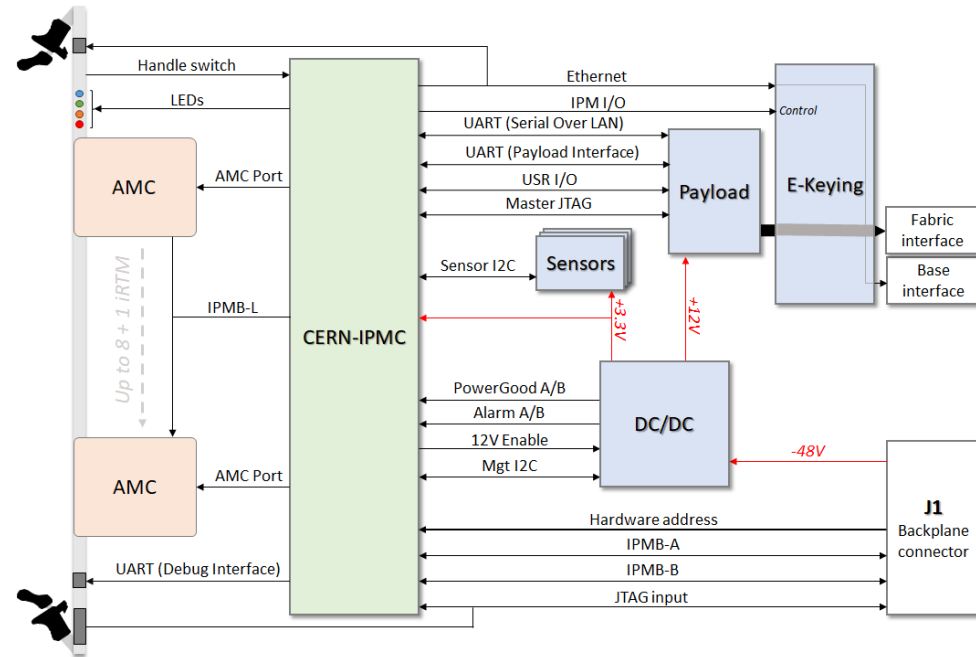
- Improve SoC < > IPMC connectivity
 - Communication to get IPMC info and status to the SoC
 - Based on UART interface – Payload Interface
 - Allows getting blade position in a crate (used for HPM.3)
- 3 UART interfaces:
 - Original UART port remains on pin 57 (Tx)/60 (Rx)
 - Additional UART interface located on GPIO can be routed to:
 - User I/O [0:1]
 - User I/O [24:26]
 - New UART interface on pins 58 (Tx) /61 (Rx)
 - Allow enabling all of the UART features:
 - Serial Debug Interface (SDI)
 - Serial Over LAN (SOL)
 - Payload Interface (PI)
 - Configuration is made in XML configuration file (static)
- **Compliant with original connector specification**
 - Pin 58/61 were non-connected on previous versions
 - Connectivity to new pins can be removed by taking off the 0 Ohm resistors

Possible configuration using all three interfaces:



Typical use of the CERN-IPMC

- **HPM.3: Ethernet configuration via the IPMC.**
 - **IP address depending on the blade position** in the system and not on a MAC address
- **HPM.2: IPMI on LAN**
 - Allows getting the supervision system (e.g.: DCS) **fully redundant**.
 - **No need to handle differently** communication via Ethernet or IPMB buses.
 - Implement **Serial Over LAN** to redirect UART to Ethernet. A nice to have to communicate with a S.o.C.
- **HPM.1: Upgrade via IPMI**
 - Ensure **stable configuration** with image checker
 - Implements automatic/manual **rollbacks**
 - Keep of **non volatile parameters**
 - E.g.: thresholds modified during a run are not updated by a reconfiguration.



