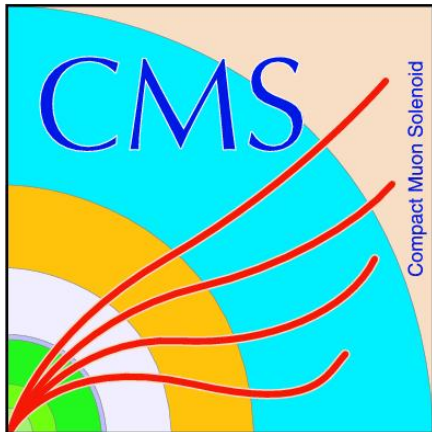


Emulator System for GEM-CSC Trigger

Aysen Tatarinov

Texas A&M University



CMS GEM DAQ
Hardware Roundtable
November 21, 2013

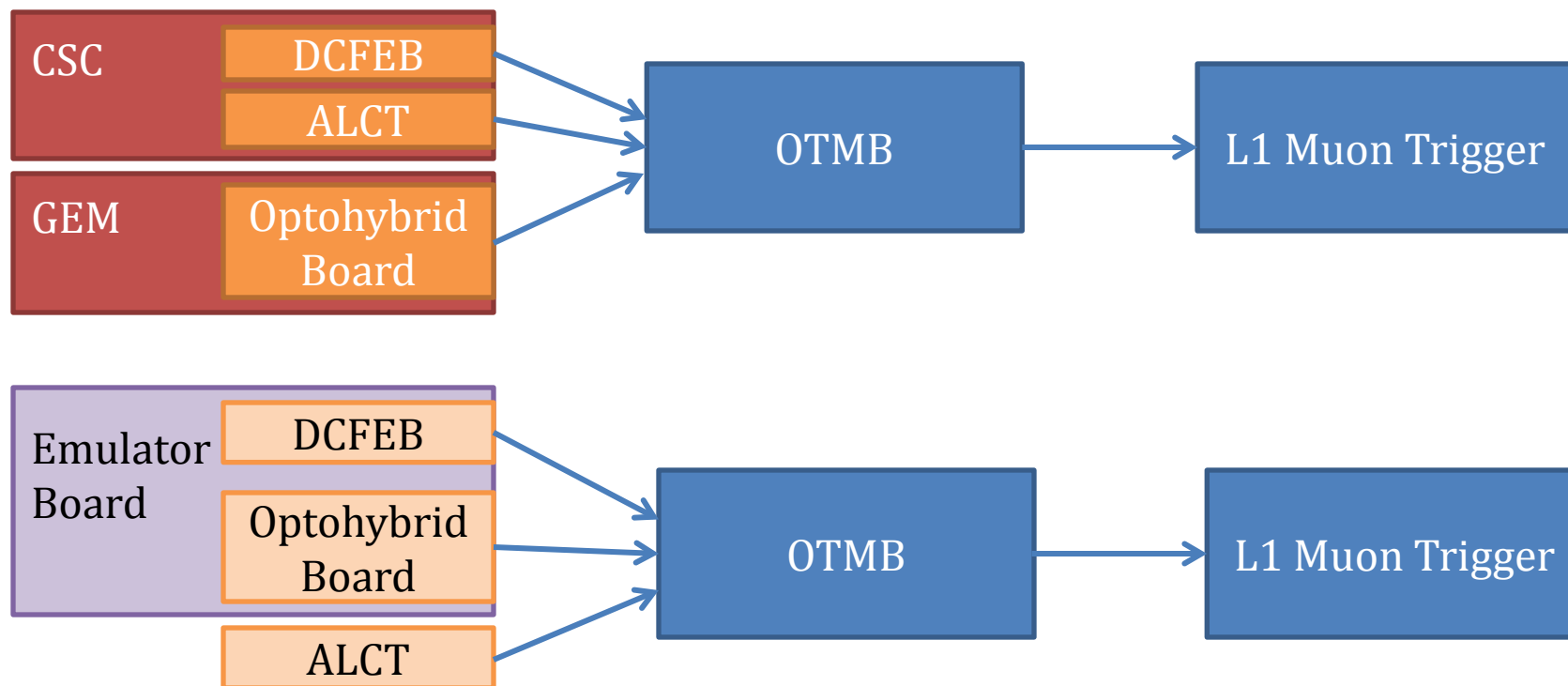


Outline

- Reminder
 - Emulator System for GEM-CSC Trigger
 - Short-Term Plan
- CSC-GEM Test Stand Application

