

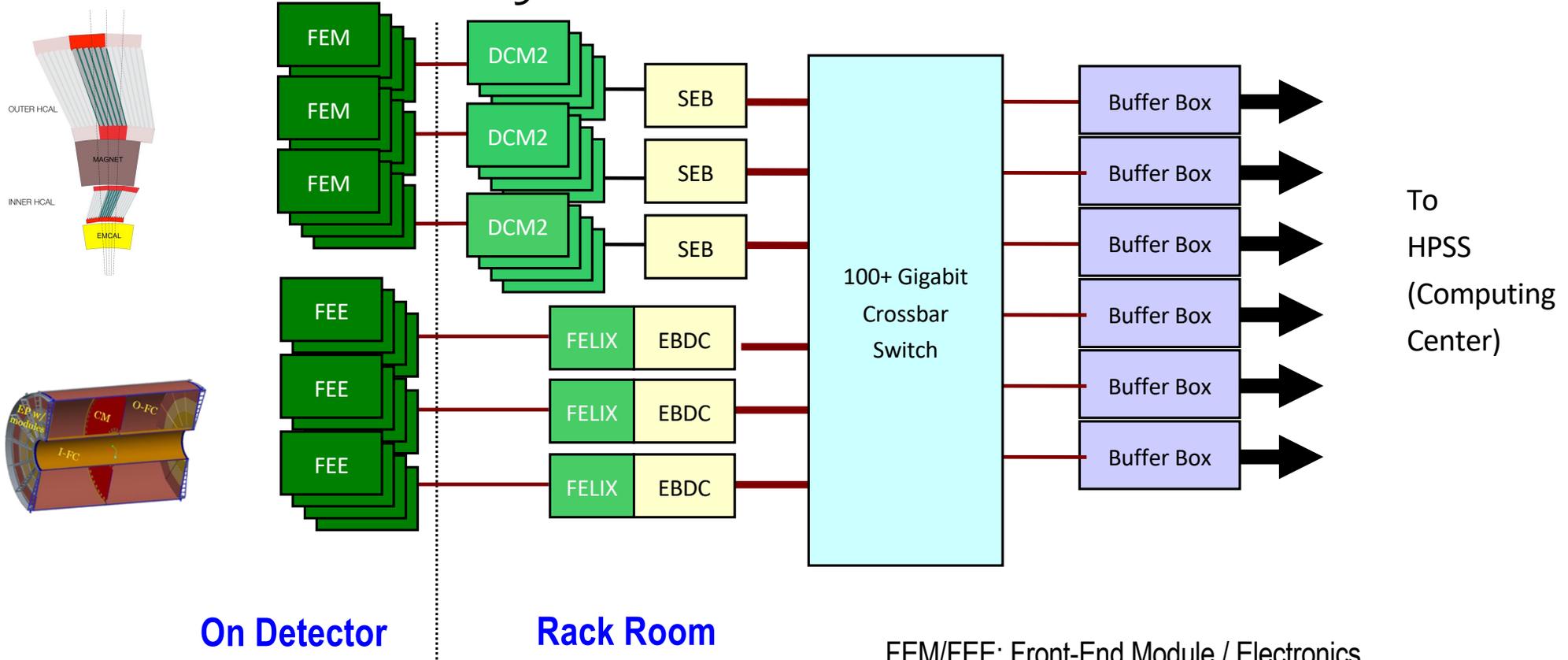
Integration of INTT Readout to sPHENIX DAQ

RIKEN/RBRC
Itaru Nakagawa

References

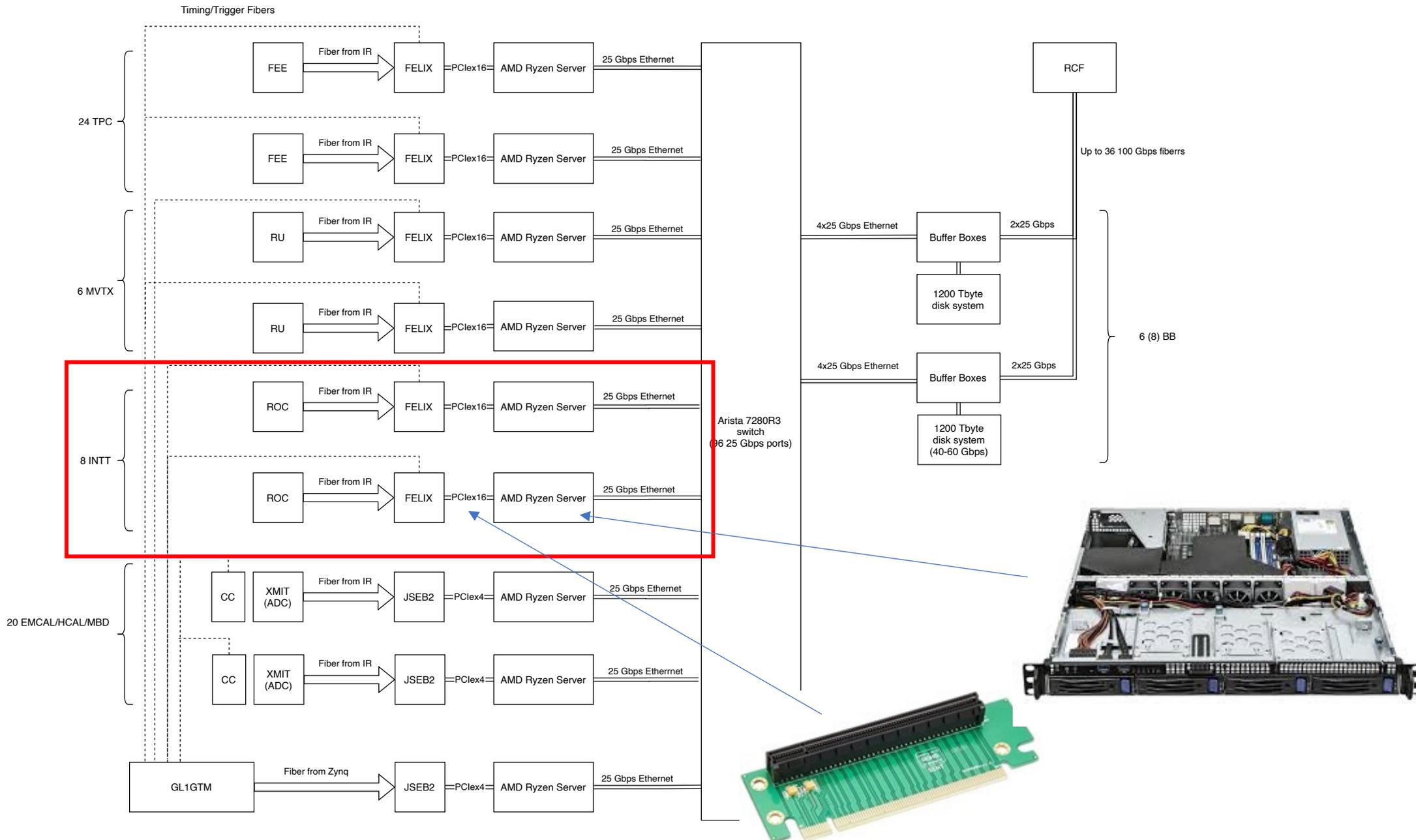
- RCDAQ Documentation :
https://www.phenix.bnl.gov/~purschke/rcdaq/rcdaq_doc.pdf
- Martin's Presentation at Software and Computing Review (May 16, 2022)
https://indico.bnl.gov/event/15770/contributions/63198/attachments/40976/68564/Purschke_DAQ.pdf

