Thoughts on DAQ (software) for ArgonCube

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The Goal

The Committee expects the first phase [of ArgonCube] to investigate open questions such as … data compression, and event reconstruction.

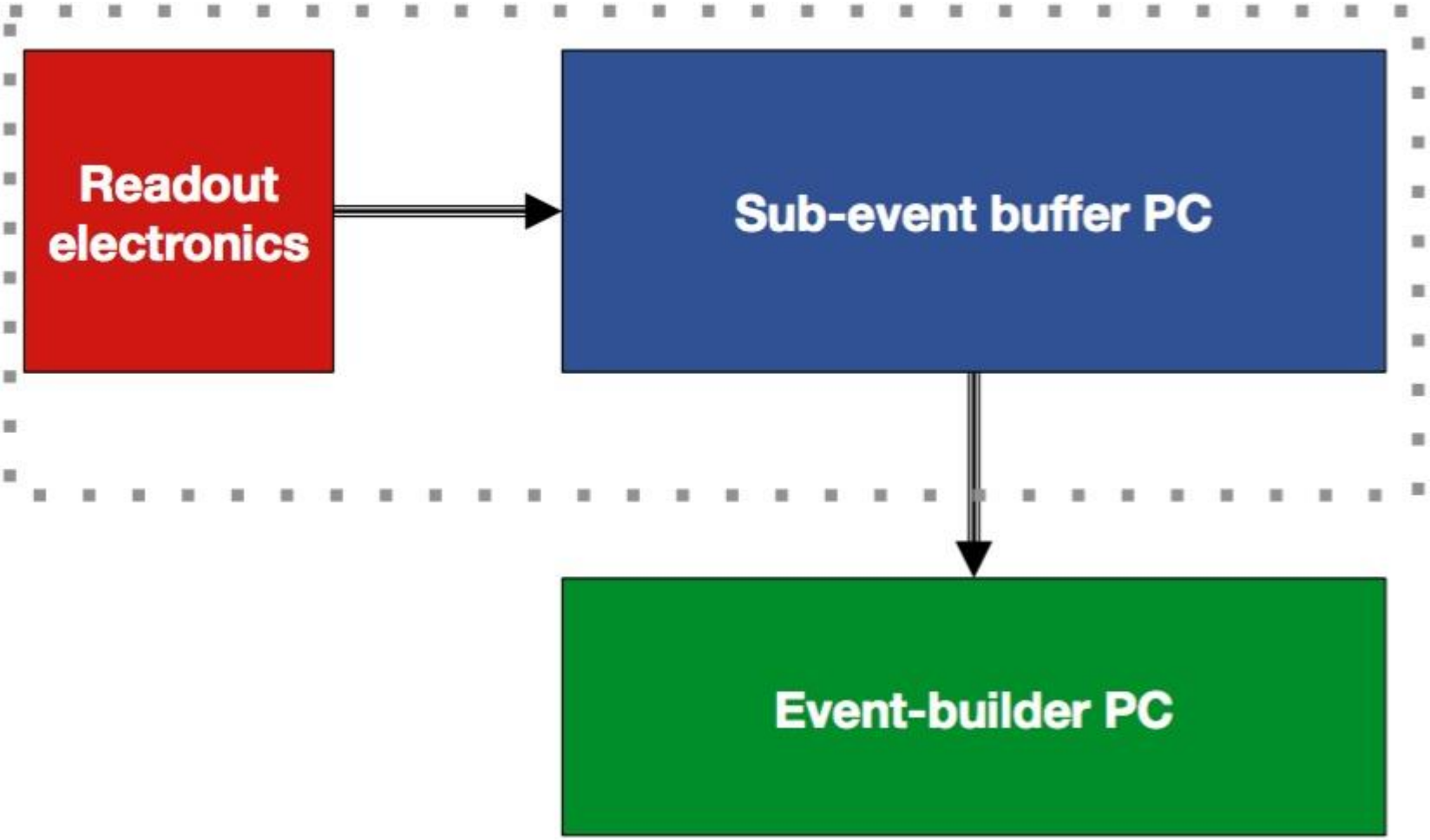
We need to reliably..

