



FEX Hub Module Preliminary Design Review:

Hub Requirements

**Dan Edmunds, Yuri Ermoline,
Wade Fisher, Philippe Laurens**

01 Oct 2014

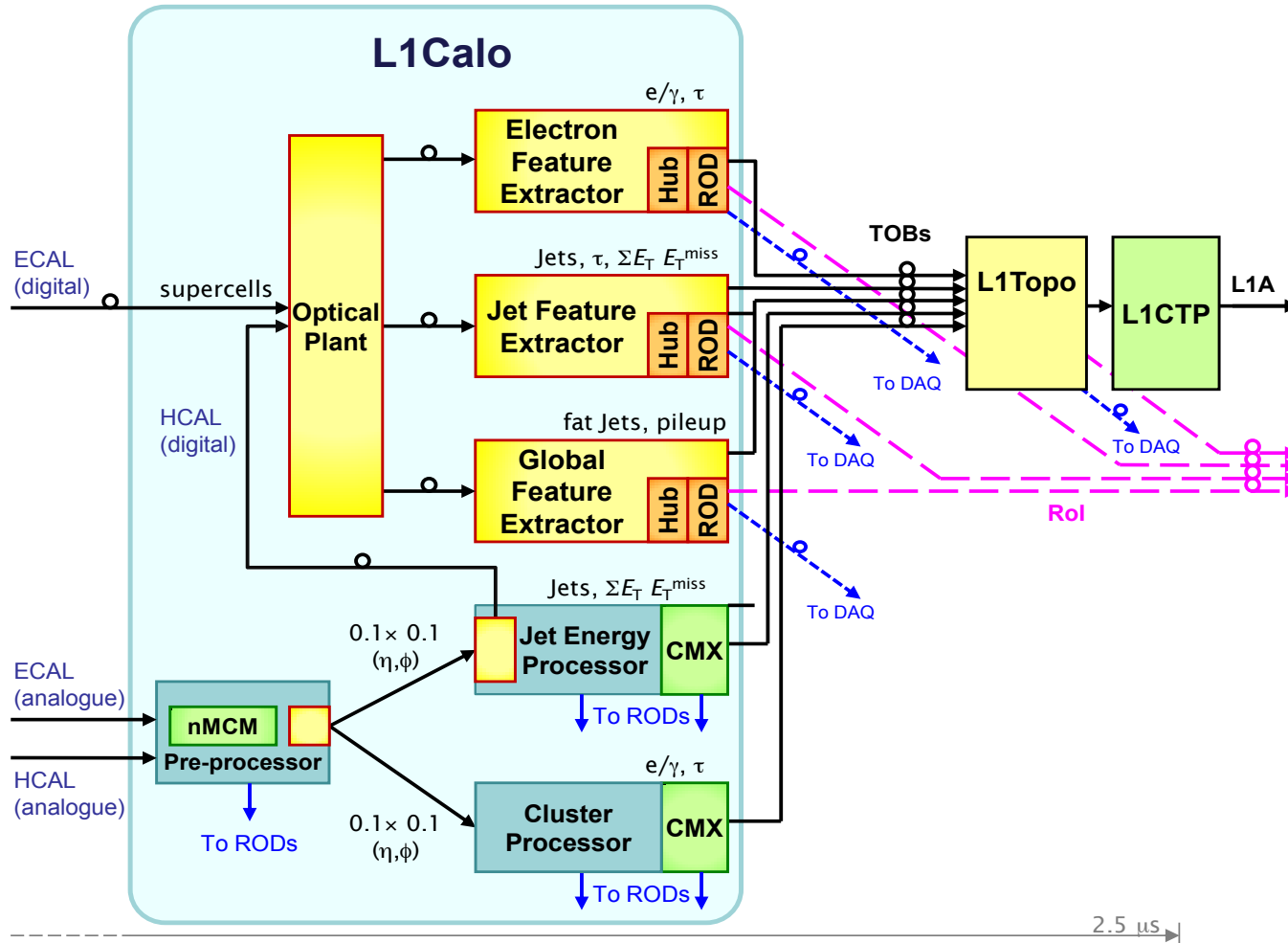


Introduction

- ❖ We are presenting the preliminary design specifications for the prototype FEX Hub module
 - Preliminary designs for interfacing L1Calo modules are available:
 - eFEX: <https://indico.cern.ch/event/298876/>
 - jFEX: <https://indico.cern.ch/event/331185/>
 - gFEX (coming soon)
 - ROD: <https://indico.cern.ch/event/323679/>