sPHENIX Subsystem Readout Schematics



No event builder

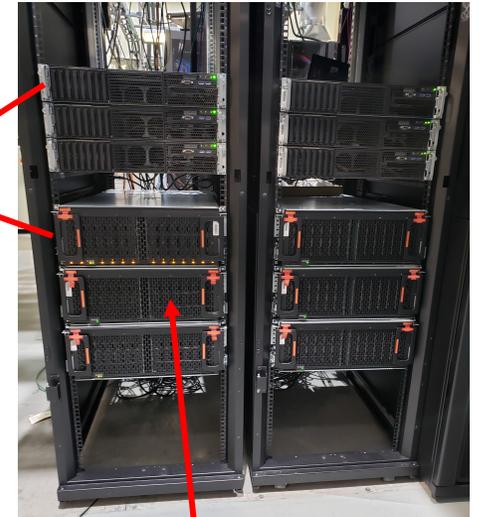
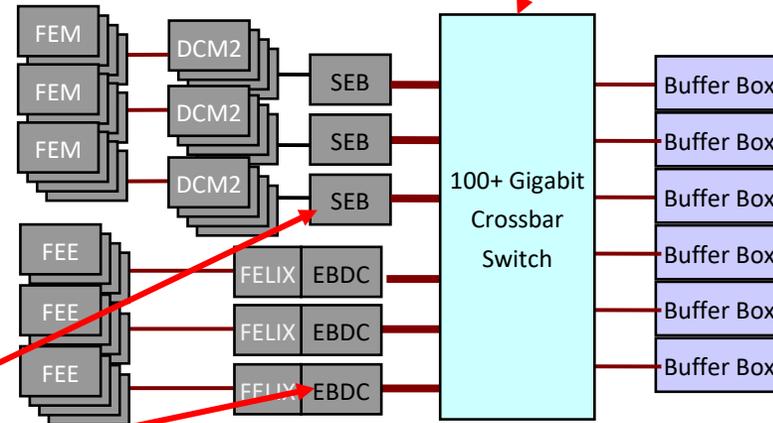
- FEM/FEE: Front-End Module / Electronics
- DCM2 - Data collection Module (v2)
- FELIX - ATLAS-developed readout card
- SEB - SubEvent Buffer
- EBDC - Event Buffer and Data Compressor