Software porting to v.1.3

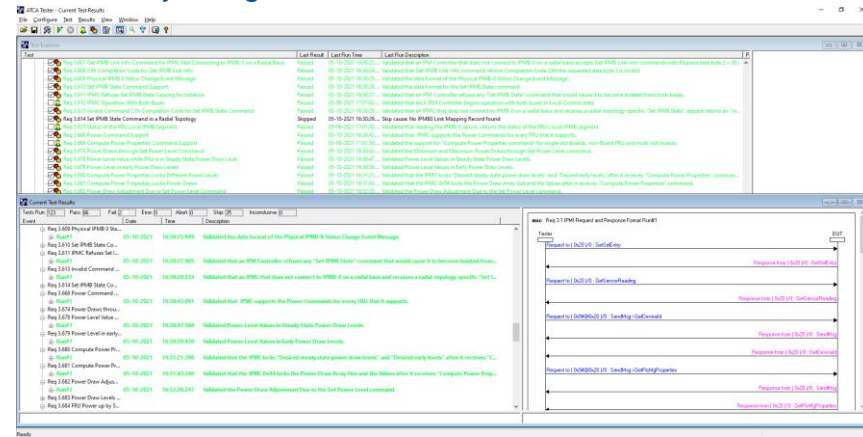
- **Based on latest version of the Pigeon Point solution:**
 - Fixes IPMB-0 bus instabilities that were observed by the L1Calo team
 - Adds support for HPM.2 R1.1 and HPM.3 R2.0
 - Stability improvement (e.g.: sensor interface updated, HPM.1 on power cycle issue...)
- **V.1.2 to v.1.3 “How to”:**
 - New configurations: UART, Non volatiles parameters (e.g.: sensor thresholds)
 - Release note and how-to: <https://gitlab.cern.ch/ep-ese-be-xtca/ipmc-project/-/tags/v.1.3>

Software porting to v.1.3

- **Extensive tests performed:**

- Active test ran for all of the interfaces during several hours/days
- Allowed finding conflicts on IPMB-L bus detected (issue was found on our MMC configuration)
- HPM.1 stability [Upgrades in a loop] (watchdog reset detection issue was fixed)
- Non-volatile parameters issue on HPM.1 upgrade (e.g.: IP address not reset to default)
- Compilation errors depending on UART configuration were solved by fixing the code
- TCP/IP issue on extensive use and add Linux support
- Tested with Polaris Tester:

- Number of tests: 123
- Passed: 86
- Failed: 2
 - As the iRTM is emulated, it cannot be accessed by the Polaris tester without configuring the setup .. This was tested manually
- Skipped: 35
 - AMC not implemented, e-keying not set



Software porting to v.1.3

- **Status**

- Test performed locally with the CERN-IPMC tester
- Test performed by the ATLAS L1Calo team in real environment
- Additional test for sensor integration are on-going with the CMS DTH team
- Release note, including a guide for the software migration, was written

- **Plans (coming weeks)**

- Accelerated aging using climatic chamber
- Fully populated crate using the tester
 - Extensive polling of a large number of sensors
 - ATCA Insertion/extraction emulation
 - AMC/iRTM insertion/extraction emulation



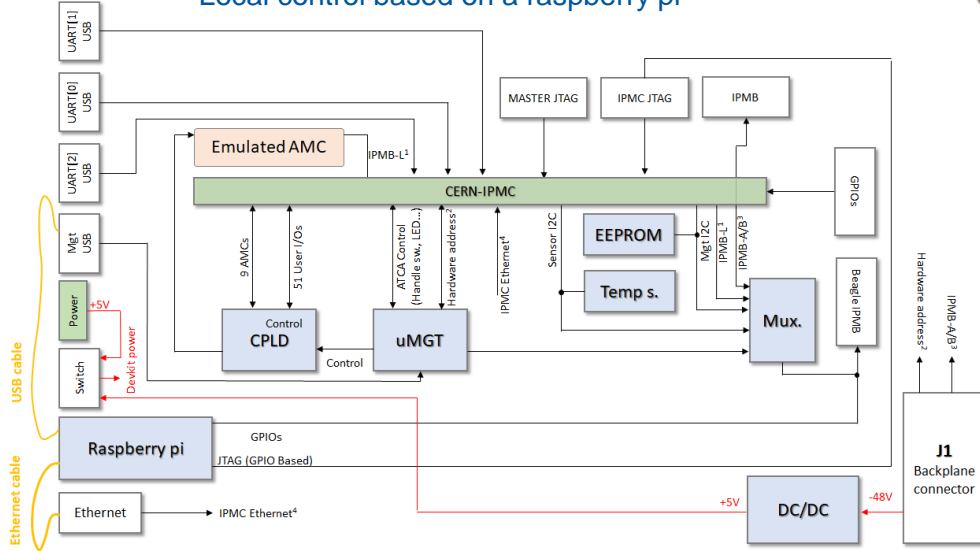
Fully populated crate with CERN-IPMC devkit.