- collect lots of data
- be able to store/process/reconstruct it
- do this for variety of readout technologies

The DAQ (software) Challenge

- Not going to touch on the hardware side
  - Very interested, but different set of questions
- From the software, the modularity means…
  - → be able to run the modules independently *and* together, seamlessly
  - → support different data input formats and convert to common data output format
- For R&D, common solution for all modules not completely necessary
  - But could be a clear benefit where we have limited development resources

As an example: MicroBooNE's DAQ



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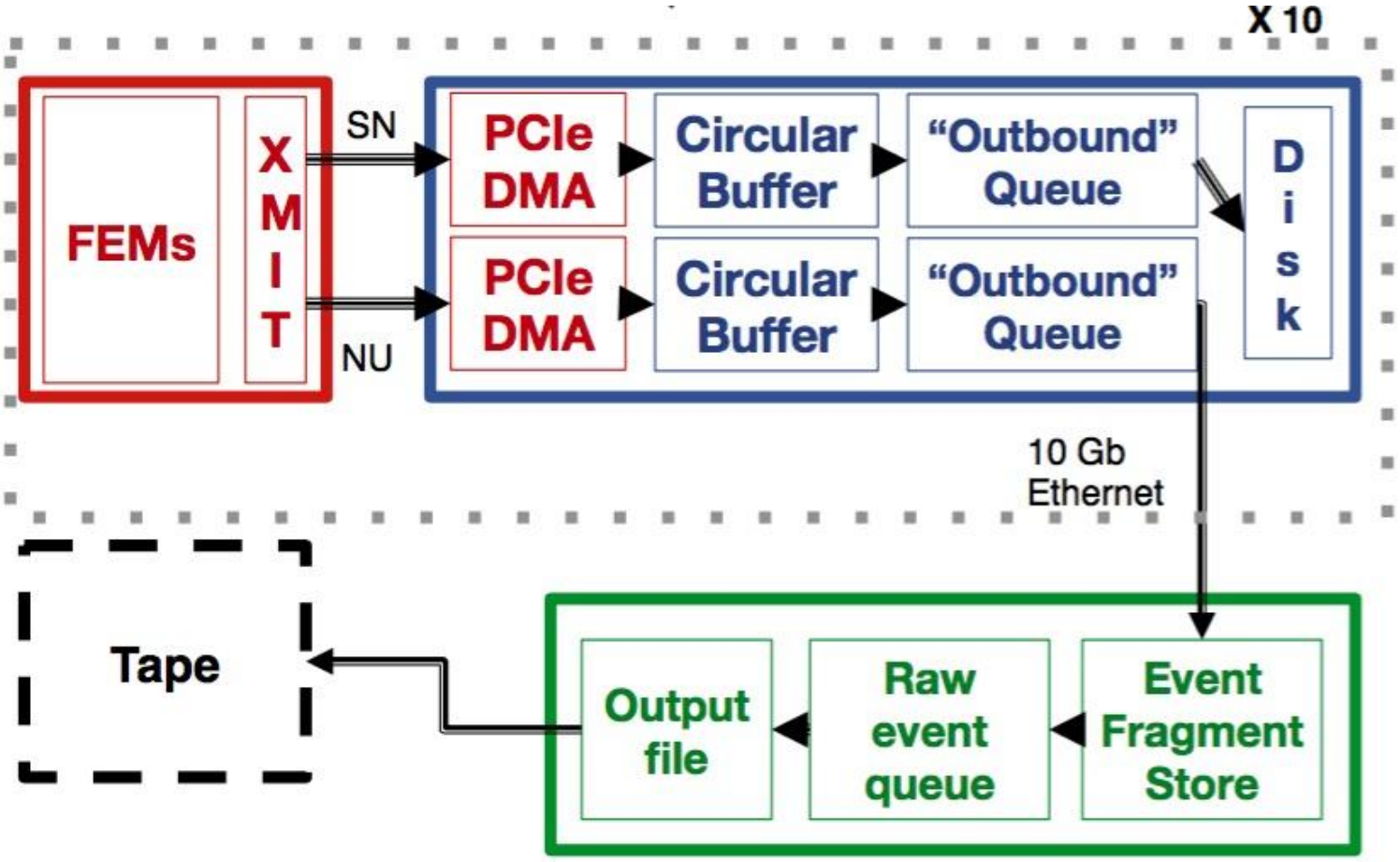


