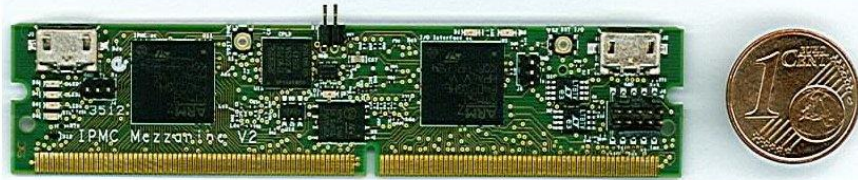# LAPP IPMC Mezzanine HARDWARE & SOFTWARE

xTCA Interest Group Meeting

27/03/2014

Alain Bazan, Fatih Bellachia, Sébastien Cap, Nicolas Dumont-Dayot, Jasmin Fragnaud, Nicolas Letendre, Guy Perrot, Isabelle Wingerter

IPMC Mezzanine V2.1 –> V2.2

- **Mechanical**
  - **Small size: DDR3 VLP Mini-DIMM**
  - **Vertical or horizontal mounting**
- **Based on ARM Cortex M4 µC**
- **Hardware is fully tested and required a small HW modification**
  - **Tested with a mix of Boundary Scan tests (internal connections) and operational tests (connectors)**
  - **Coming soon: full BS test**
- **Documentation available**
  http://lappwiki.in2p3.fr/twiki/bin/view/AtlasLapp/ATCA
- **20 boards cabled in 2 batches**
  - **19 available and 1 more to be tested**
  - **All modified to be compliant with V2.2**
- **New production (V2.2) foreseen mid 2014 then yearly**
- **Users have been contacted to get their quantities and date requirements.**

Users requests

Experiment/Subdetector	Contact	June 2014	June 2015	June 2016	June 2017
ATLAS FTK	Jinlong Zhang	63	43		
ATLAS FEX ATCA Hub	Wade Fisher	1	7	18	
ATLAS L1Calo eFEX	Ian Brawn	4	4	30	
ATLAS L1Calo FTM	Ian Brawn	3	5		
ATLAS L1Calo Topo	Ulrich Shaffer	5		4	
ATLAS L1Calo jFEX	Ulrich Shaffer			10	
ATLAS LAr	John Hobbs	4			
LHCB	Jean-Pierre Cachemiche	3			
BELLE	Igor Konorov	15			
Total		**98**	**59**	**62**	

