

# Introduction to DAQ discussions

at CERN

**DRAFT**

Giles Barr

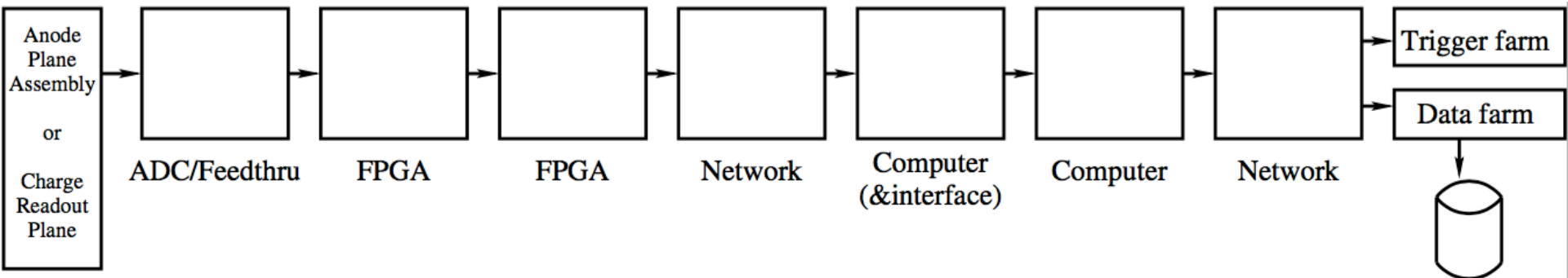
25 Feb 2016

# Overview

- General ProtoDUNE DAQ requirements
  - Front-end warm electronics options
  - Back-end computing options
  - Trigger and timing system options
  - Online storage and processing options
  - Workshop summary – Thursday
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- (General protoDUNE Offline Computing Requirements)

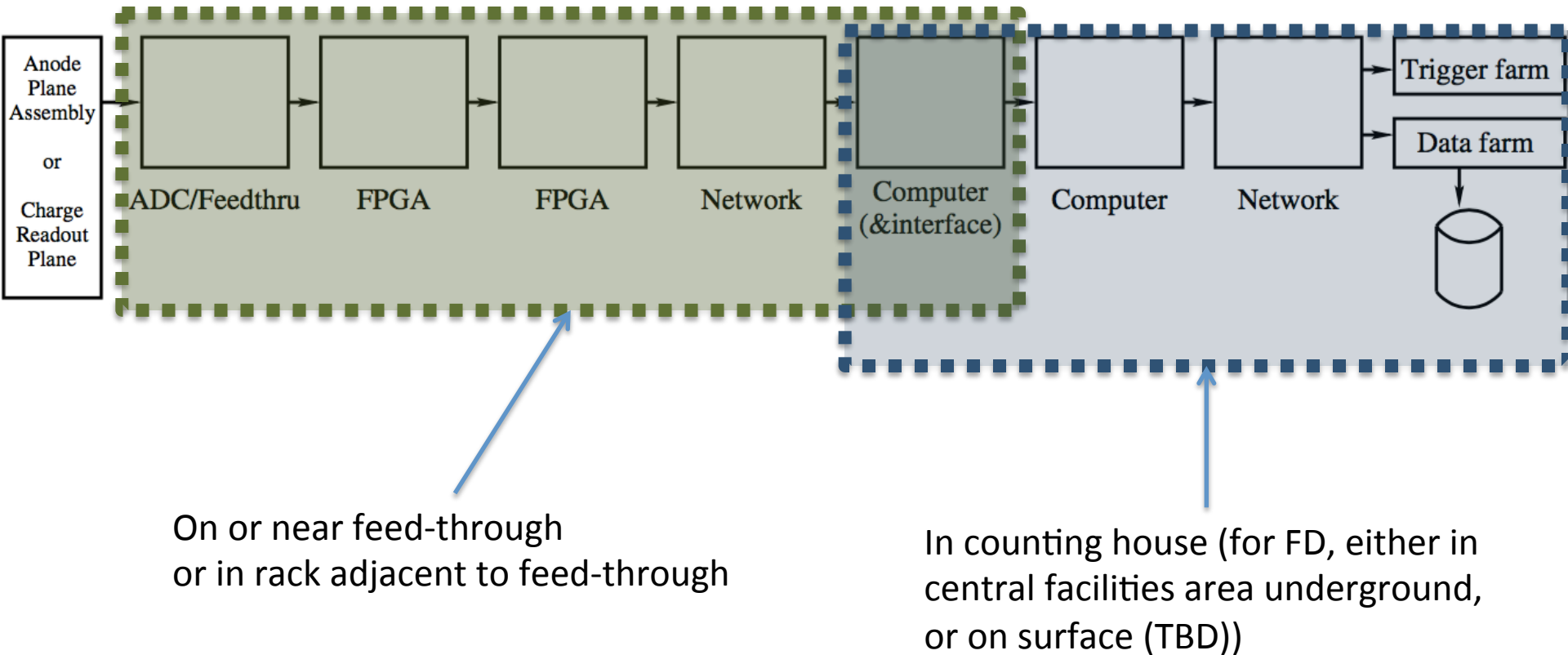
# Summary of currently discussed architectures