1008 Rack Room Implementation Status



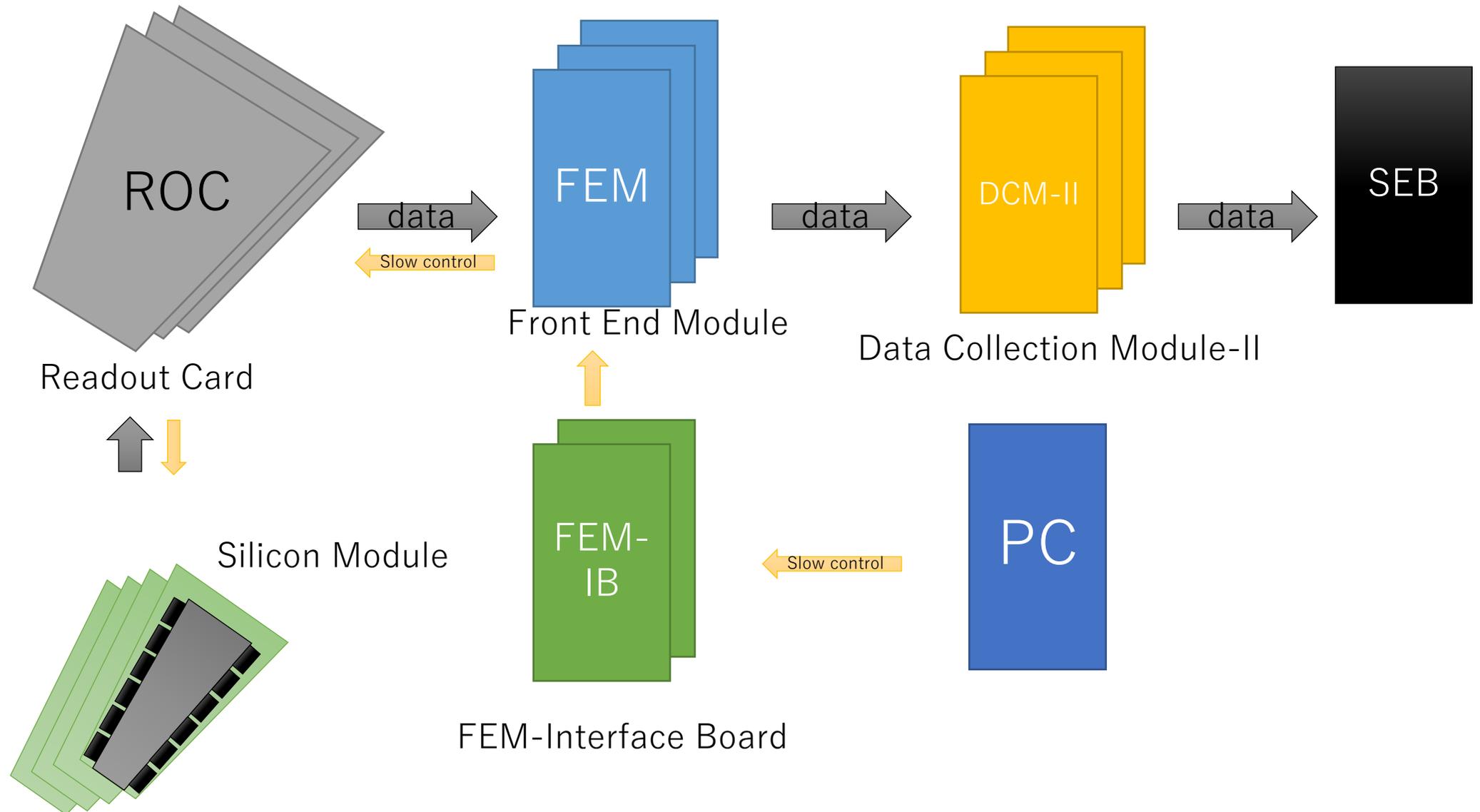
20 SEBs and 30 EBDCs, 50 machines total
1 rack / 10 machines still coming (INTT)



JBOD enclosure

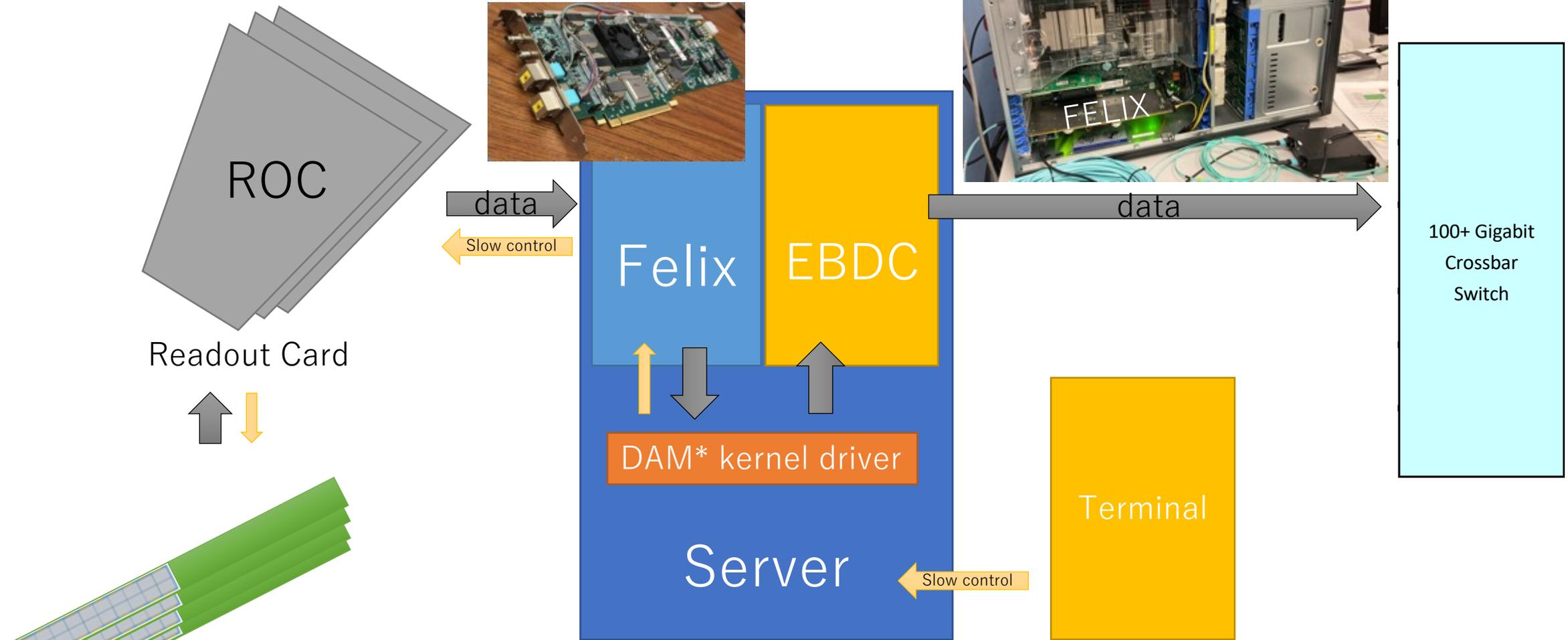
JBOD = "Just a Bunch Of Disks"
102 14TB disks, ~1.5PB raw disk space
~ 1.2PB usable after RAID etc
6 BBs -> 7PB disk space

FVTX Readout Chain



INTT-Felix Readout Chain

OS: Debian



*Data aggregation module (DAM) is the driver for FELIX board and was succeeded from TPC. Raul added INTT unique feature to it like slow control commands for example.