FTK:
3   April
7   June
53   Autumn

FTK:
43   Summer
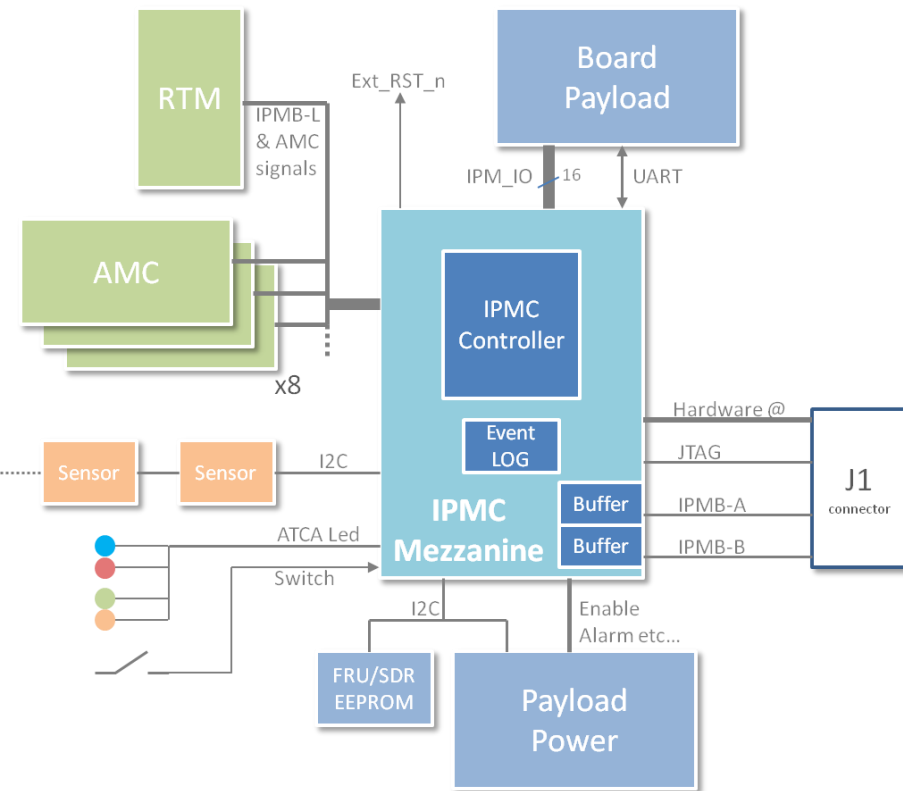
IPMC Features

- **IPMC features**
  - IPMBus with on board buffers, Hardware address detection
  - Hot Swap management with ATCA Leds and front panel switch
  - Management of up to 8 AMC + RTM
  - On board Event LOG
  - FRU & SDR access via I2C
  - Access to ATCA board sensors via I2C
  - IPM_IO: Configurable User Signals for Payload management, ekeying …

⇒**Reduce number of devices and save time for ATCA carrier designers**
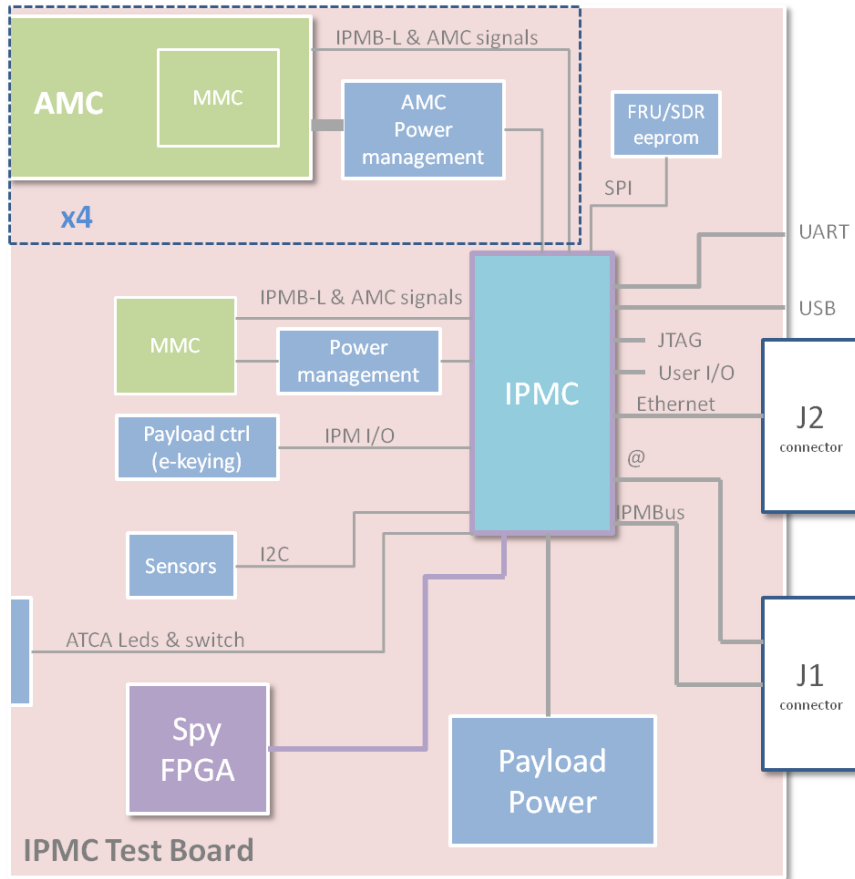
Non-IPMC Features