The diagram below captures the main features of all the schemes, in some cases some of the boxes get combined together



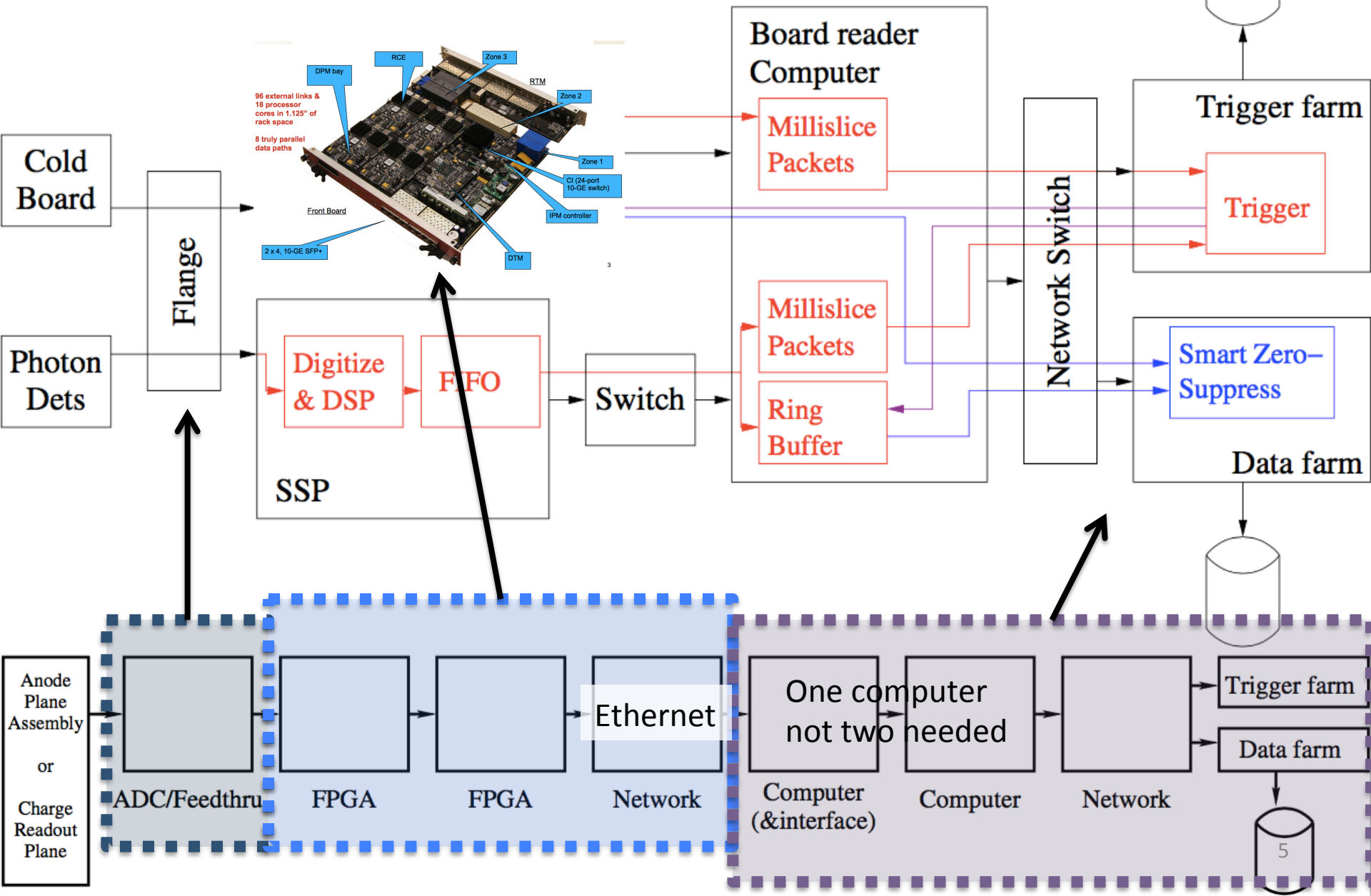
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The diagram below captures the main features of all the schemes, in some cases some of the boxes get combined together