FELIX Server



9808 Alburto Ave, Santa Fe Springs, CA 90670
Phone: 800-552-6868 Fax: 562-463-3580

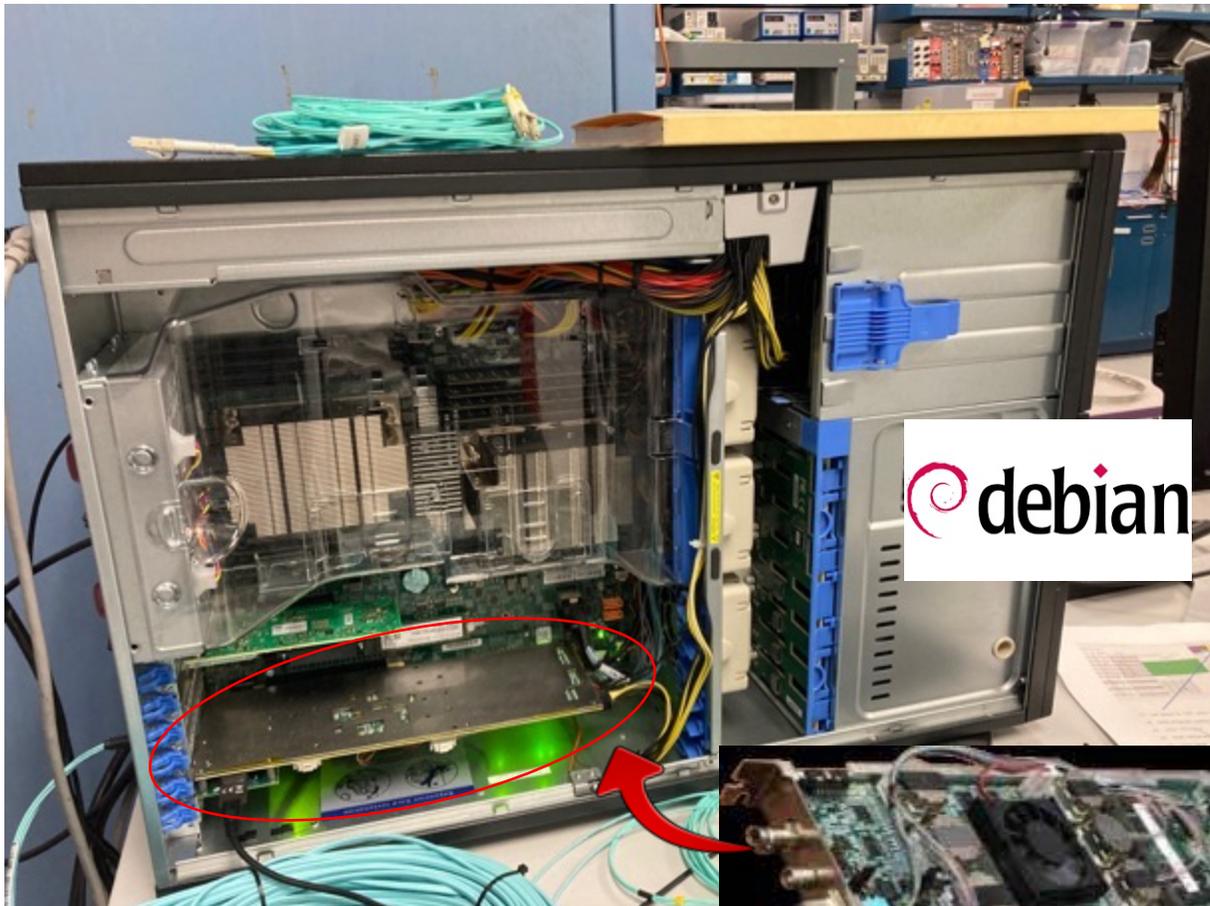
Bill To:
BROOKHAVEN NATIONAL LABORATORY
FISCAL DIVISION BUILDING 400-D
PO BOX 5000
UPTON, NY 11973

SKU	Description
-----	-------------

4U AMD EPYC Server	
- Supermicro A+ Server 4023S-TRT - 8x SATA/SAS - Dual 10-Gigabit LAN - 1280W Redundant	
- (Dual AMD EPYC 7001/7002* Series Processors)	
- (1280W Redundant Power Supplies)	
- (2 PCI-E 3.0 x16 slots, 3 PCI-E 3.0 x8 slots)	
- (Full-Length/Full-Height PCIe Slots - Up to 13in)	
- 2 x AMD EPYC 7352 Processor 24-core 2.30GHz 128MB Cache (155W)	
- (48-Cores Total)	
- 8 x MICRON 16GB PC4-23400 2933MHz ECC Registered Memory	
- (128GB RAM)	
- 1.0TB Intel SSD Pro 7600p Series M.2 PCIe 3.0 x4 NVMe Solid State Drive	
- Mellanox ConnectX-5 EN MCX512A-ACAT - 25Gb 2-Port SFP28 PCIe3.0 x8 NIC	
- Rackmount Mounting Rails for Supermicro SC743 Chassis	
- Aberdeen System Assembly and Testing (Server)	
- 5 Year Depot Warranty (Return for Repair)	
- NO Top Plate RMA (Opt-Out)	

