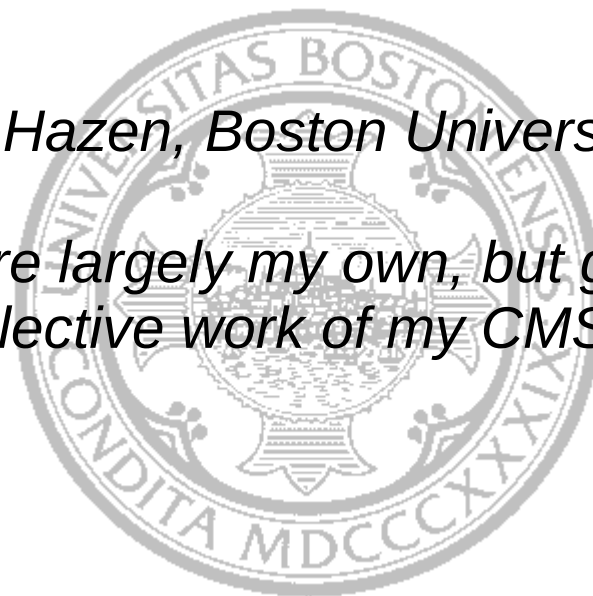




The Use of ATCA in CMS at the HL-LHC

E. Hazen, Boston University

(views are largely my own, but generally reflect the collective work of my CMS colleagues!)