 - Many implementation details are not ready to be finalized yet
 - Prototype Hub should address all of these, though
 - Today's goals:
 - Clear understanding of interface to FEX & ROD modules
 - Well-defined scope of Hub functionality
 - Agreement on prototype (production) schedule and test-rig Hubs
- ❖ Collection of all relevant Hub Materials (talks, docs, etc)

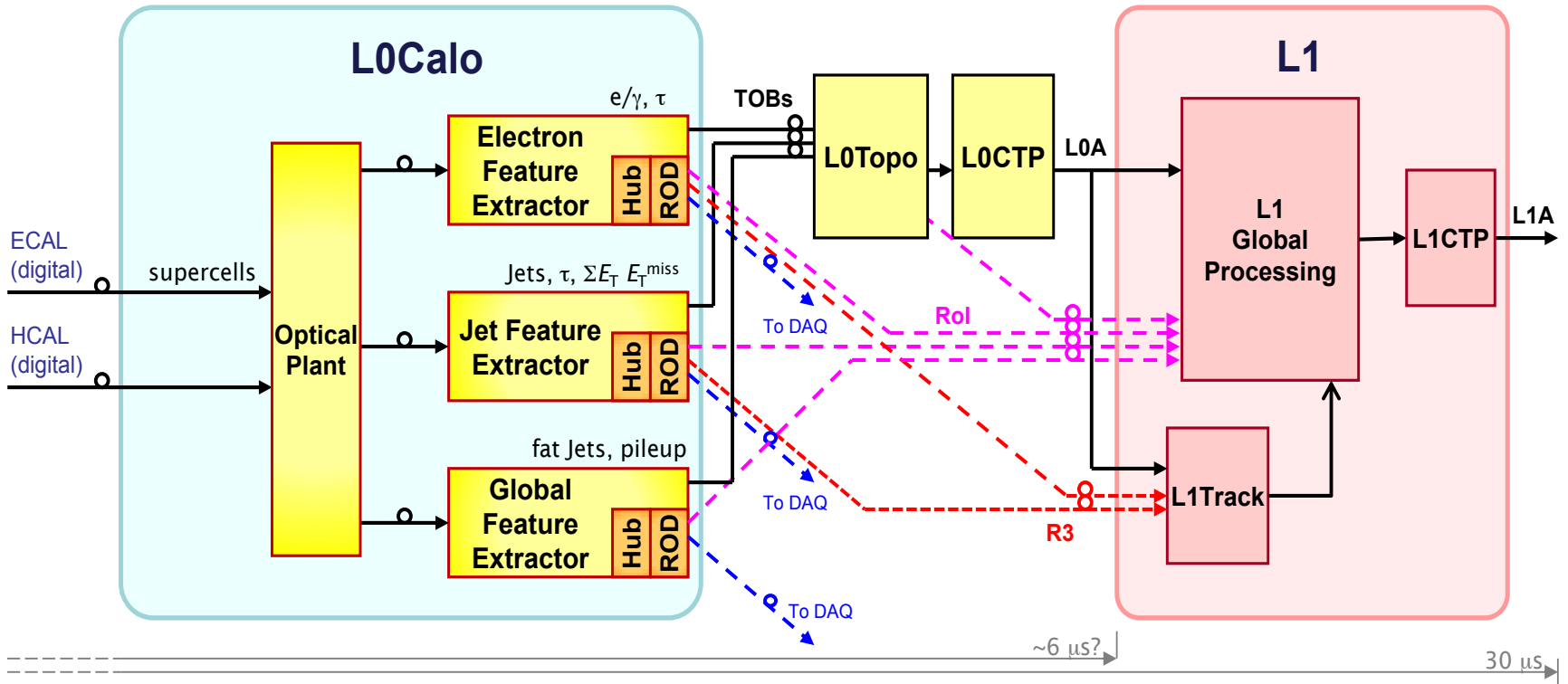
http://www.pa.msu.edu/hep/atlas/l1calo/hub/specification/1_preliminary_design_review/