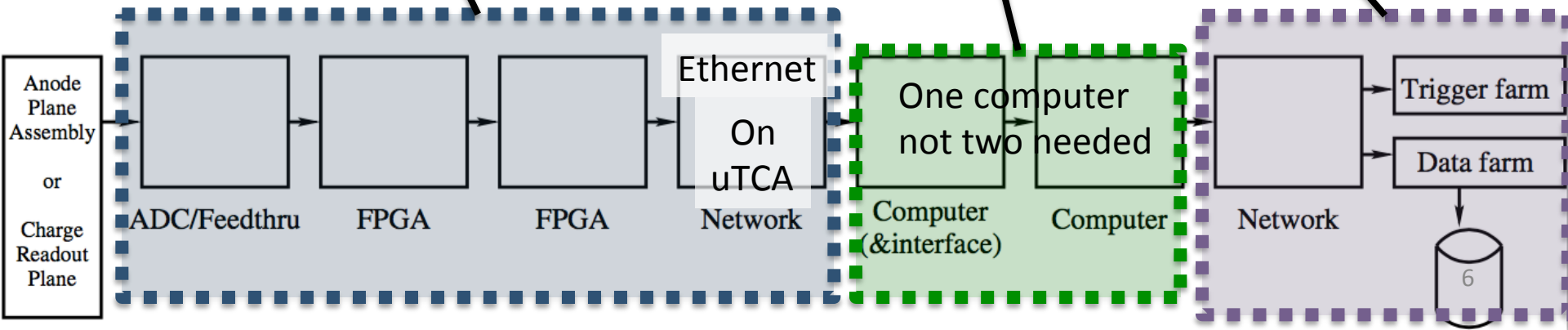
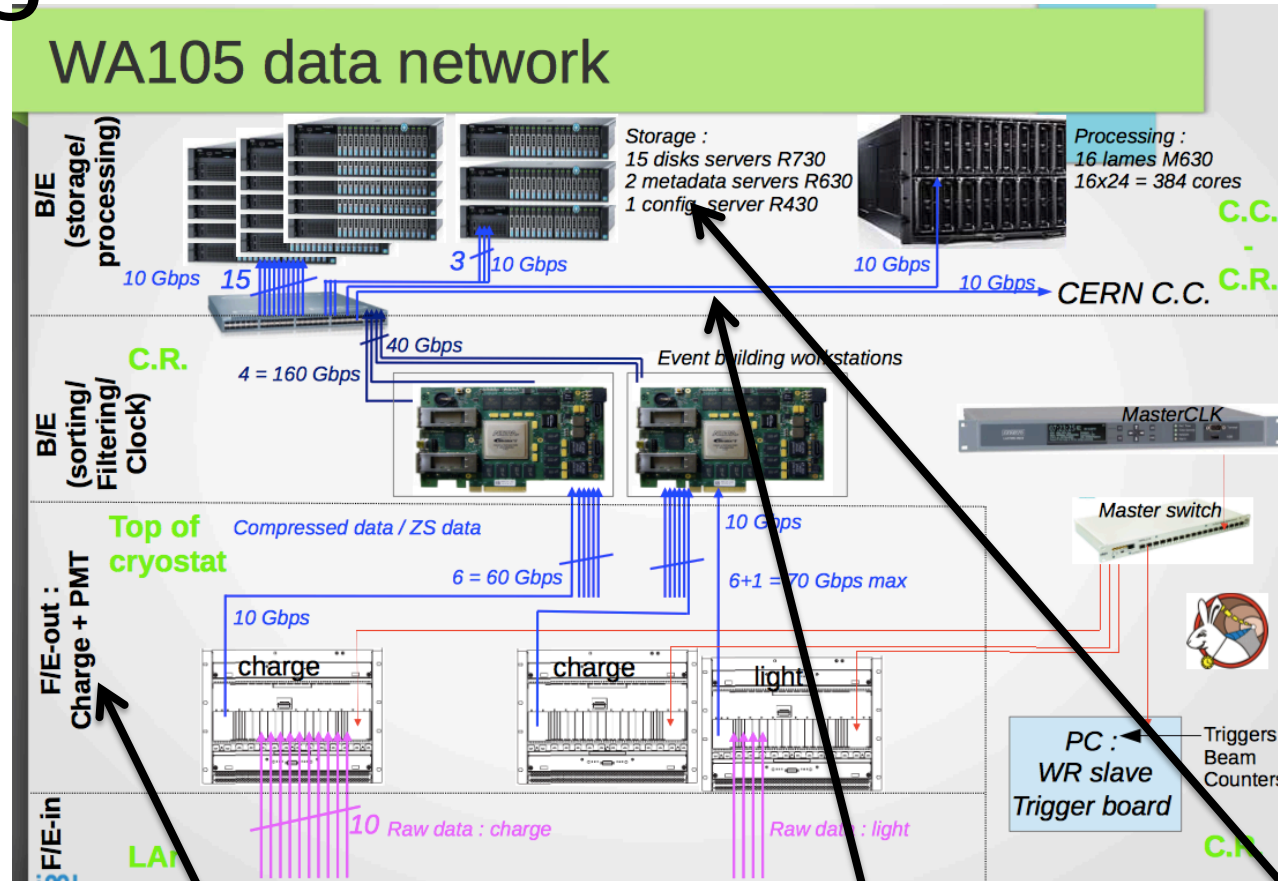