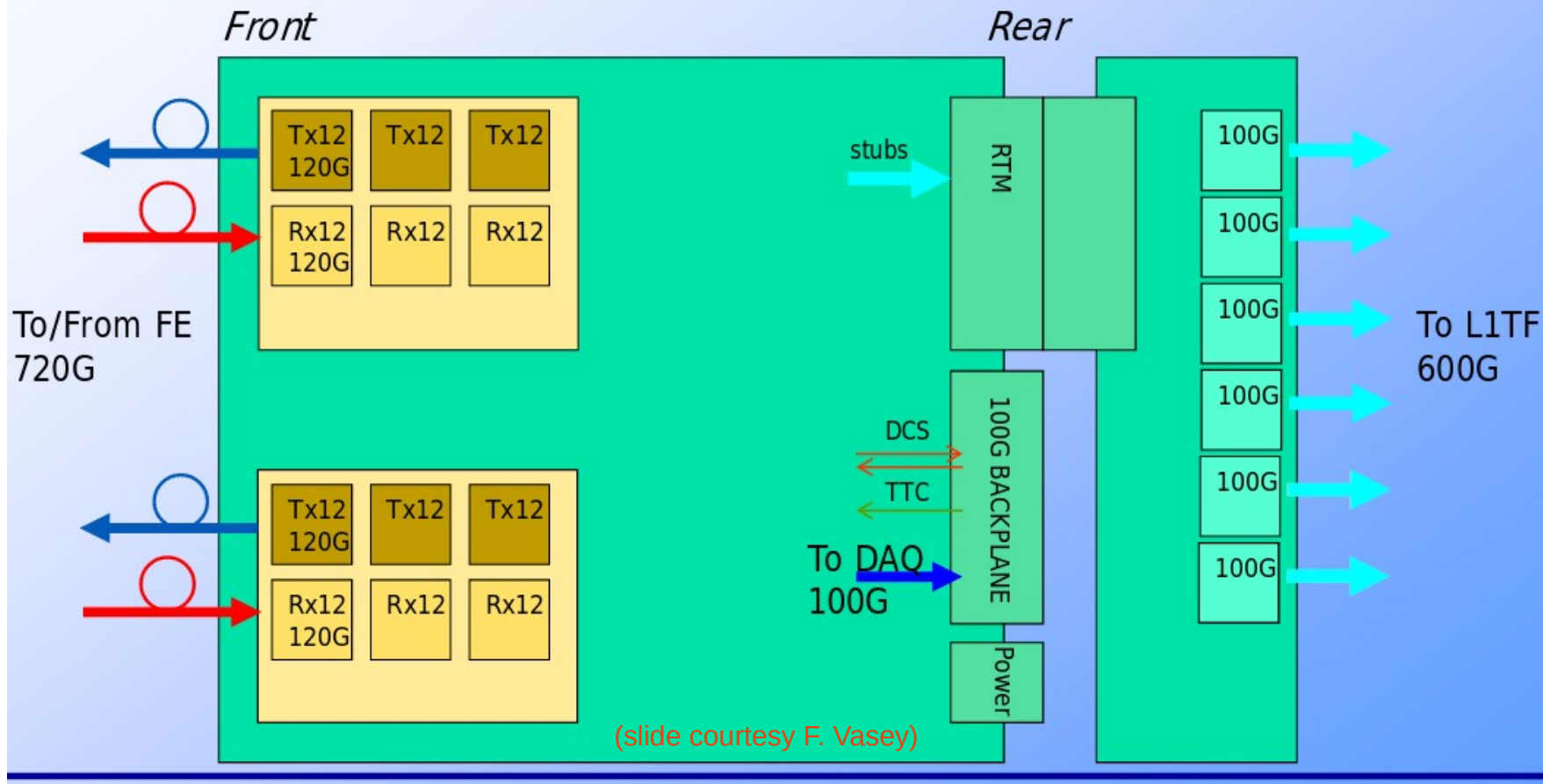




An “Easy” example Tracker DTC



- FE: 72 x 10G Transceivers
- BE-TF: 24 x 25G Transceivers on RTM
- BE-DAQ: 4 x 25G Transceivers
- 100G ATCA backplane





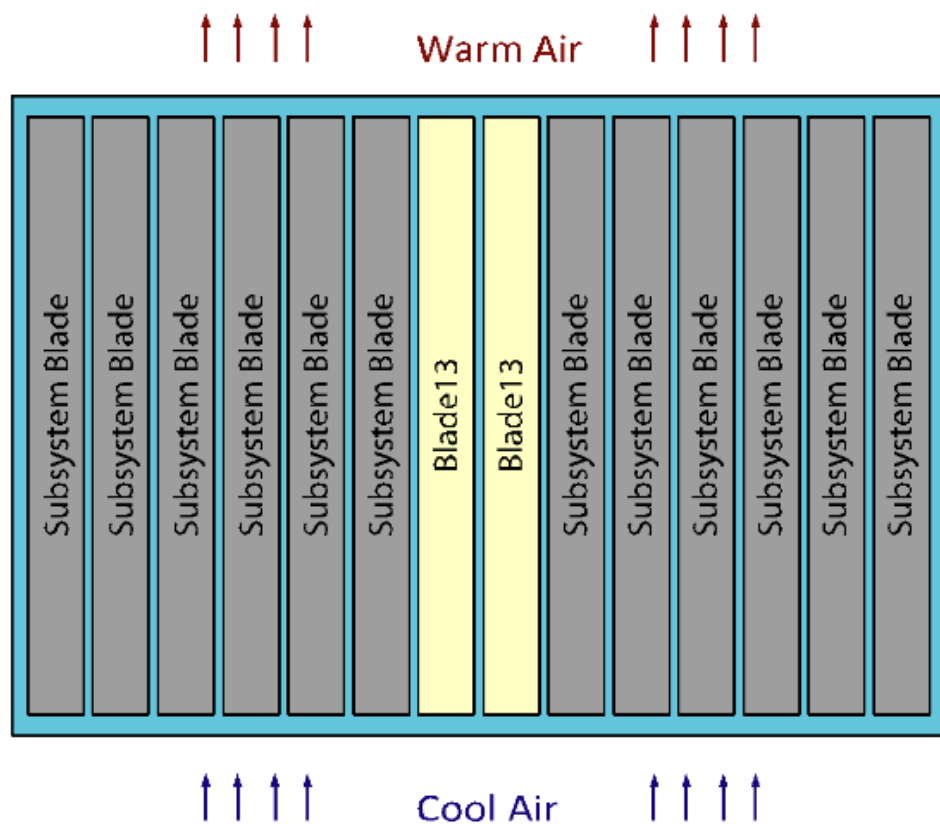
Common Features



- Implementing the “physics” functions is sufficient challenge, so we are trying to standardize the common features. Thus the following proposal
 - Commercial shelf manager outside card cage
 - CMS-specific DAQ blade (aka Blade13) in switch slot providing (over ATCA standard backplane):
 - LHC clock on ATCA CLK3
 - High precision (low jitter) multiple of LHC clock
 - Fixed-latency controls path (sim to TCDS)
 - Buffer management from back-end (sim to TTS)
 - DAQ at target rate of 100Gb/s per blade