- **NON-IPMC features**
  - **Ethernet**
  - **JTAG Master**
  - **Custom interface**
  - Up to 35 user IO
  - **USB port**
  - **IPMC firmware upgrade**
 → **auto back to Factory Firmware if core freezes**
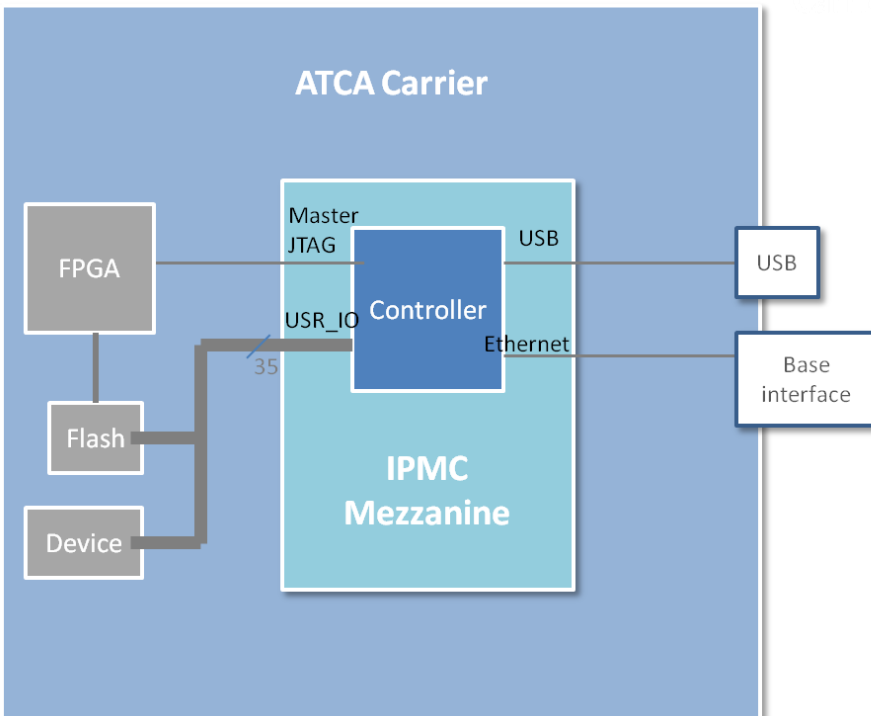
⇒**Applications:**
- **Carrier FPGA or μC firmware upgrade via Ethernet**
- **Interface between Ethernet / USB and user defined bus**
- **Etc… (user ideas)**

LAPP IPMC V2 Test Board

- **ATCA board**
- **Designed to tests and debug IPMC mezzanine V2.1- V2.2 (Hard and Soft)**
  - **Board powering (hot swap, power negotiation)**
  - **IPMB and communication with shelf manager**
  - **Sensors reading**
  - **E-keying**
  - **AMC power management with different devices**
  - **AMC management (communication with MMC)**
  - **Ethernet / USB / UART**
  - **User_IO and IPM_IO**
- **Features**
  - **4 AMC slot + 1 MMC slot**
  - **Communications between 2 AMCs, and to the fabric for E-keying tests**
  - **Spy FPGA connected to IPMC signals**