# 35t-RCE evolution

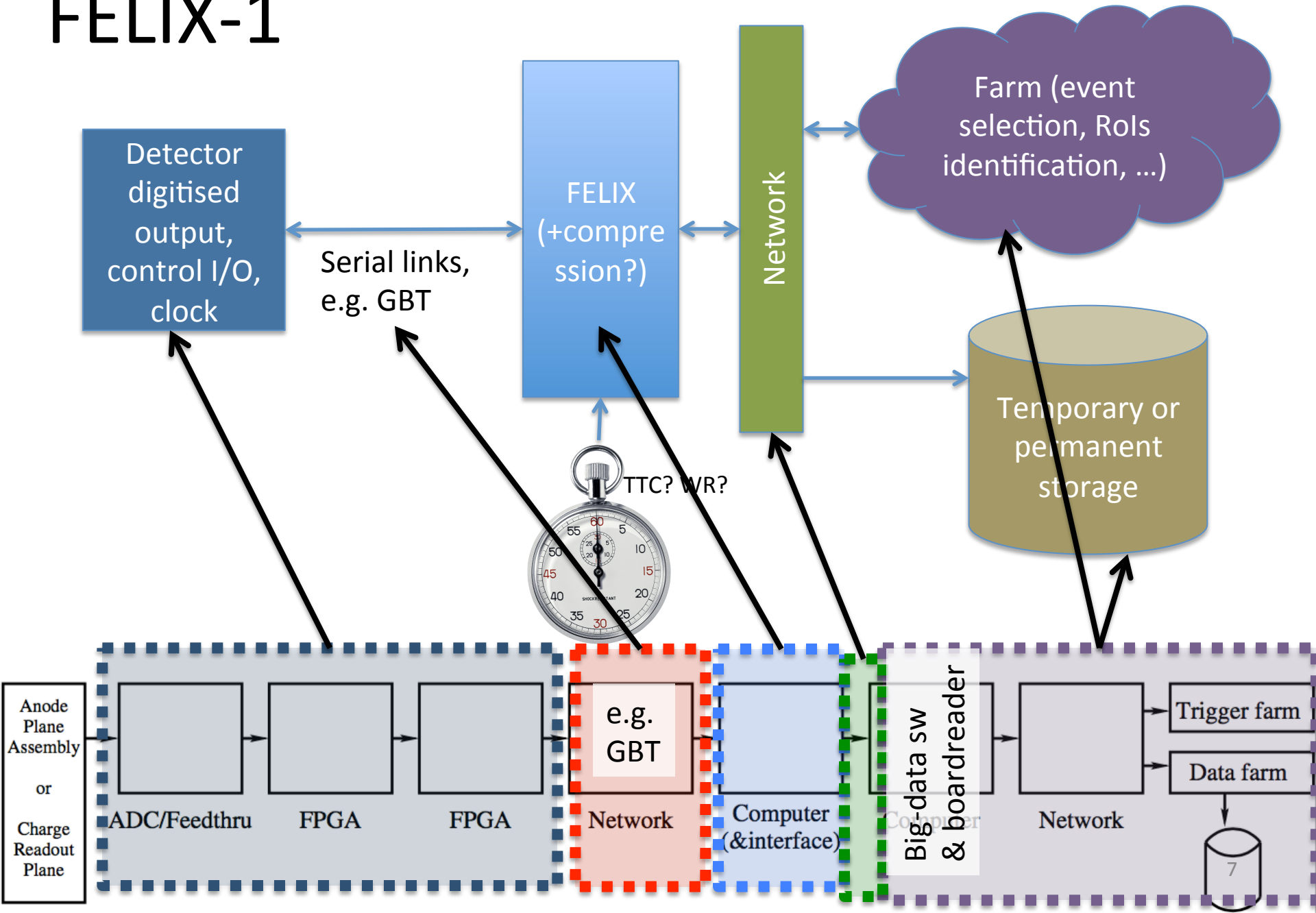
Note this is a design for the far detector, protoDUNE is likely a little different