L1Calo Upgrade, Phase-I



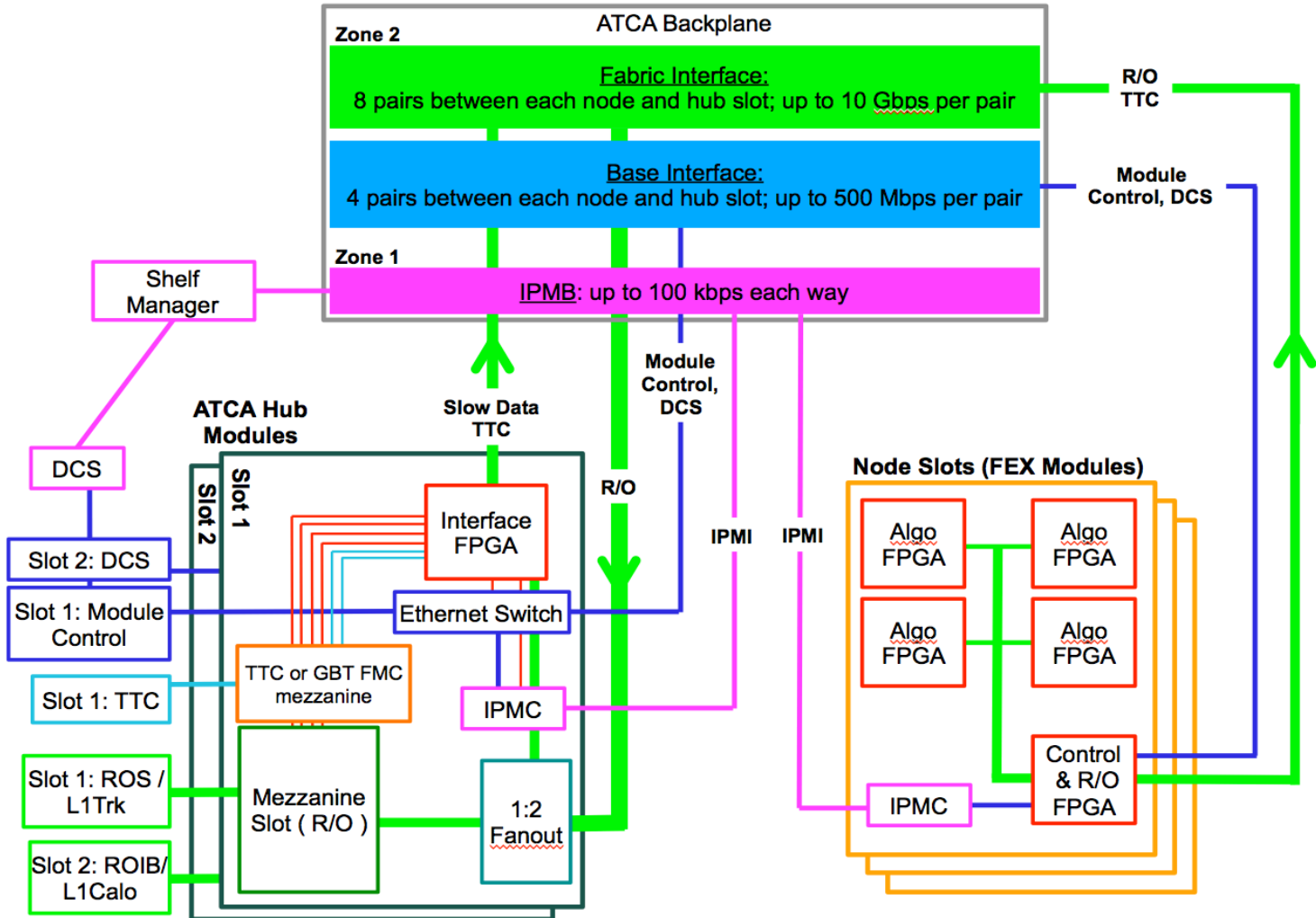


L1Calo Upgrade, Phase-II