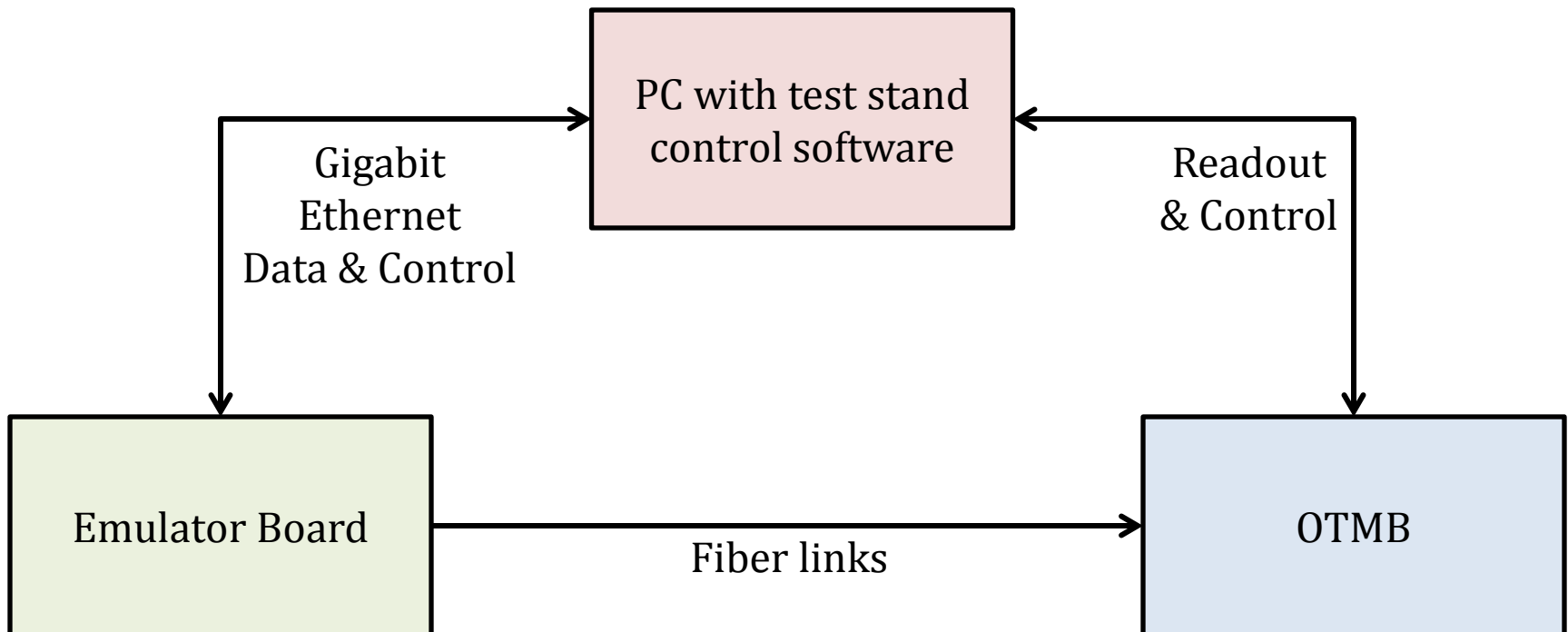
Emulator for CSC and GEM Data

- Emulates data inputs to OTMB from GEM & CSC electronics
 - A useful system for OTMB firmware development
- Initial developments focus on emulation of DCFEB comparator data and GEM trigger data sent to OTMB
 - These are fiber optic data paths