CERN-IPMC DevKit vers. 4

- New development kit available
 - ATCA form factor compliant (features a zone 1 connector)
 - Powered from the backplane input
 - Local control based on a raspberry pi



Can be used on a desk as well as in an ATCA shelf

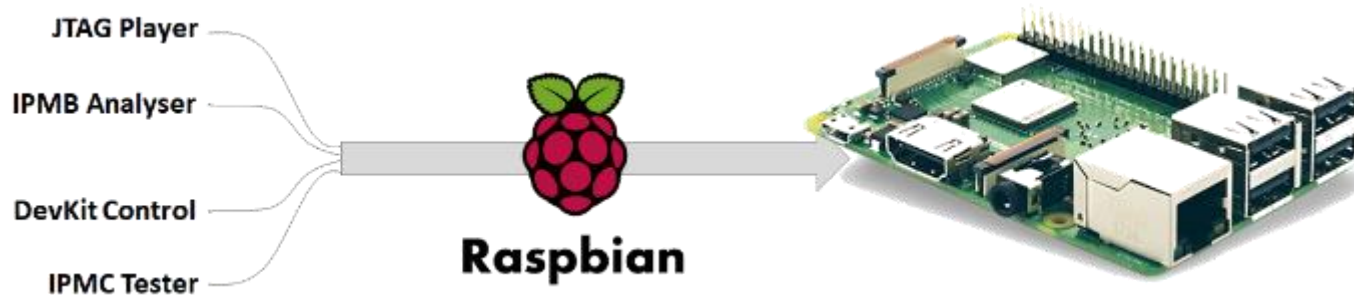


Block diagram available in backup slides



CERN-IPMC DevKit vers. 4

- New features available
 - Run on local Raspberry pi
 - Based on Raspbian distribution (Linux)
 - Need Ethernet and USB connectivity to the Ethernet and Management ports



CERN-IPMC DevKit vers. 4

- JTAG Player
 - Used to reset the CERN-IPMC to CERN default firmware
 - Can be used to flash firmware upgrade according to the CERN-IPMC support team
 - Only one command in raspberry terminal: `jtag_player -reset`
- DevKit control
 - Allows configuring the test setup via the command line interface of the raspberry pi
 - One command per action - e.g.: `devkit_ctrl -a SETHA -v 0x43`
 - Implements all of the actions supported by the devkit controller
- IPMC Tester
 - Allows running a full hardware test for a CERN-IPMC
 - Using it reconfigures the module with the CERN default firmware
 - Generates a report and a log file, which can help debugging a module

CERN-IPMC DevKIT vers. 4

- IPMB Analyser
 - Captures IPMB-A, IPMB-B or IPMB-L packet and format them for Wireshark
 - Only one command in raspberry terminal: `ipmb_sniffer -p <port> -o <output file>`

```
pi@raspberrypi:~$ ipmb_sniffer -f example.pcap -p ipmb1
[Info] Open port IPMB-L [2]
[Info] Start saving to example.pcap for -1 seconds
[Info] Press Enter to stop capturing
[Info] Received: 802 bytes
[Info] Saved 802 bytes
pi@raspberrypi:~$
```