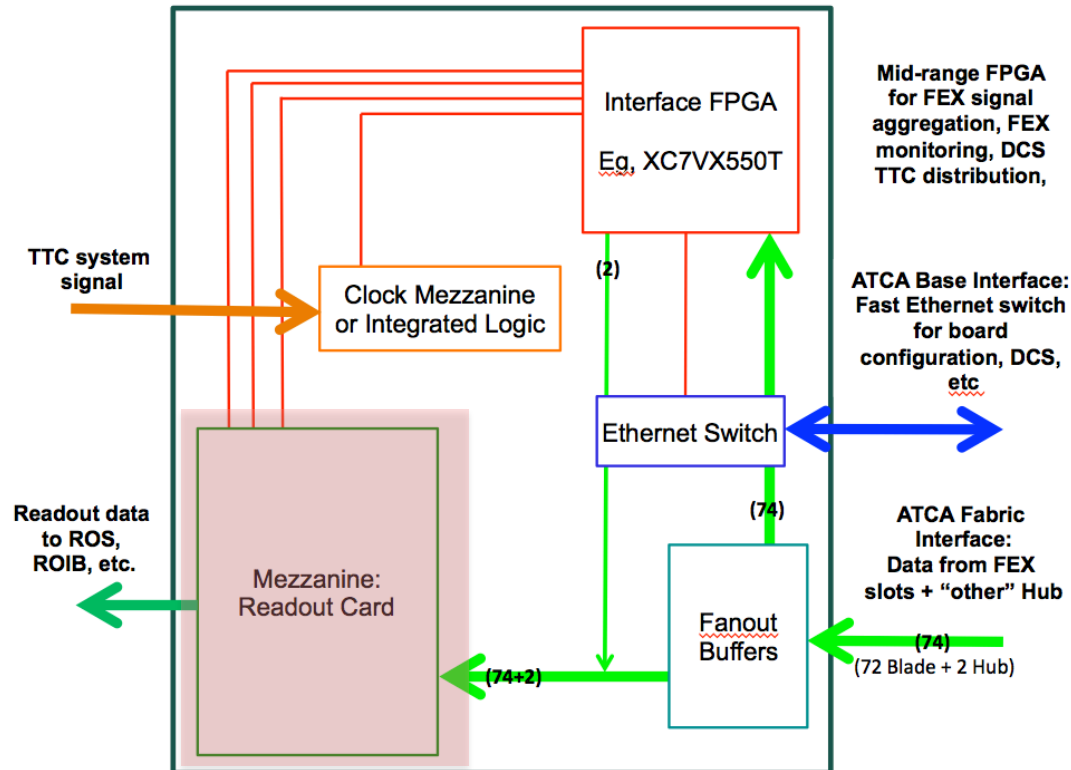
FEX Hub Module Use Diagram





FEX Hub Requirements (1)