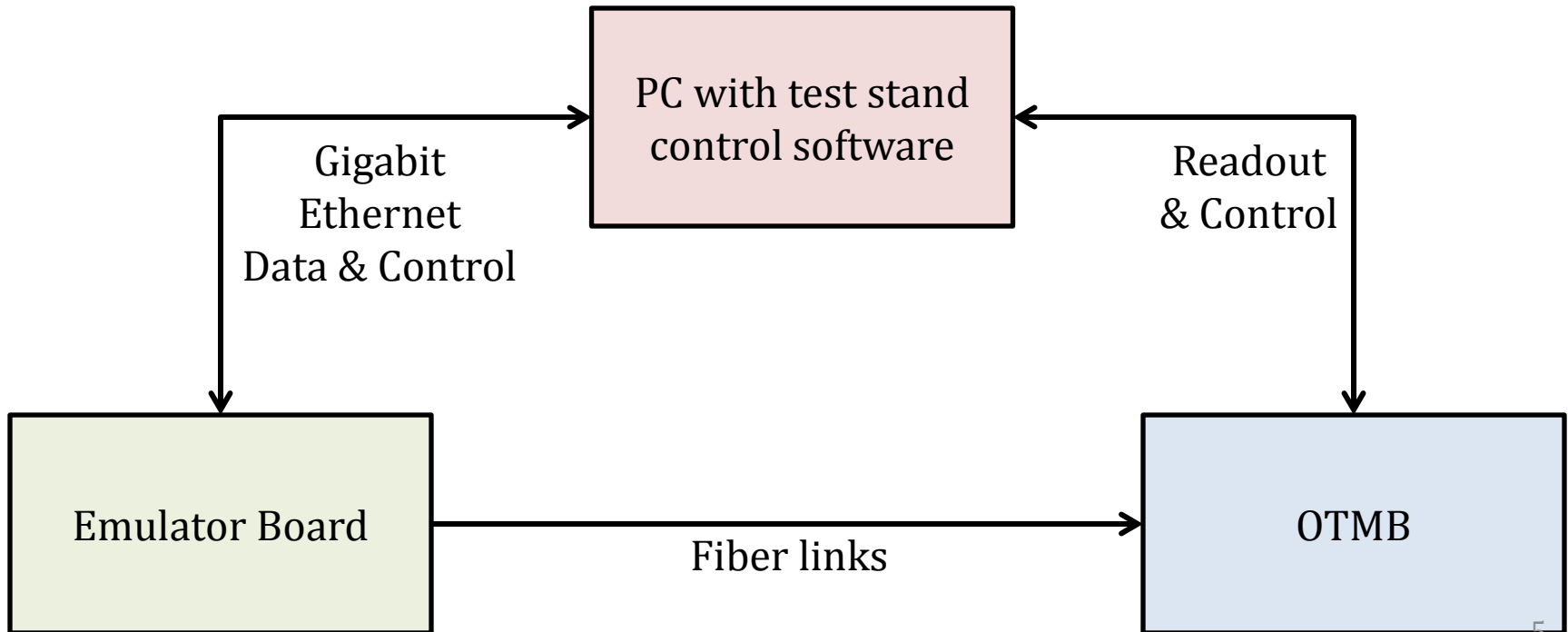
Emulator Test Stand Setup

- PC running XDAQ-based software controls the test stand
 - Data generation and loading into the emulator board
 - Data transmission from the emulator board to OTMB
 - Readout of trigger results from OTMB

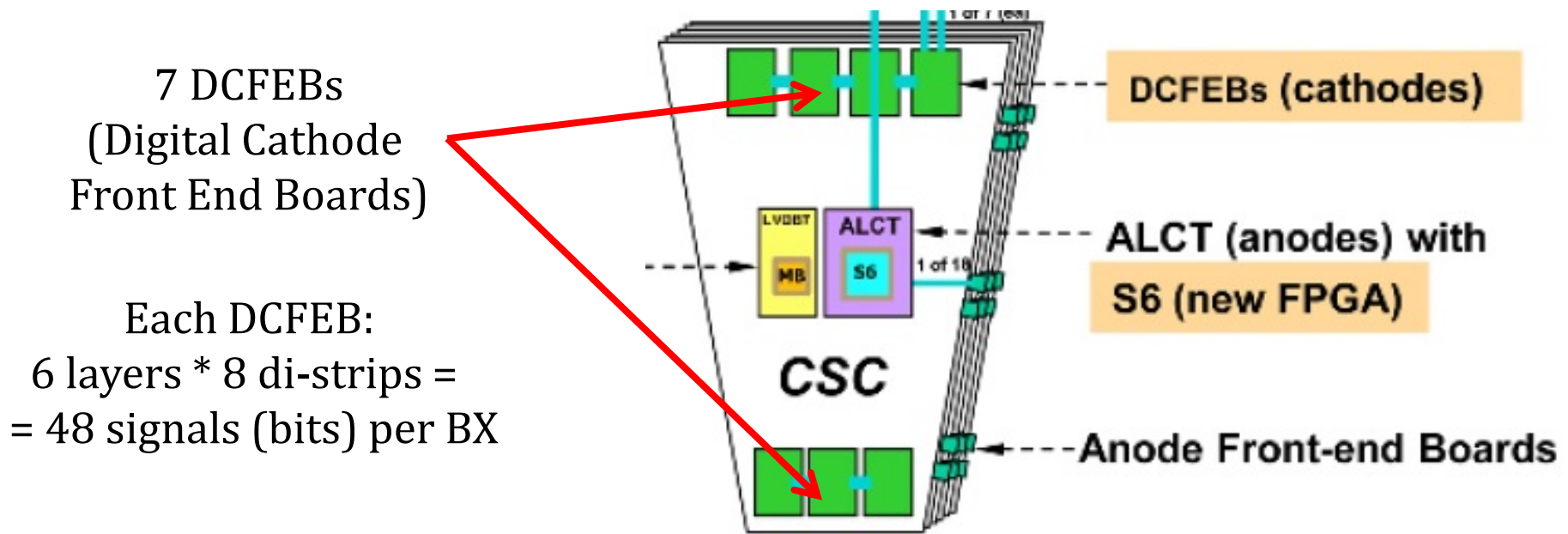


Short-Term Plan

- Short-term plan: proof the concept with simple options
 - Software to generate CSC data describing one straight muon stub and load it into the emulator board
 - Transmit the data to OTMB
 - Basic readout from OTMB to see if we can trigger the same stub