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	I2C-0	0x75	IPMI/ATCA	7	Req, Get Device ID, seq 0x02
2	0.000001	I2C-0	0x10	IPMI/ATCA	19	Rsp, Get Device ID, seq 0x02
3	0.000002	I2C-0	0x75	IPMI/ATCA	9	Req, Set Event Receiver, seq 0x03
4	0.000003	I2C-0	0x10	IPMI/ATCA	8	Rsp, Set Event Receiver, seq 0x03
5	0.000004	I2C-0	0x75	IPMI/ATCA	8	Req, [ATCA] Get PICMG Properties, seq 0x04
6	0.000005	I2C-0	0x10	IPMI/ATCA	12	Rsp, [ATCA] Get PICMG Properties, seq 0x04
7	0.000006	I2C-0	0x75	IPMI/ATCA	9	Req, [ATCA] Get FRU LED Properties, seq 0x05
8	0.000007	I2C-0	0x10	IPMI/ATCA	11	Rsp, [ATCA] Get FRU LED Properties, seq 0x05
9	0.000008	I2C-0	0x75	IPMI/ATCA	10	Req, [ATCA] Get LED color capabilities, seq 0x06

Frame 1: 7 bytes on wire (56 bits), 7 bytes captured (56 bits)
Inter-Integrated Circuit (Data)
Intelligent Platform Management Interface
[Response in: 2]
Header: Get Device ID (Request) from 0x20 to 0xea
Target Address: 0xea
Target LUN: 0x00, NetFN: Application Request (0x06)
Header checksum: 0xfe (correct)
Source Address: 0x20
Source LUN: 0x00, SeqNo: 0x02
Command: Get Device ID (0x01)
Data checksum: 0xd7 (correct)

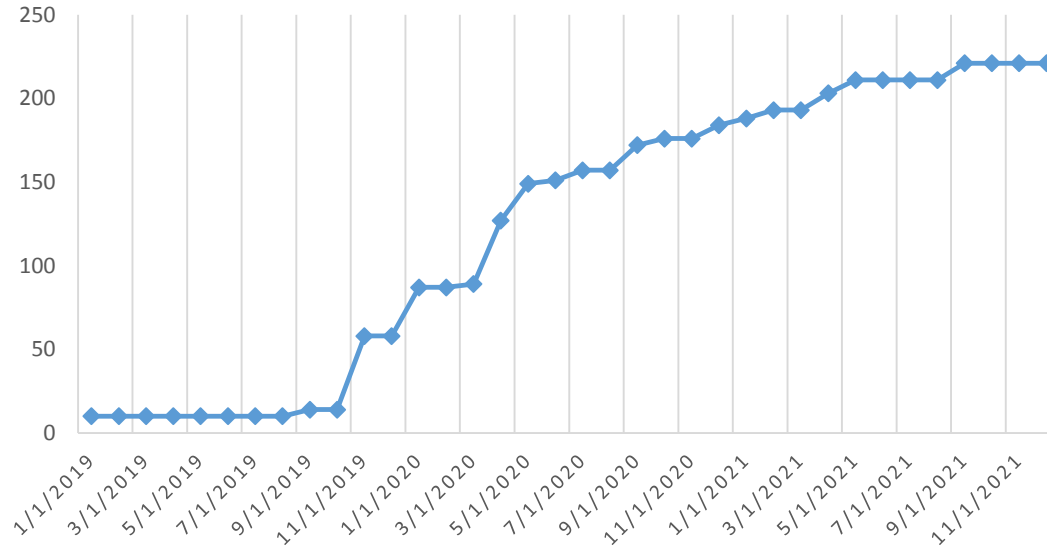
0000 ea 18 fe 20 08 01 d7

CERN-IPMC DevKit vers. 4

- IPMC Tester
 - Testing improvement: automatic module flashing via raspberry pi interface
 - Was originally done manually
 - Avoid operator intervention and make the test fully automatic
 - Reports automatically generated
 - Test can be executed externally (allow user to test their own hardware)