Proposed ATCA Shelf



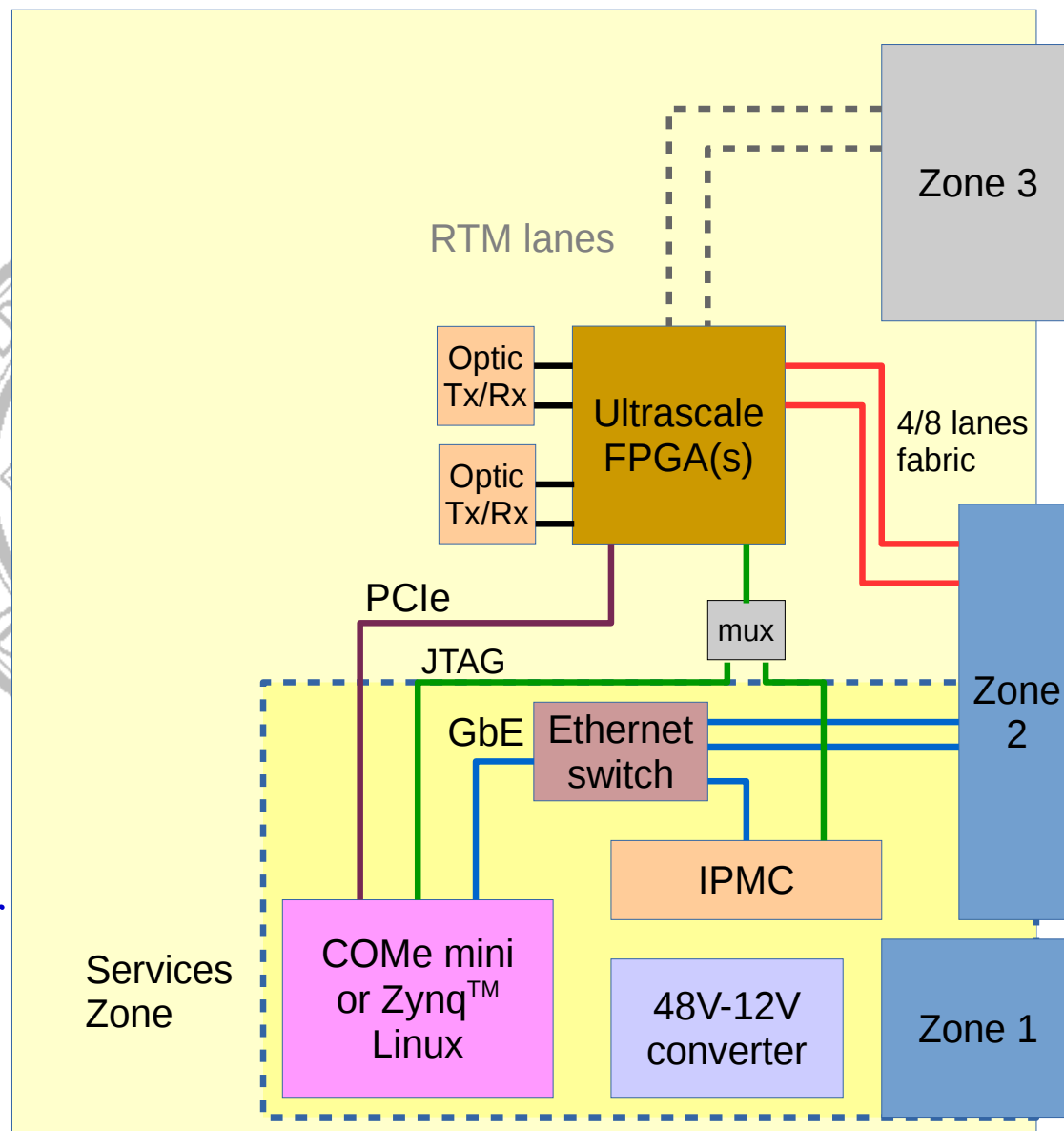
- 12 blade slots
- 2 switch slots (either COTS or DAQ)
- Vertical cooling
- 48V power input
- Dual-star or mesh



Typical CMS Blade



- IPMC design by CERN (talk elsewhere here)
- On-board system-on-chip/board running OS with full TCP/IP
 - Fast addressed access to FPGAs via *e.g.* PCIe
 - JTAG for remote configuration and debug
- Ethernet switch: access IPMC and on-board Linux from either switch slot
- Ultrascale+ class FPGAs with two fabric ports routed to backplane for DAQ @ 10-25 Gb/s
- Reference design will be available for “Services Zone”





Forward...



CMS ATCA Crate Specification and Blade Requirements

Mark Dobson, Tom Gorski, Magnus Hansen, Eric Hazen, Jeroen Hegeman, Gregory Iles, and others September 2016 – Version 0.0

General concepts

This document describes a CMS-specific application of a COTS ATCA crate. It describes requirements for crate mechanics, backplane interconnections and some prescriptions for signal protocols on a few of the interconnections. It does not describe any software requirements at this stage, nor prescribe any particular implementation except as examples.

We have chosen ATCA as a crate system to complement microTCA and VME for the next

Document in preparation to guide blade development and aid in shelf selection

Preparation of reference design blade underway