Quote Expires 08/05/2020

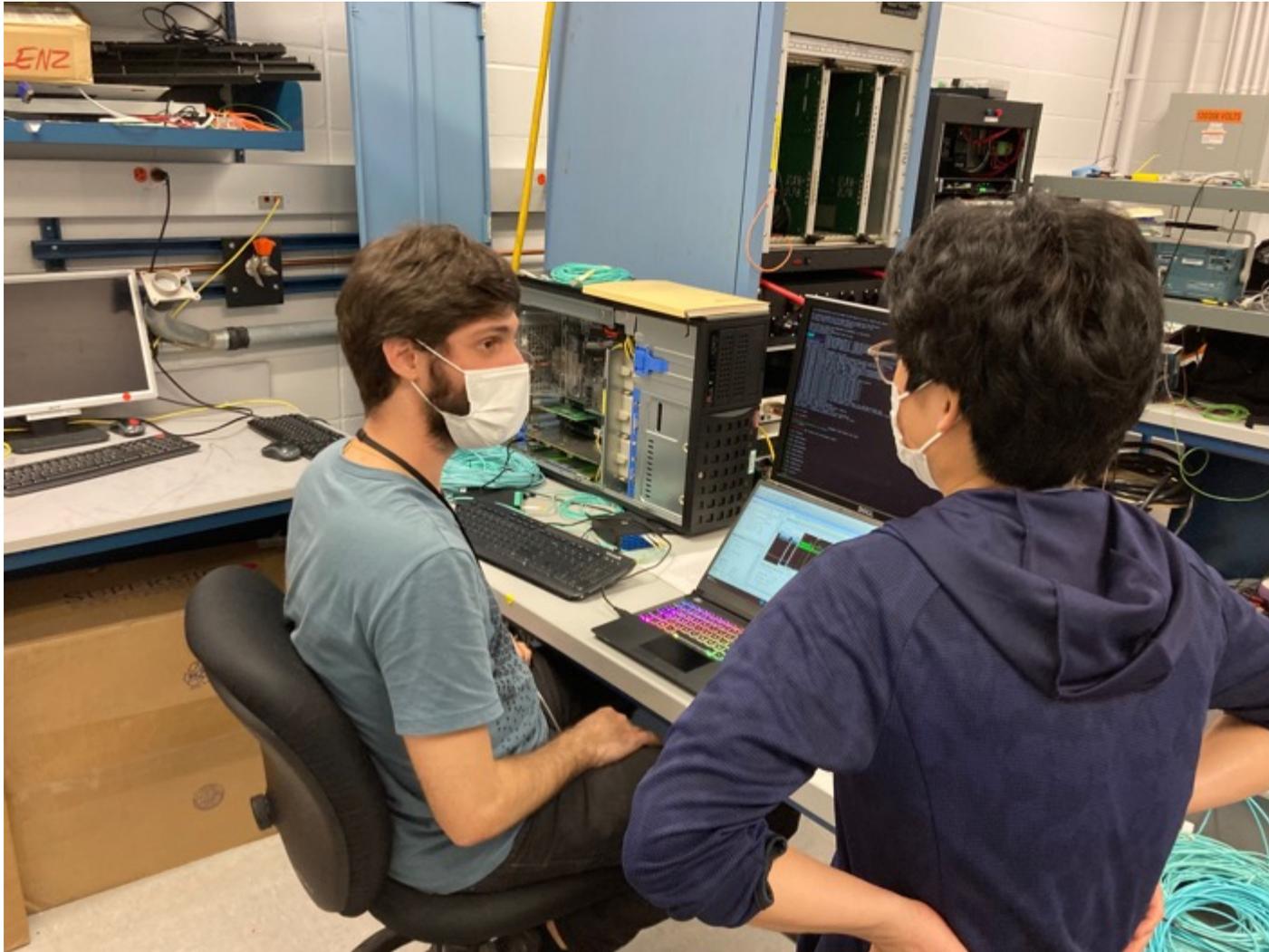
- The Linux server meets the FELIX operation requirement.
- Felix has been developed under Debian Linux distribution.
- The Felix servers in 1008 are also operated with Debian.
- **Whatever software developed in TB should work at 1008 environment.**⁸



