Development of an ATCA IPMI Controller Mezzanine Board to be used in the ATCA developments for the ATLAS Liquid Argon upgrade

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Outline

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- **ATCA controller mezzanine**
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Context

Motivations

We need :

- High input and output bandwidth
- High speed communications between boards
- Powerful signal processing

This is why ATCA platform was chosen:

- High speed and high density communications between boards over backplane
- Large boards (32x28 cm)
- Possibility of rear transition modules (RTM), and mezzanines card (AMC)
- Reliability (hot swap, real time diagnostic)

We build an ATCA board to evaluate:

- ATCA specifications (Intelligent Platform Management Interface 'IPMI' facilities)
- Management trough Ethernet (Firmware upgrade, DSP configuration, monitoring...)
- Many 12x10Gbps incoming optic fibers
- High speed and high density board.
- High power DSP cells from FPGA

For that we have designed a board called “ROD evaluator” and an IPM Controller Mezzanine board

ROD evaluator

Synoptic

ROD evaluator Design

CAD completed :

- 16 layers
- Minimum lines width : 75 μm
- Laser and blind buried vias

Cost =\$\$\$\$\$

Before launching production :

- > Test FPGA building blocks
- > Test FMC mezzanine with IPMC

We have designed 2 boards:

- > ATCA controller mezzanine board
- > ATCA test mother board

ATCA test board

Synoptic

Tests of :

FPGA building block

- Boot from CPLD & parallel Flash
- Communications with DDR3 & Flash

ATCA CTRL Mezzanine :

- IPMC (IPM Control) through IPM Bus
 - => Communication with Shelf manager
- ATCA power supplies management
 - => Hot swap (insertion switch)
 - => Enable DC/DC
- Alarm/failure diagnostic
- Board configuration through Ethernet
 - => Firmware upload
 - => Optimal filtering coefficient upload
 - => Sensor reading
 - => Etc..

ATCA test board

ATCA Controller mezzanine

IPM Controller

- PICMG 3.0 R3.0 – ATCA base specification
- IPMI v1.5 and relevant subset of IPMI v2.0

JTAG Master

- ▶ JTAG chain controlled by Ethernet
 - .XSVF file player
 - Program motherboard FPGA

Motherboard configuration and monitoring

- Communication through high speed LVDS links

HARDWARE:

- FMC (FPGA Mezzanine Card) format
- Xilinx Spartan 6 for highly configurable I/O
- μ C ARM Cortex M3

ATCA Controller mezzanine Software

ATCA Controller mezzanine FRU & SDR generator

FRU (Field Replaceable Unit) data :

- Identity of the carrier board
=>Ex : IO description on J2 connector

SDR (Sensor Data record) :

- Sensors description of the carrier board
=>Ex : handle switch, temperature sensor

ATCA Controller mezzanine

Example of info to Shelf manager

The screenshot shows a web browser window titled "Pigeon Point™ Shelf Manager, Board Information - Windows Internet Explorer". The address bar displays the URL "http://lapp-sm10/cgi-bin/shmm/board.cgi". The page content is titled "Board Information" and includes the text "Verbose mode turned on".

The main content area displays detailed information for two physical slots:

- Physical Slot # 3:**
 - 92: Entity: (0xa0, 0x60) Maximum FRU device ID: 0x...
 - PICMG Version 2.1
 - Hot Swap State: M3 (Activation In Process), Previous: M2 (Activation Request), Last State Change Cause: Change Commanded by shelf Manager
 - Device ID: 0x00, Revision: 0, Firmware: 1.00 (ver 1.00)
 - Manufacturer ID: 0abba0, Product ID: 2011, Auxiliary Rev: 00
 - Device ID String: "LAPP_IPMC "
 - Global Initialization: 0xc, Power State Notification: 0xc, Device Capabilities: 0x29
 - Controller provides Device SDRs
 - Supported features: 0x29
 - "Sensor Device" "FRU Inventory Device" "IPMB Event Generator"
- Physical Slot # 7:**
 - 82: Entity: (0xa0, 0x60) Maximum FRU device ID: 0x04
 - PICMG Version 2.2
 - Hot Swap State: M4 (Active), Previous: M7 (Communication Lost), Last State Change Cause: Communication Lost (0x4)
 - Device ID: 0x12, Revision: 0, Firmware: 1.51 (ver 1.5.1), IPMI ver 1.5
 - Manufacturer ID: 005f13, Product ID: 6900, Auxiliary Rev: a3000020

A yellow callout bubble points to the "FRU" information in the Physical Slot # 3 section, containing the text: **FRU : current and previous ATCA state, ID, version,...**

The browser status bar at the bottom shows "Terminé" and "Intranet local | Mode protégé: désactivé".

Summary

We have designed an ATCA ROD Evaluator board to evaluate the functionalities needed by the next generation ROD in the context of the ATLAS LAR upgrade:

- Large number of fast links (High speed and high density board)
- Recent generation of FPGA (many DSP cells and Ser-Des) and optical receivers
- ATCA platform

For the control of that board, we have designed a generic ATCA IPMI Controller mezzanine in the FMC format.

- Acts as an IPM Controller
- Direct Ethernet access
- Uploads the FPGA firmware and other parameters
- Monitors the board parameters

This mezzanine and its software is currently tested on an ATCA Test board we have designed

Next step is the design of a smaller IPM Controller