Readout architecture

Use of VME in ATLAS

Is VME not adequate for future systems?

Interest in ATCA

Tentative time scale for development and deployment of ATCA based systems

List of projects

Risks
Current Readout Architecture

- ReadOut Drivers (ROD) and ReadOut Buffers (ROBIN element of the ROS) separated
  - ROD in VME
  - ROS in PCs
  - S-Link in between

- Reasons for separation
  - Easier commissioning
  - Factorisation
VME based RODs

- **In normal data taking**
  - The VMEbus does see the data
    - They go through S-Links
  - VMEbus used for configuration, control and monitoring
    - Limited bandwidth

- **During special runs (standalone, calibration,...)**
  - DAQ software running in the VME crate
  - Trigger rate can be limited
What has been good with VME

- Availability of standardised crates and easy procurement process
  - Easily integrated in the counting room
    - Size, cooling, ...
  - Different flavours although a single protocol
    - Size, power supplies

- Availability of maintenance contract

- Availability of Single Board Computers
  - Family with upgrade capability
  - Standard ATLAS software
    - ROD crate DAQ

- Overall relatively low overhead cost
  - 840 ChF per slot for a 9U system & 640 ChF per slot for a 6U system
  - Includes bin, fan-tray, power supply and SBC

- About 220 crates in ATLAS
Is VME not adequate for future systems?

- If we keep the same readout architecture and the same functional boundaries
  - VME can still do the job
  - Monitoring tasks could run in PC connected to ROD through ethernet

- However, it’s difficult to predict what VME will be in the years 2022–2032 (HL-LHC)
  - First designs in VME in 1982 or so…
  - VXS could be a natural extension
Interest in ATCA (1)

- High speed connections between boards could be very useful for the calorimeters upgrades
  - Phase 2

- In the case we change the architecture and we merge the ROD and the ROS on the same physical system
  - Not at all the baseline
Why ATCA?

- Need boards large enough to accommodate the I/O

Up to 48 Fiber’s per AMC (4 - SNAP12)

Possible LAr ROD

Connection to ROB through ATCA backplane using 10Gigabit Ethernet

LVL 1 Interface

AMC PU
Wish list

Whatever the selected new standard will be we’ll need the following:

- Integration in the existing infrastructure
  - Cooling with vertical air-flow
- Common family of crates (as done for VME)
- Controller (Shelf manager & control software, embedded CPU?)
- Purchasing and maintenance contracts
Current System Schedule

- PRR dates for the FE electronics and for the RODs

**FE PRR vs date**

**ROD PRR vs date**
Tentative Schedule

- Not yet discussed in ATLAS

- Large change in off-detector electronics not before Phase-2 (2022 or so)
  - Although some new parts for level-1 calorimeter and possibly new muon detector parts (New small wheel) could be installed for Phase-1

- Decision on which platform is to be used to be done within the next 2 years
  - Decision process not defined yet
  - Standardisation needed

- Availability of standard elements (crates, etc.) for deployment 2 years after(?)
On-going Projects (1)

▶ Developments at SLAC
  ◦ Presented during TWEPP10 and last ACES
    ▶ http://indico.cern.ch/event/twepp10
    ▶ http://indico.cern.ch/event/ACES2011

▶ TTC included in new generations

▶ Used for reading out the new IBL0 pixel layer
  ◦ Although the new ROD for IBL will be in VME
On-going Projects (2)

Tile Calorimeter

- Development of mezzanines
- Optical link card with SNAP12
- GBT receiver
On-going Projects (3)

- LAr calorimeter goal: 150 Tbps total system

- AMC cards are Processing Units

- ATCA Carrier board

- Controller mezzanine (presented this morning)
Conclusions

- ATCA is a good candidate for the calorimeter RODs
  - High amount of data to be treated
  - High speed interconnections between board for Level1
  - Which redundancy do we require?

- No formal decision taken yet

- Must be easily included in current infrastructure

- Similar support as we have for VME would be required
  - Controller
  - Procurement and maintenance