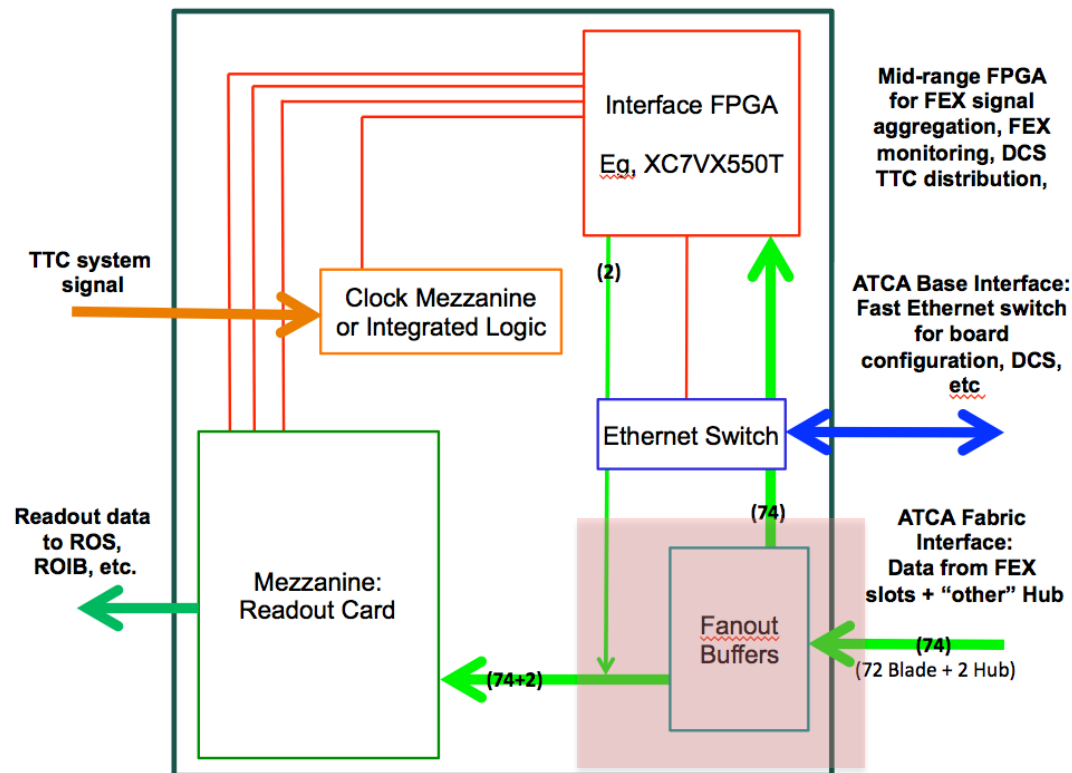
- ❖ The FEX Hub module physically holds the ROD Mezzanine
 - Electrical connections via two 400-pin Meg-Array connectors
 - Mechanical supports as necessary





FEX Hub Requirements (2)

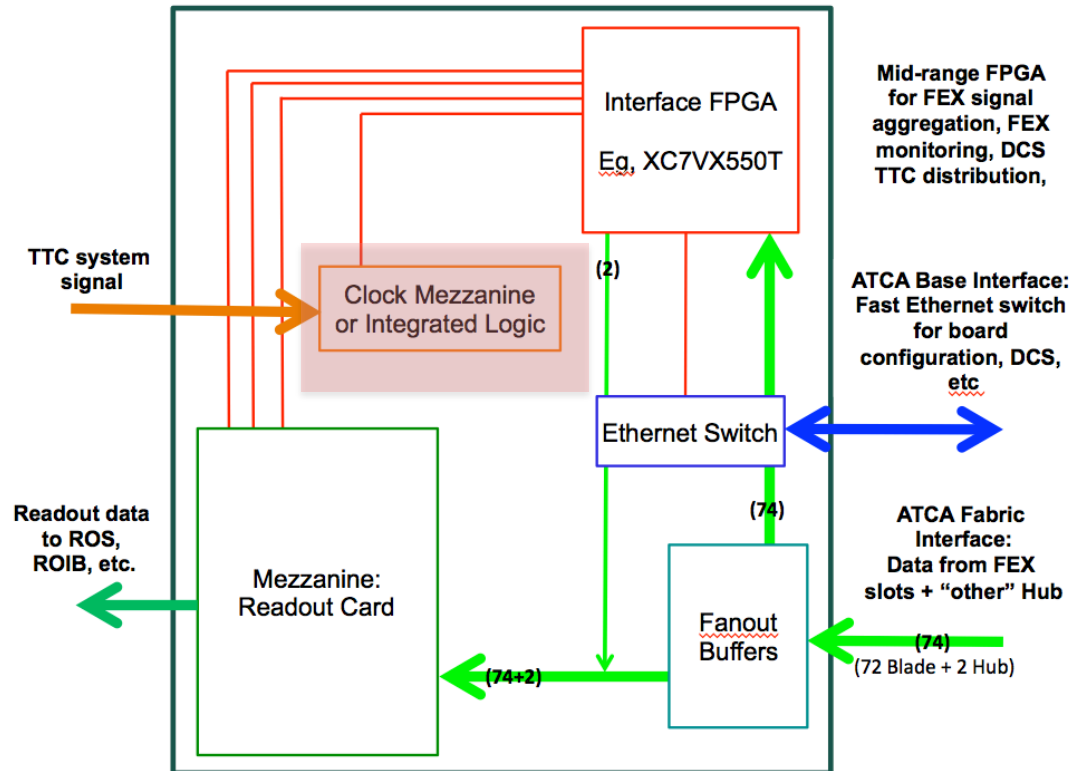
- ❖ The FEX Hub receives and distributes high-speed signals over the fabric interface.
 - 6 serial streams of readout data from FEX slots, 2 from the other Hub
 - Data is fanned-out to the ROD and the Hub main FPGA