LAPP IPMC V2 Test Board
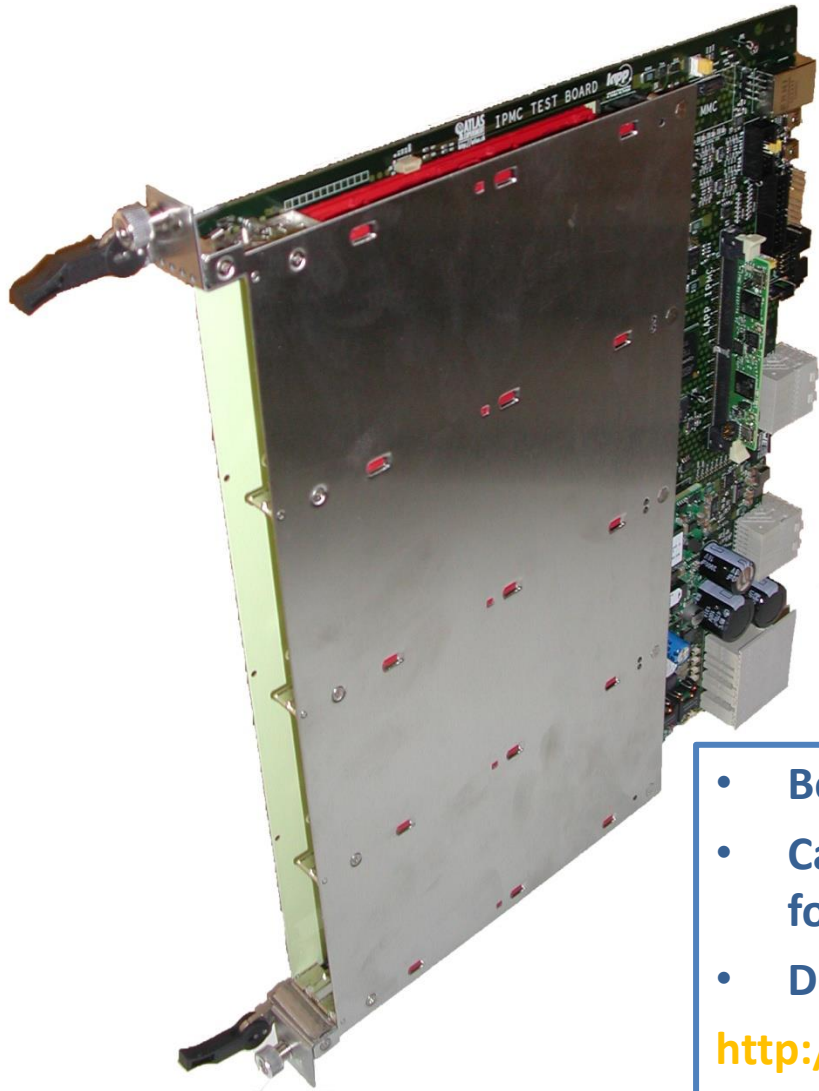
Blade with IPMC being tested at CERN with Polaris Tools
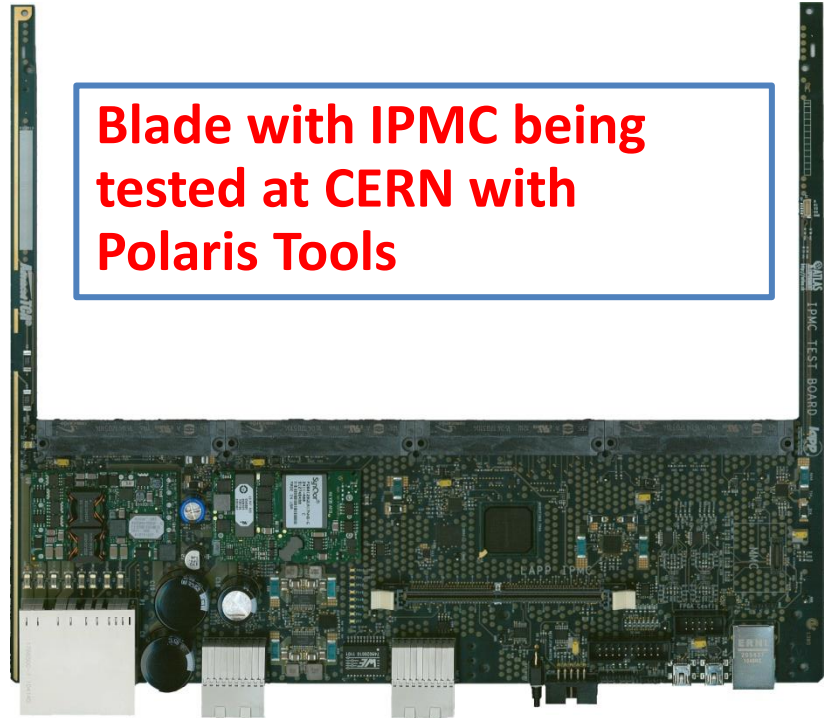
- **Board fully tested and functional**
- **Can be used as "reference design" for carrier designer for the IPMC part**
- **Documentation and schematic available**