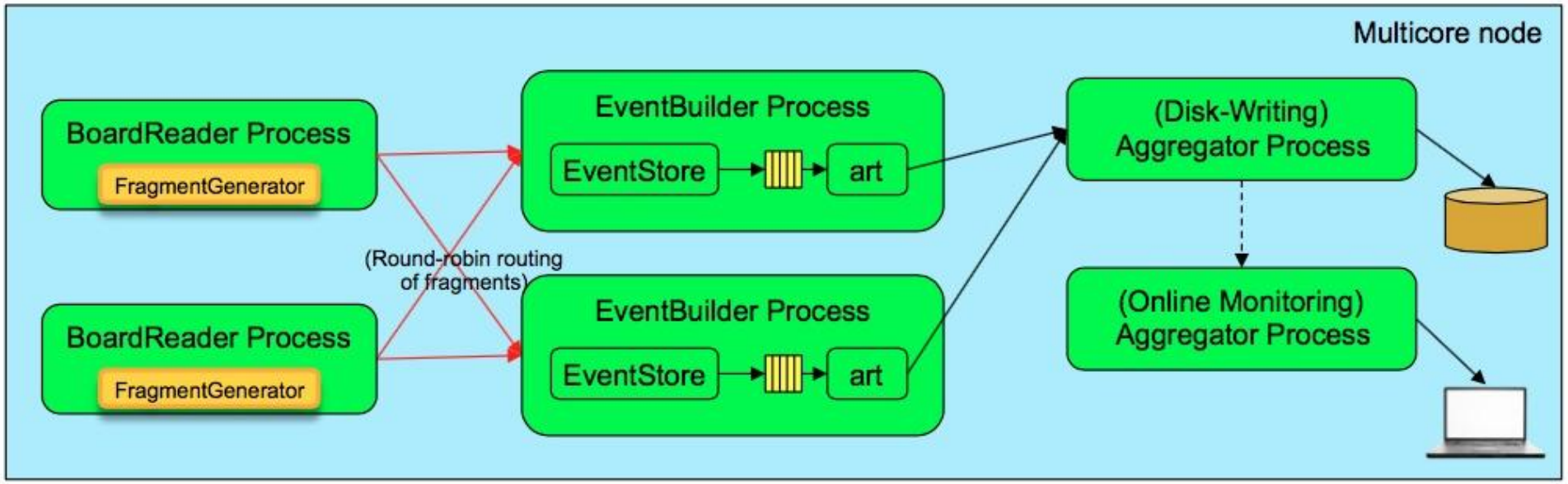
MicroBooNE DAQ details

- Bigger than the modules here, of course
  - >8000 wires, reading out at 2 MHz over 4.8 ms → 150 MB/event without compression
    - Huffman coding compression about factor 5
- Inputs from TPC and PMT sources with a common clock, common trigger
  - But inputs from other sources (Laser, cosmic paddles, beam info) that are linked based on event timing
- We've exercised about 350 MB/s disk-writing speed, with one event builder node

Same general model used by artdaq

- artdaq: FNAL SCD's core DAQ software
  - Common, reusable components for data transfer, event building and writing, process management, state behavior, messaging, and more
- Provides integration to art event-processing framework
  - → Link to LArSoft reconstruction
  - Allows for use of same algorithms online and offline
- In use by a number of LAr experiments
  - Including Darkside, DUNE 35-ton and Lariat

artdaq data flow



Ultimate goal

- Common software framework for handling data after it arrives in PC
  - Specific-written pieces for data arrival
- Common tools for control of data flow
  - Run control, configuration, etc.
- Same basic design from test stand to final production
  - Allow flexible and modular software implementation
- SBN program will likely drive much of this work
  - ArgonCube can benefit, and help drive development

Open questions for discussion

- Hardware…
- Triggering scheme
  - Will one module trigger readout in another?
  - If we aren't reading out unsuppressed waveforms, is there a need for a hardware-driven trigger?
- Reconstruction software links
  - artdaq → LArSoft, but LArSoft currently bases reco on wires
- Others for sure...

Thank you!