FELIX

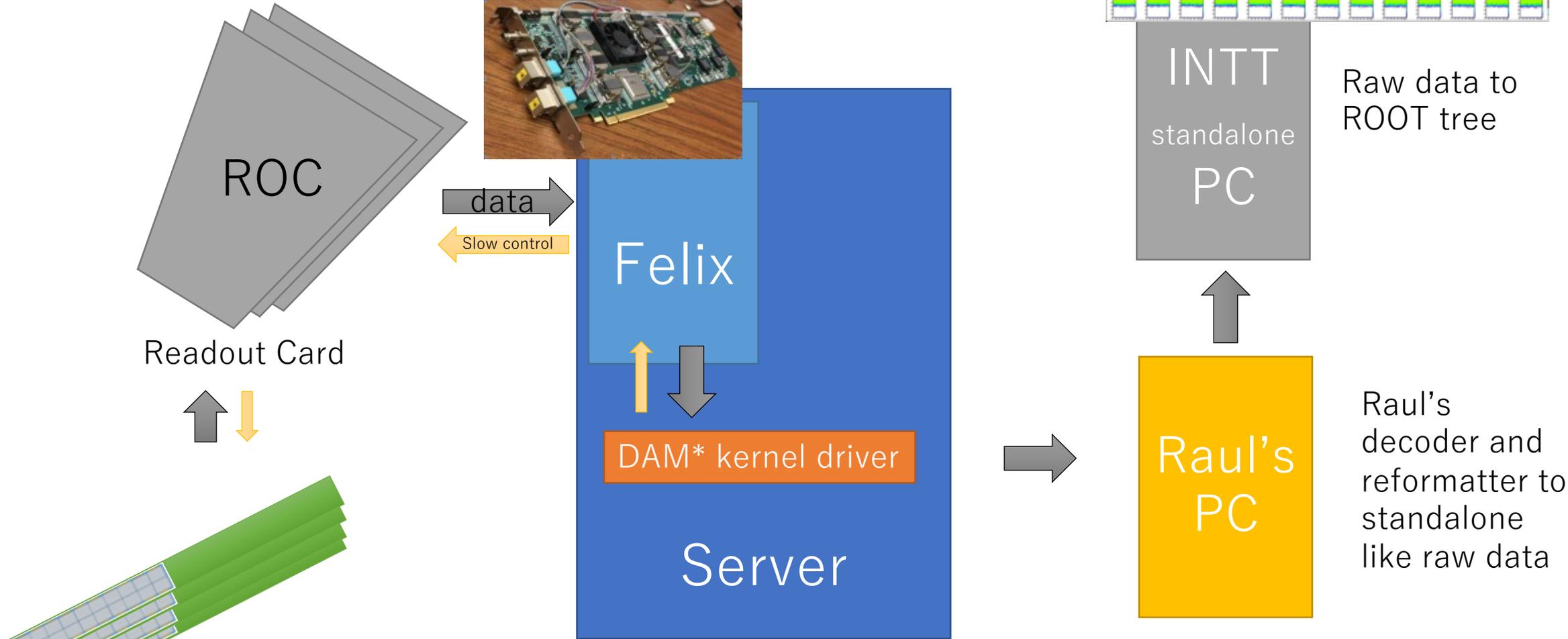


FELIX Readout Development



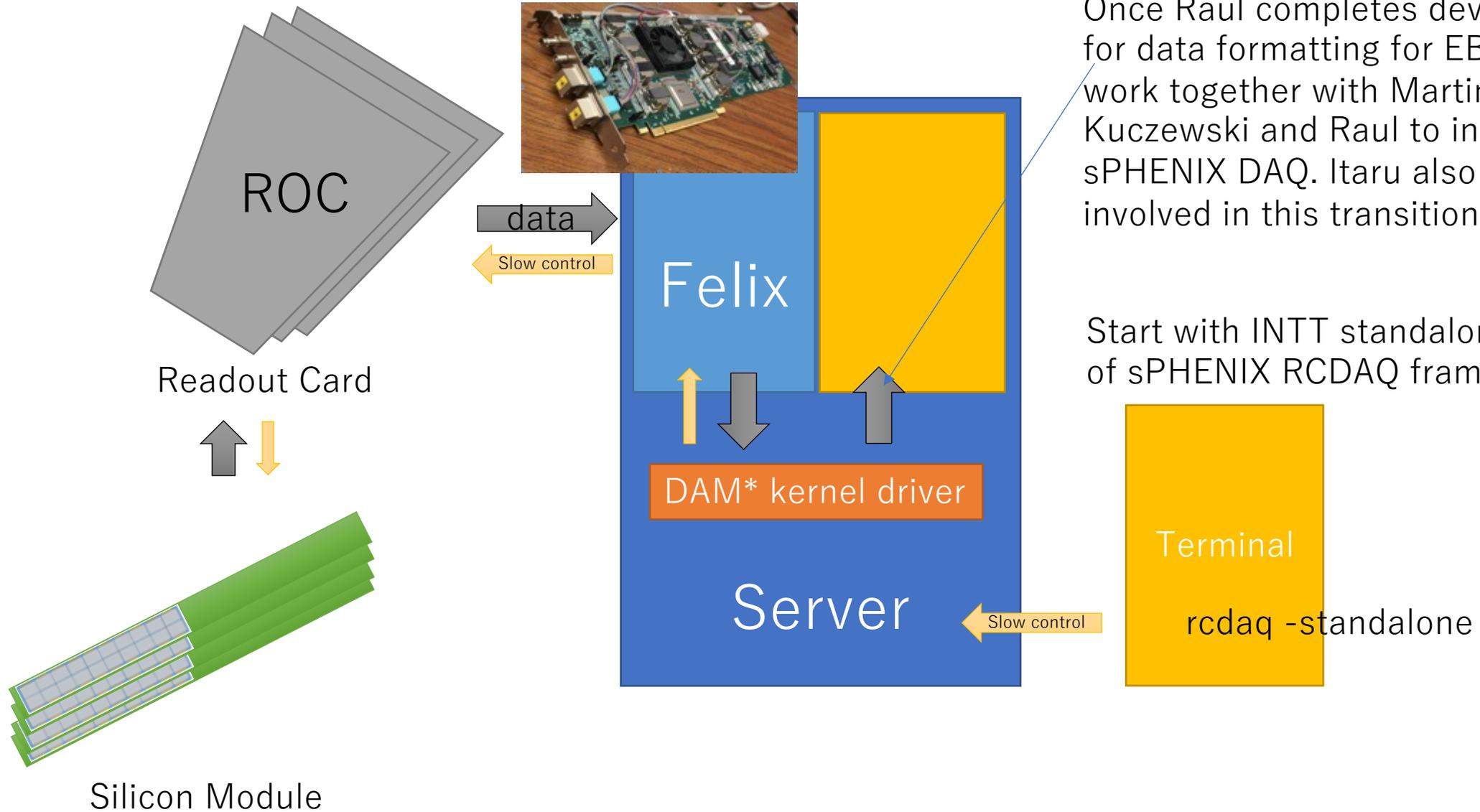
Is in good progress as Genki has been reporting

Where we are?