http://lappwiki.in2p3.fr/twiki/bin/view/AtlasLapp/ATCA

- **5 boards tested and available**

Software project name

INTELLIGENT PLATFORM MANAGEMENT CONTROLLER SOFTWARE

Specifications

The IPMC software solution is fully compliant with the following specifications:

- IPMI v1.5 *(document revision 1.1)* and some relevant subset of IPMI v2.0 *(document revision 1.0)*.
- PICMG 3.0 R3.0 *(AdvancedTCA™ base specification)*.
- AMC.0 R2.0 *(AdvancedMC™ base specification)*.

Software environment

Features

- Linux host development
- 32-bit ARM Cortex-M4 microcontroller
- Written in standard ANSI C
- GCC (4.7.0) tool chain
- Open Source Configuration Management environment: - CMT
- FRU (ATCA board) Hex generation utility (using M4 preprocessor)
- OpenOCD (0.6.1) utility (Linux/Windows)
  - Need USB to JTAG interface Debug-Adapter-Hardware
    - Olimex ARM-USB-TINY-H
    - NGX technology
    - …

Software design

Focus

- Distributed bare-metal application
- Event (message) driven architecture
- The component (module) based design of the IPMC software source code allows the user to easily customize without modifying the existing code.

- IPMI Controller (FRU/SDR monitoring).
- ATCA User interface (e-keying, specific configuration)
- OEM functionalities (full user non-ATCA application)
  - JTAG master (e.g. upgrade of ATCA blade firmware)
    - **SVF** player
  - IPMC firmware Upgrade via TCP/IP (e.g. Base Interface)

Software status

Package	Unit Testing	Integration Testing	System Testing	Comment
HAL	✔	✔	✔	
JTAG master	✔	✔	✔	
IPMB	✔	✔	✔	
IMC	✔	✔	✔	**v0r2**
IMC	✔	✔	✔	**v0r3**
lwip	✔	✔	✔	
Channel	✔	✔	✔	
MessageQueue	✔	✔	✔	**v0r1**
MessageQueue	✔	✔	✔	**v1r0**
MessageDispatcher	✔	✔	✔	**v0r1**
MessageDispatcher	✔	✔	✔	**v1r0**
IPMC	✔	work in progress…	.	**v1r0**
FRU/SDR storage	✔	✔	✔	M24256
E-Keying (backplane)	✔	✔	✔	
Sensors	✔	work in progress…	.	AD7414 LTC2499 LTC4151 IQ65033QMA10

Software status

	Unit Testing	Integration Testing	System Testing	Comment
Module	.	.	.	
Watchdog	✔	.	.	
CMC	✔	.	.	
E-Keying (Carrier)	.	.	.	

AMC Management

To do list…
Help is welcome ☺

- Short term plan
    - Complete IPM Controller tests
    - Complete sensors monitoring
    - Implement the Carrier E-Keying
    - Complete Carrier Management Controller tests
- Long term plan
    - Outsource some features (i.e. package)
    - Validation of IPMI/PICMG specifications
    - SDR and FRU Hex generation utility (e.g. GUI)
    - Quick Configuration utility (e.g. GUI)
    - Fully compliant with IPMI v2.0
    - Implement HPM.1 Upgrade Commands
    - Software Forge