Goals and status of the ATLAS VME Replacement Working Group

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Outline

- **Goals of the ATLAS VME Replacement working group**
- **Approach used by the group**
- **Sub-systems involved**
- **Possible common elements and recommendations**
- **Major points to solve**
- **Summary**

Boundary Conditions & Goals

- **VMEbus is a key element of the ATLAS readout system**
  - It is the standard used for the ATLAS Read Out Drivers (RODs)
  - Useful features (mechanics, electrical) for housing custom modular electronics
  - VMEbus protocol: Mostly used to control and monitor the custom boards (RODs)
  - VMEbus is an "old" standard and its long term future (HL-LHC 2022-32) not known
- **A lot of work is going on in the labs for developing new electronics in view of the LHC upgrades**
- **In order to coordinate efforts a VMEbus Replacement Working Group has been setup**
  - It is composed of one representative per sub-system
  - The Goals of this group are to:
    - Understand the work going on in the different labs for the different sub-detectors
    - From there select the standard to be used for the new back-end electronic including RODs
    - Identify common equipment between the different sub-systems (and other experiments)
    - Propose a standard and deliver draft recommendations by the end of 2012
    - Collaborate with other LHC experiments where possible

Approach

- **A 1 day meeting including the other LHC experiments has been organized in July**
  https://indico.cern.ch/conferenceDisplay.py?confId=196590
- **A questionnaire had been prepared and presentations were to give answers to it**
- **The analysis of this questionnaire showed that ATLAS sub-systems were all driving for ATCA**
  - There seems to be no need for uTCA
  - But there will be AMCs at the level of the ATCA blades
- **Possible common elements are being identified**
- **A list of points to solve is being defined**
- **Solutions and / or recommendations will be proposed**

Sub-systems involved

- **Liquid Argon Trigger interface: Phase I**
- **Liquid Argon Back-End Readout System (RODs): Phase II**
- **L1 Calo: Phase I**
- **CSC ROD: Phase 0 (!). Will use ATCA blades developed by SLAC for a different project and adapted to CSC**
- **SCT FTK, FTK-LV2 Interface: Phase?**
- **Tiles Back-End Readout System (RODs): Phase II**
- **It is not excluded that other sub-systems will also switch to ATCA (e.g. the muon small wheels)**

Possible Common Elements (1)

- **System Manager (Software layer to manage shelves)**
  - Custom code (integrated into DCS) based on ipmitool / OpenIPMI?
- **ATCA shelf** (14 slots to fit in 19 inches Frames)
  - Backplane
    - Full mesh and radial IPM links
    - May use some fabric links for TTC distribution
  - Vertical airflow (to be compatible with existing infrastructure)
- **Shelf manager**
  - COTS component
  - Follow recommendation of shelf manufacturer
- **IPMC (mezzanine and S/W framework)**
  - LAPP IPMC design (already foreseen by LHC-b)
- **MMC (mezzanine and S/W framework)**
  - DESY/CPPM/CERN design whenever needed (AMC)
- **Power supply**

Possible Common Elements (2)

- **Blades**
  - Do we want to recommend commercial blades?
    - AMC Carrier blade
      - For what AMC format and fat pipe-protocol?
    - Switch blade
      - Most likely ATLAS ATCA blades will use Ethernet on both base and fabric interface
    - CPU blade (so far: Only one potential user in the ATLAS community)
  - Do we want to standardize some generic community built blades?
    - Carrier blade
    - Switch blade (e.g. including TTC distribution)
- **Tools for blade / system development and diagnostics**
  - E.g. IPMC tester S/W

Possible recommendations

- **Protocol on Fabric and Update channels**
  - Fabric: 10 / 40 GBE
  - Update: Do we need the Update channel at all?
- **Protocol between AMCs and carrier**
  - PCIe seems to be dominating the COTS market
  - Should we go for Ethernet anyway?
- **Some definition of Zone 3**
  - Follow PICMG 3.8?

Major points to solve

- **Power supply**
  - Format and location (one per shelf, per frame…)
  - Output power (ATCA blades may require up to 250 W)
  - Cooling in the existing infrastructure
  - Remote control
- **Shelf Cooling**
  - Keep vertical (bottom to top) air-flow for compatibility with existing rack infrastructure (turbines, heat exchangers)
- **Timing Trigger Control (TTC) distribution**
  - Globally in a (ATCA based) sub detector segment
  - Locally in a single shelf
  - Compatibility with future TTC upgrade (Phase II)

Some other points to understand

- **How do ATCA systems and PSUs integrate into DCS?**
  - Is there commercial or open source S/W that could be used?
- **Configuration and monitoring**
  - Is there a need for common concepts and S/W packages?
  - Do we have to re-design the RCD S/W?
- **Implications of vertical air flow within a rack**
  - If one shelf in a rack increases its fan speed, the other shelves in that rack need to follow suit
- **Main Data flow**
  - Will the backplane be used to transfer (collect) physics data?
- **Are there implications for related DAQ sub-systems (e.g. ReadOut System, on-line S/W, databases)?**

Summary

- Main **needs** for the Back-end upgrade of ATLAS have been **identified**
- The answer seems to be **ATCA**
- Some **common elements** have already been defined
- A non exhaustive **list of points to solve** exists
- Work will continue…