*Data aggregation module (DAM) is the driver for FELIX board and was succeeded from TPC. Raul added INTT unique feature to it like slow control commands for example.

Next Step



Once Raul completes development for data formatting for EBDC, then work together with Martin, John Kuczewski and Raul to integrate into sPHENIX DAQ. Itaru also tries to be involved in this transition.

Start with INTT standalone mode of sPHENIX RCDAQ framework.

Event Building in Offline

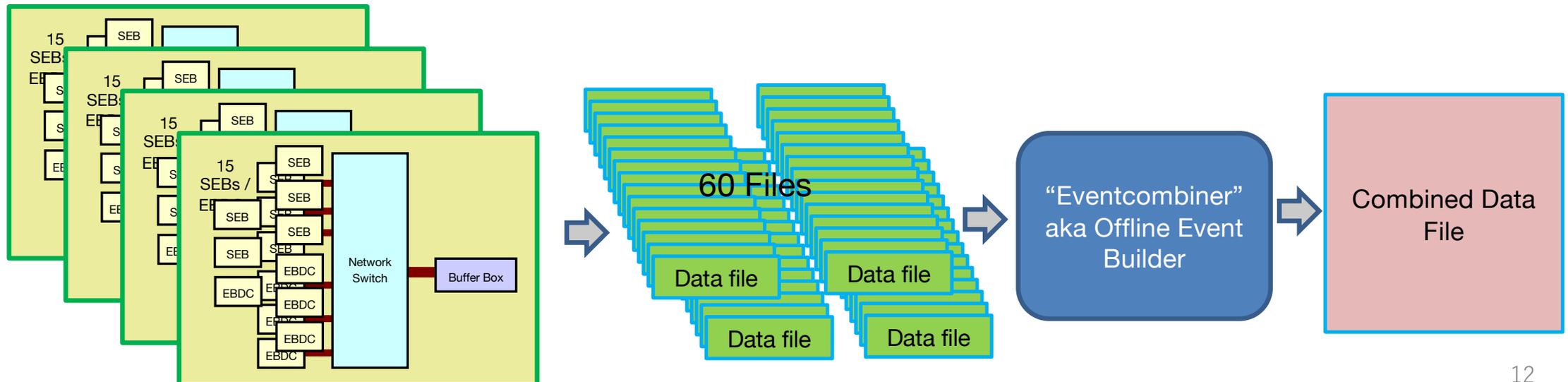
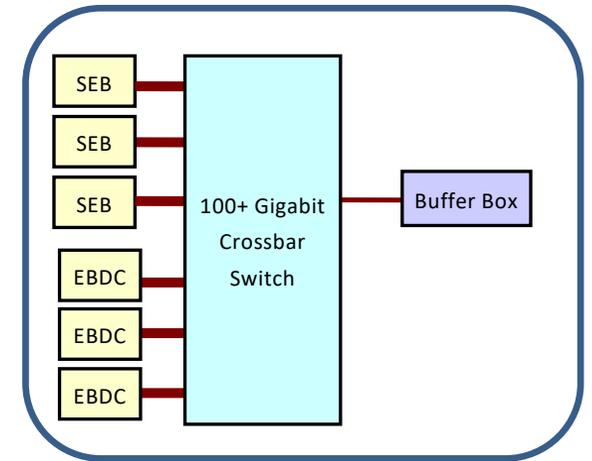
The first wave of tests was done in March '21

At the time I had ¼ front-end capacity installed = 15 of 60

Use 15 SEBs/EBDCs = 15 streams (10 foreseen)

Run 4 “volleys” one after another to get 60 files, 240 packets combined, about the number of packets and event size we expect

This tests the entire data logging chain with realistic rates

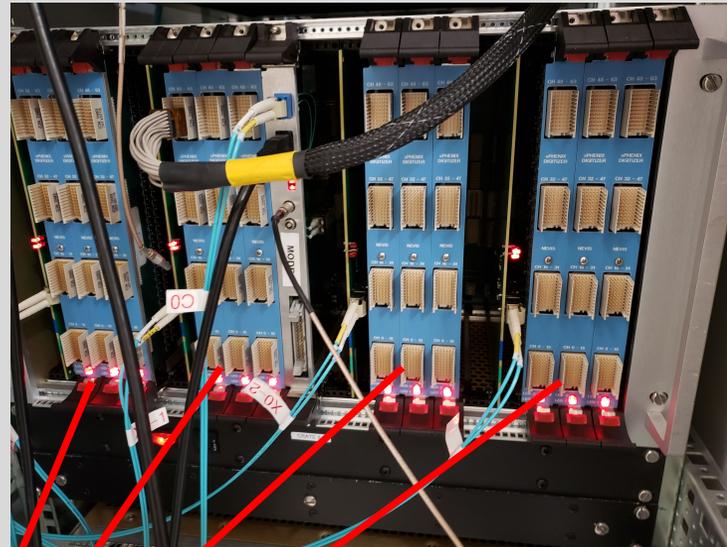
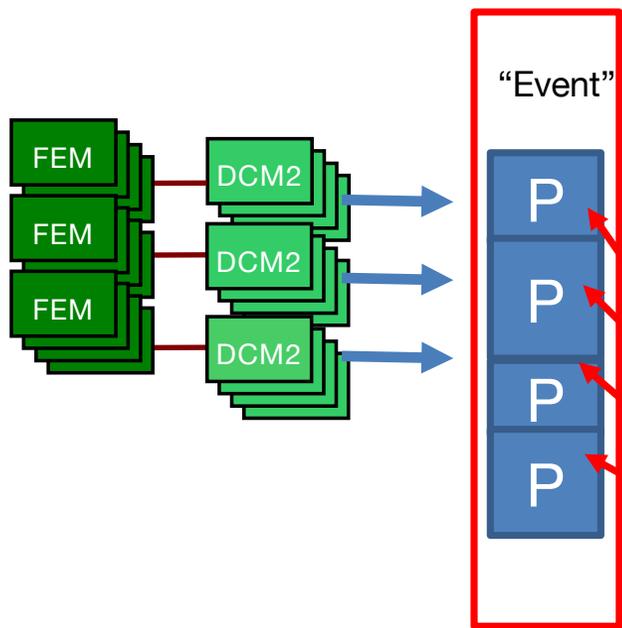