FEX Hub Requirements (3)

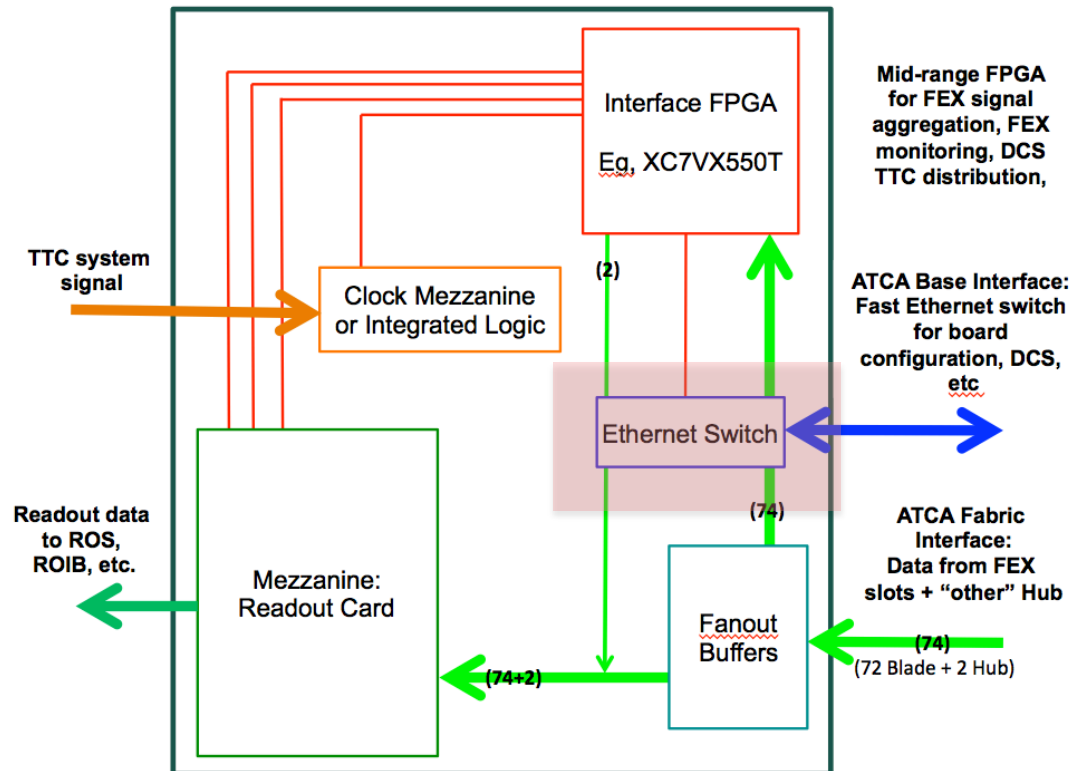
- ❖ The FEX Hub receives and distributes the clock and TTC data stream to FEX nodes, RODs and the other Hub
 - 2 Fabric Interface pairs used to transmit to each FEX & Hub node
 - TTC data stream is encoded with back-data from RODs
 - Actual implementation (TTC-FMC, SFP for GBT, etc) remains in flux