CERN-IPMC Distribution

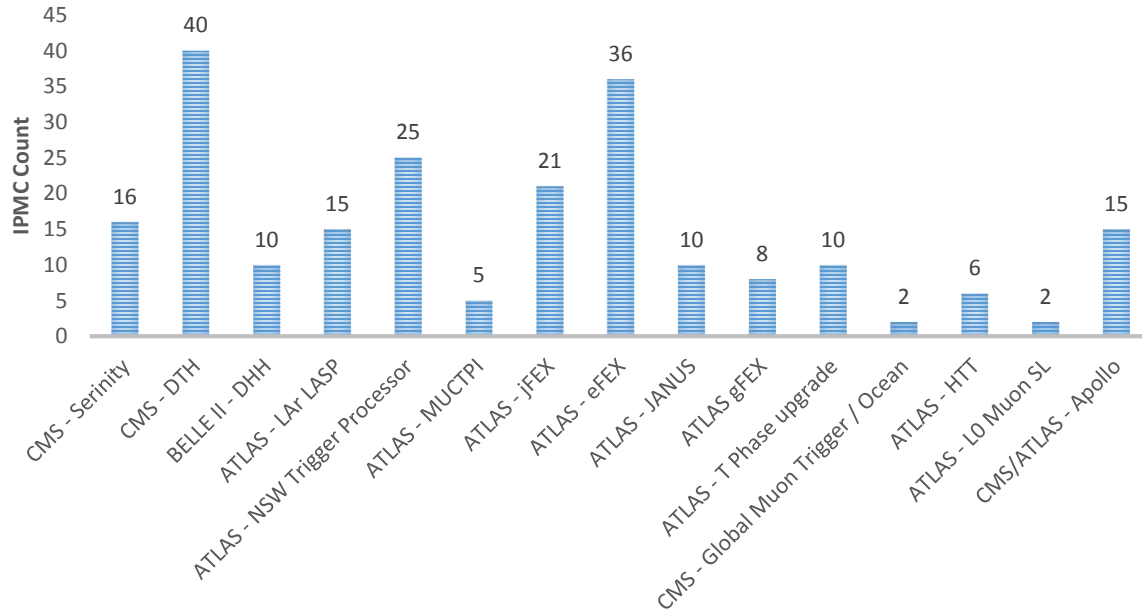
IPMC SELLING



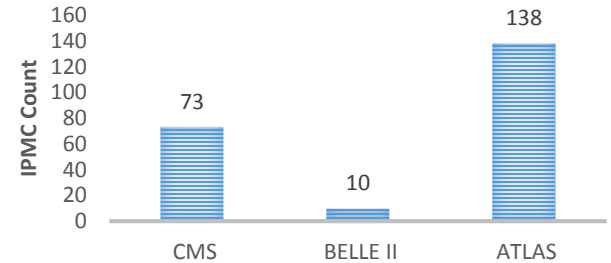
Stock:

- V3: 63
- V4: 64

CERN-IPMC Distribution



IPMC PER EXPERIMENTS



Summary

- New hardware version
 - Produced using a frame contract allowing the production of up to 1000 IPMCs until end 2022
 - First modules produced in November 2020
 - Can be ordered on <https://cern-ipmc.web.cern.ch/order>
 - need of V4 shall be specified as V3 are also still available
- Software upgrade:
 - Porting to the latest version of the Pigeon Point solution
 - Improve stability and has been extensively tested
 - Released and documented
 - Available through remote compilation since January
- New development kit available
 - ATCA standard compliant for in-crate use
 - Adds functionality based on raspberry pi controller
 - First prototype arrived at CERN in November
 - Final version received in March and successfully tested
 - Available for purchase (1500 CHF)
 - Currently used in 3 institutes