Packet ID assignments

- We assign each detector a “detector number”
- That number drives a number of things, especially DAQ packet ids
- If your detector number is 4, then the range 4001...4999 is “yours”
- The “even thousand” id (like 4000) is reserved for future use
- That has served us extremely well in PHENIX. When someone told us that packet 4063 has a problem, we’d immediately know which detector it was
- Current sPHENIX lineup:

SubSystem	ID	Packet ID
MBD	1	
MVTX	2	
INTT	3	3001 ... 3999
TPC	4	
TPOT	5	
EMCal	6	
iHCal	7	
oHCal	8	
sEPD	9	
Trigger	14	Historic Number

Packet ID Assignment



For the calorimeter digitizers, each such group contributes a Packet

```
$ dlist /data/phnxrc/1008/junk/junk-00000250-0000.prdf
Packet 21351 5981 0 (Unformatted) 93 (IDDIGITIZER_31S)
Packet 21352 5981 0 (Unformatted) 93 (IDDIGITIZER_31S)
Packet 21353 5981 0 (Unformatted) 93 (IDDIGITIZER_31S)
Packet 21354 5981 0 (Unformatted) 93 (IDDIGITIZER_31S)
```

For INTT, unique packet ID would be assigned for each Felix (2xROC)?

INTT Integration into sPHENIX DAQ

Let's have another meeting!

- I have been threatening to have another meeting that alternates with Martin's DAQ meeting
- After the collaboration meeting, I will do that
- It will alternate with Martin's meeting
- It will be limited to 1 hour at most
- We need to have 1 slide status reports from all major electronic systems, (GL1/GTM, ADC, TPC FEE, FELIX, MVTX, INTT)

Expected 1 page summary bi-weekly basis.

2022-05-18 sPHENIX DAQ Meeting 9

DAQ/Trigger meeting
Wednesday May 18, 2022, 2:00 PM - 4:00 PM, US Eastern

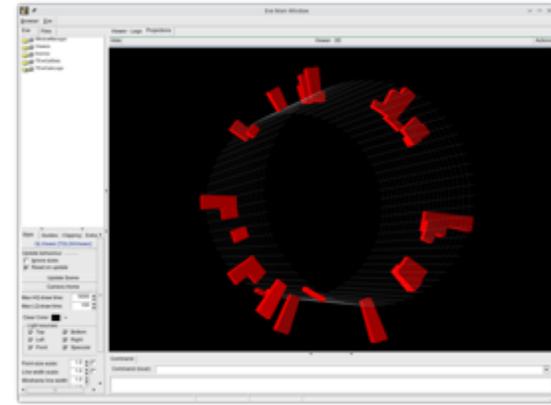
Description
Room: v1.r1.s43
Meeting URL:
Join Zoom Meeting
<https://us01zoom.us/j/1605843113?pwd=Z29uZjRlZWVlUzRlMkRlbnYyQ0Q1DQ==>
Meeting ID: 160 584 3713
Passcode: DAQ2023

From a phone
Meeting ID: 160 584 3713
Passcode: 7538169

2:00 PM - 2:15 PM	Martin's update	Speaker: Martin Purdum (pic)
2:15 PM - 2:25 PM	Danny's status update	Speaker: Danny Padrao
2:25 PM - 2:40 PM	Trigger update	Speakers: Christopher McGinn (University of Colorado Boulder), James Nagle (University of Colorado)
2:40 PM - 2:50 PM	ChI - updates	Speaker: Cheng Yi Chi (University of Colorado)
2:50 PM - 3:00 PM	Jee/JohnK	Speakers: John Kaczmarek (pic), Joseph Mead (pic)
3:00 PM - 3:10 PM	LANL Status	Speaker: Ming Liu (LANL)
3:10 PM - 3:20 PM	ORNL Update	

A lot to do with FELIX readout, but not also need to raise someone familiar with sPHENIX DAQ beside Raul within the INTT team.

Questions to Martin



- Servers
 - Do servers in 1008 provided by sPHENIX?
 - Currently the server is running with Debian. Will it be different for 1008 version? -
> Felix is developed on Devian. So it will be Debian.
 - We will start control/online softwares which runs on the server at test bench. Can they be compatible in 1008 as well? -> Same Debian, so should be compatible.
 - Why 11 servers for INTT? Not 8?
- The standalone mode of RCdaq is the nice feature. Raul should develop the code to use this standalone framework, right? -> TPC standalone is under development in 1008. Once Raul's development is in good shape, Martin, Raul, John K. will get together and setup standalone for INTT.
- Do we have to invent INTT standalone event display by ourselves?
- For INTT, unique packet ID would be assigned for each Felix (2xROC)?