ATCA in Phase-2 CMS

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All CMS Phase-2 back-end electronics will be ATCA-based

- Chose the CERN-selected Schroff chassis (dual-star)
- Chose the CERN-selected Eltek -48V rectifier
- No central recommendation for IPMC, as long as it meets the PICMG standard

Baseline:

- Two shelves per rack
  Leaves space for heat exchangers, patch panels, etc.
- DAQ and Timing Hub in the first hub slot
  Second hub slot reserved
- Two free node slots per shelf
  Leaves room for the unforeseen and for possible slot-based problems
Standardized the use of the backplane for clocks, and timing and throttling signals (as we did for MicroTCA in Phase-1)

- Standard 1 Gbit/s Ethernet to all slots
- LHC bunch-crossing clock (40.08 MHz)
- Precision crossing clock (320.64 MHz)
- (Clk3 also carries bunch-crossing clock)
- TTC2 trigger and fast-control stream (from DTH to back-ends)
- TTS2 throttling stream (from back-ends to DTH)

DAQ links use the front-panel side for optical fiber connections
There are many excellent back-end boards being developed in/around the CMS collaboration, each targeting one or more specific tasks.

Time does not allow me to discuss (or even show) them all.
DAQ and Timing Hub (DTH)

DTH: ATCA board housed in subdetector back-end crates

- Lives between the synchronous world of L1 trigger and detectors and the asynchronous DAQ world
- Distributes clock signals, synchronization commands, L1 trigger, and slow control from central systems to back-ends
- Receives event fragments from back-ends, concentrates and buffers these, and transmits them to the data-to-surface network
On-board monitoring/control logic

Trying to converge on a (more-or-less) common approach. Current contenders are:

- **Zynq-based**
  Favoured by most of the hardware developers for its ease of integration with the actual hardware.

- **COMExpress**
  Favoured by the sysadmins for its x86 architecture. I.e., straightforward integration into the existing x86-based online cluster infrastructure.

For maintenance and operations, we should like to settle on a single architecture and OS, preferably on a mezzanine for upgradability.
Apart from hoping for convergence, we’re also studying how best to support diversity in the online systems.

On-going investigations into improving online network robustness and possibly allow higher levels of autonomy on certain parts. E.g.:

- ‘Segmentation’ (or VLANs) of the control network
- Rigorous use of bastion hosts to shield hardware from network and vice versa
Open items, to be studied once some multi-board setups become available, and start being used:

- **Powering and cooling integration.** (Following the EP-ESE and ATLAS studies with interest, so far.)
- **Noise vs. people working, noise vs. visitors, noise...**
• A lot of ‘details’ still under discussion
• The current rapid developments on the hardware side help focus the discussions
• Expect convergence on many topics in the next O(12) months, driven by experience integrating the first round of back-end, trigger, and DAQ prototypes