FEX Hub Requirements (4)

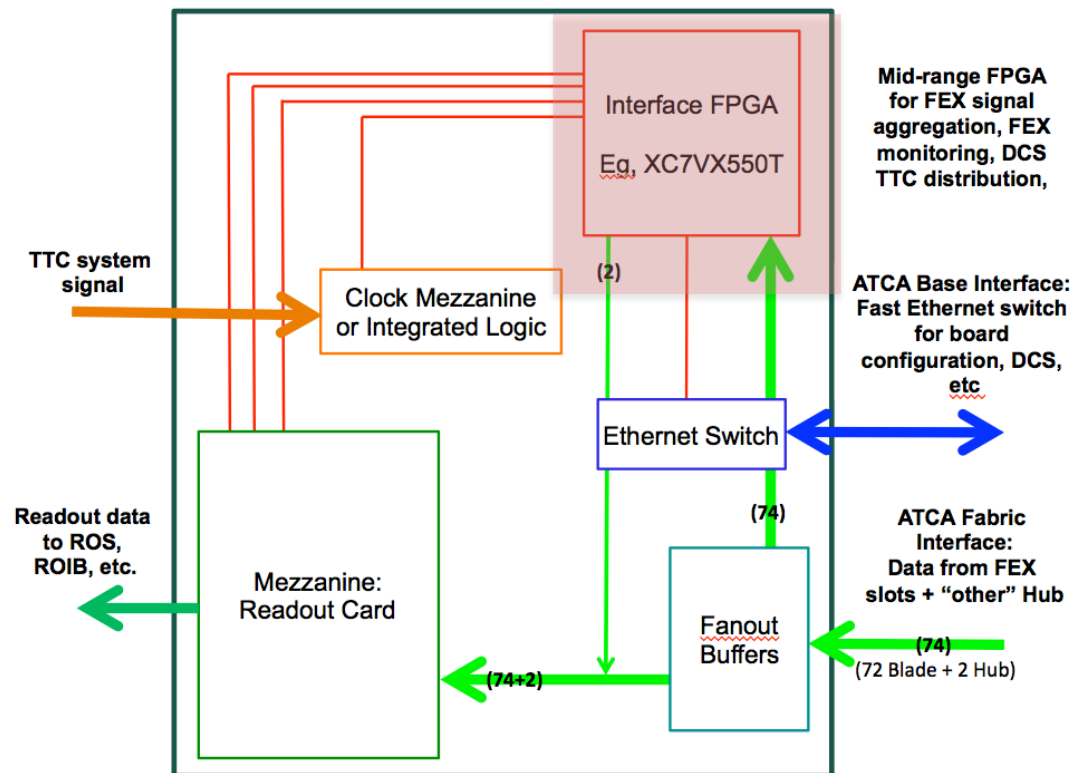
- ❖ The FEX Hub modules establish Ethernet networks on the Base Interface
 - 1 network intended for slow control, 1 for DCS-like monitoring
 - Connections to each network by RODs on Hubs 1 and 2 are needed





FEX Hub Requirements (5)

- ❖ The FEX Hub will maintain some level of future-proofing “lifeboat” resources
 - Main FPGA chosen by # MGTs, plenty of resources for processing
 - External optical connection “option” will be made available





Conclusions

- ❖ The FEX Hub module is a core L1Calo module
 - Introduced during Phase-I upgrade, continued use through Run-4
 - Facilitates communications in and out of FEX ATCA shelves

- ❖ Core functionality is reasonably understood
 - Physical and electrical support for ROD mezzanines
 - Route FEX readout data to ROD modules
 - Receive and distribute TTC clock and data signals
 - Establish Ethernet networks on ATCA Base Interface
 - Lifeboat capabilities to address future readout demands

- ❖ Some implementation details remain open
 - Goal is to finalize details soon for Hub prototypes
 - Electrical connections to other modules should maintain flexibility
 - Clock implementation needs to be finalized