DCFEB Data Format



- Di-strips with no hits: all zero bits
- Di-strip with hit: hit location with half-strip precision encoded in “triads “ — 3 bits transmitted over 3 BXs
 - 1st bit — tells there is a hit in this di-strip
 - 2nd bit — tells in which strip there is a hit
 - 3rd bit — tells in which half-strip there is a hit

CSC-GEM Test Stand Application



HyperDAQ

Zones: default Groups: profile

http://165.91.180.31:20012

urn:xdaq-application:lid=3



[Control Panel](#)



[Cluster Explore](#)



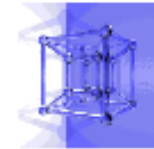
[executive](#)

urn:xdaq-application:lid=0



[pt http PeerTrans...](#)

urn:xdaq-application:lid=1



[hyperdaq](#)

urn:xdaq-application:lid=3



[xrelay](#)

urn:xdaq-application:lid=4



[pt fifo PeerTrans...](#)

urn:xdaq-application:lid=8



[emu pc
EmuPeriphe...](#)

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application:lid=70



[emu pc
TAMUTestAp...](#)

urn:xdaq-
application:lid=80



[emu pc
CSCGEMTest...](#)


urn:xdaq-
emu::pc::CSCGEMTestApplication

Custom applications

New XDAQ-based application
for CSC-GEM test stand

CSC-GEM Test Stand Application


- Application layout with all functionality in place



designed by J.Gutleber L. Orsini

GEM-CSC Test Stand

emu::pc::CSCGEMTestApplication



http://165.91.180.31:20012
urn:xdaq-application:lid=90

Generate DCFEB data

Directory:

DCFEB #: Half-strip #:

Upload DCFEB data

Directory:

Status of DCFEB#:

Status of DCFEB#:

Transmit DCFEB data

Readout results from OTMB

Generation of DCFEB Data

- Generate DCFEB data: one muon stub going through specific half-strip in specific DCFEB

Generate DCFEB data

Directory:

DCFEB #: Half-strip #:

```
[cmslab1] /home/cscdev/TriDAS/emu/emuDCS/CSCGEMTestStand/tmp > ls -l
total 56
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_1.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_2.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_3.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_4.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_5.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_6.pat
-rw-r--r-- 1 cscdev cscdev 4096 Nov  6 15:35 DCFEB_7.pat
[cmslab1] /home/cscdev/TriDAS/emu/emuDCS/CSCGEMTestStand/tmp > xxd -b DCFEB_1.pat | head
00000000: 10000000 10000000 10000000 10000000 10000000 10000000  .....
00000006: 00000000 00000000 00000000 00000000 00000000 00000000  .....
0000000c: 00000000 00000000 00000000 00000000 00000000 00000000  .....
00000012: 00000000 00000000 00000000 00000000 00000000 00000000  .....
00000018: 00000000 00000000 00000000 00000000 00000000 00000000  .....
0000001e: 00000000 00000000 00000000 00000000 00000000 00000000  .....
00000024: 00000000 00000000 00000000 00000000 00000000 00000000  .....
0000002a: 00000000 00000000 00000000 00000000 00000000 00000000  .....
00000030: 00000000 00000000 00000000 00000000 00000000 00000000  .....
00000036: 00000000 00000000 00000000 00000000 00000000 00000000  .....
[cmslab1] /home/cscdev/TriDAS/emu/emuDCS/CSCGEMTestStand/tmp >
```

One file for each
of seven DCFEBs

Hits in half-strip #1
in each of six layers

Upload & Check DCFEB Data

- Uploading DCFEB data to the emulator board
- Checking DCFEB data (reading it back and comparing with generated data)

Upload DCFEB data

Directory:

Upload data Status of DCFEB#:

Check data Status of DCFEB#:

Status of uploading and checking for each of seven DCFEBs

Upload DCFEB data

Directory:

Upload data Status of DCFEB#:

Check data Status of DCFEB#:

- Manually upload different data for DCFEB1 and perform check again:

Upload DCFEB data

Directory:

Upload data Status of DCFEB#:

Check data Status of DCFEB#:

Application shows that DCFEB1 did not pass the check

Data Transmission & Reading Out Results

- Data Transmission to OTMB
 - Work on the emulator board started

Transmit DCFEB data

Transmit data

- Reading out results from OTMB
 - Should be straightforward

Readout results from OTMB

Readout results

Conclusions

- New XDAQ-based application for CSC-GEM test stand
 - Data generation: **DONE**
 - Data uploading to the emulator board: **DONE**
 - Validation of uploaded data: **DONE**
 - Data transmission on OTMB: **in progress**
 - Reading our results from OTMB: **in progress**