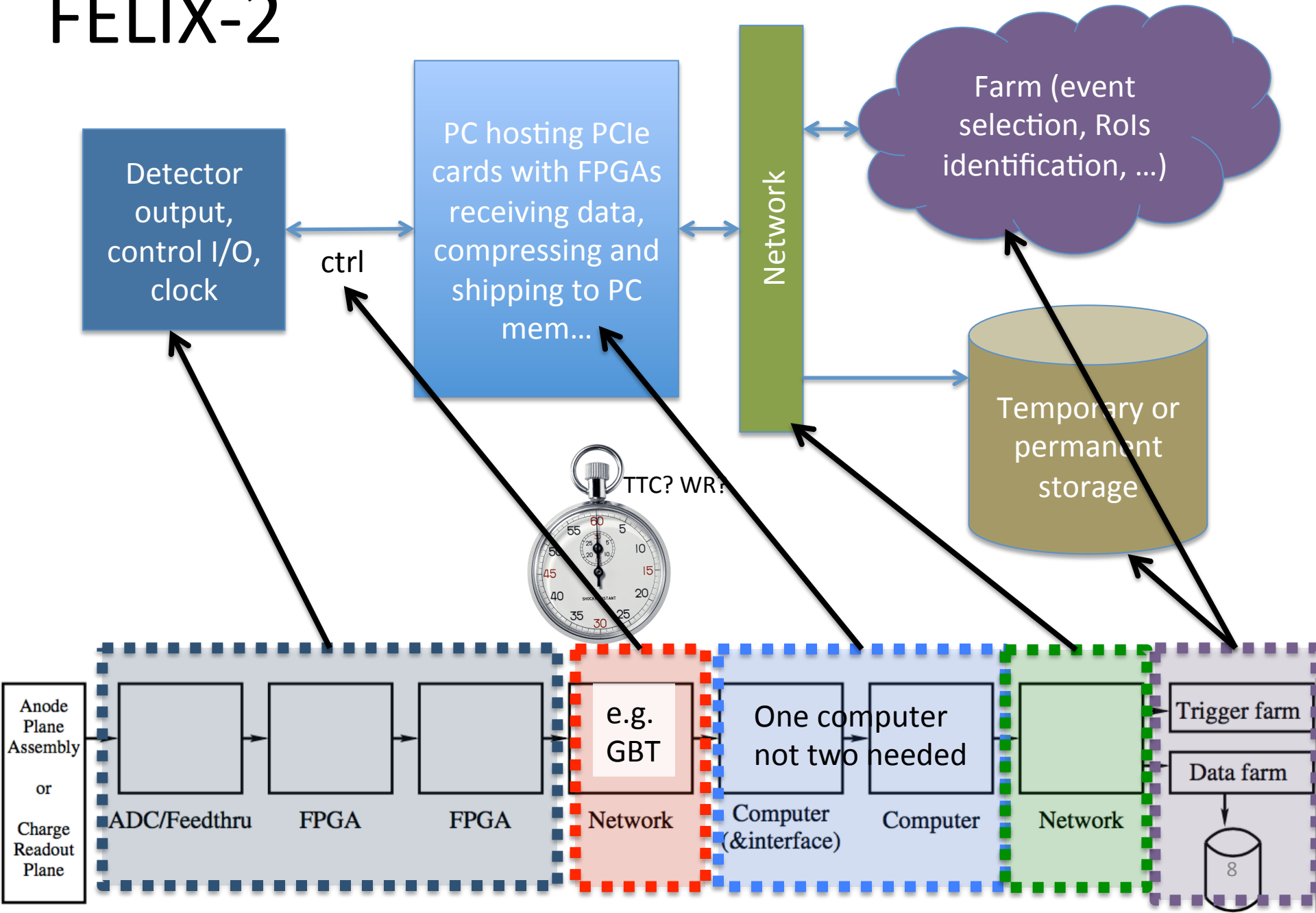
# WA105



# FELIX-1

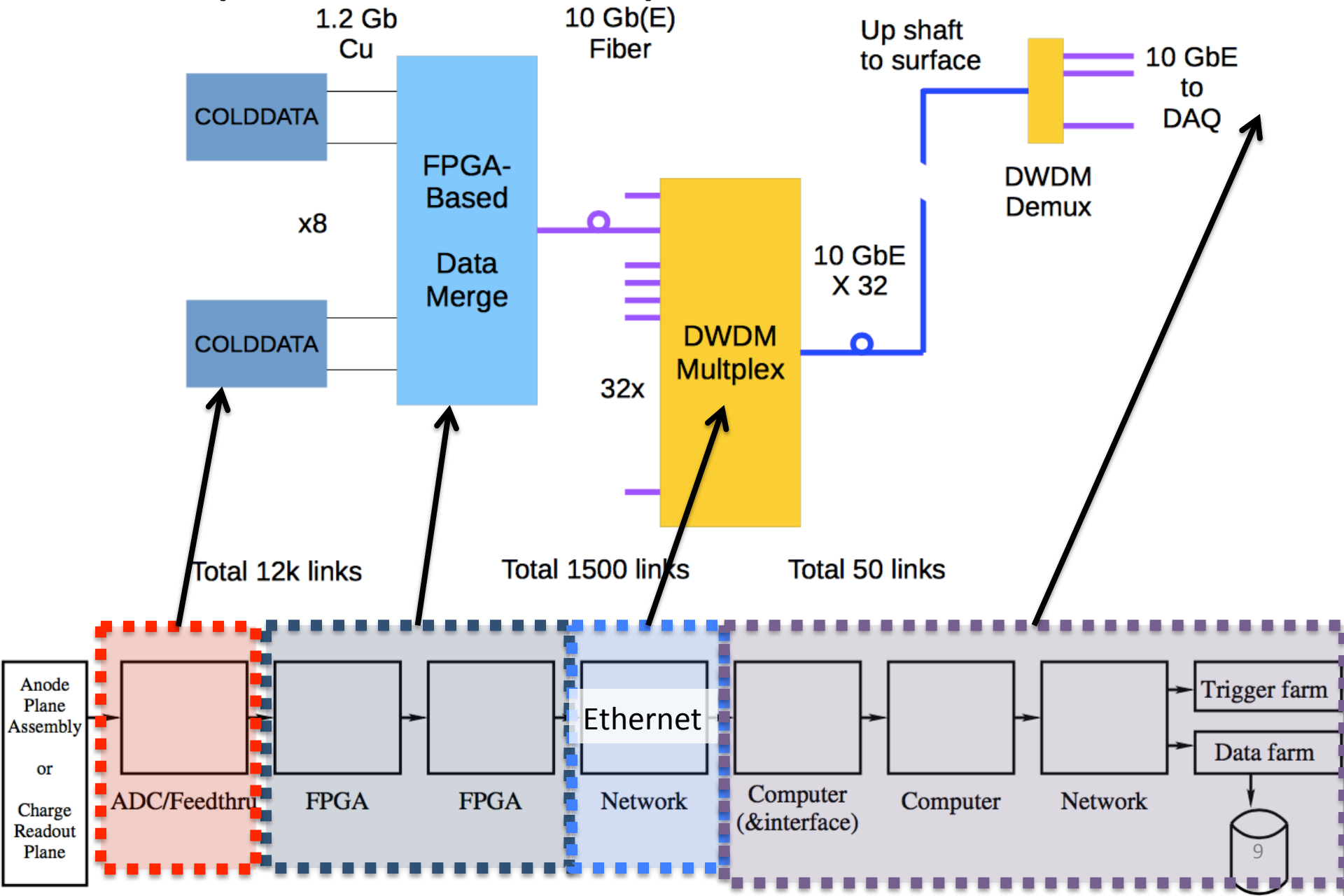


# FELIX-2





# New (E.Hazen et al.)



# Requirements

This section is under construction and will move to the front of the talk when it is more finished.

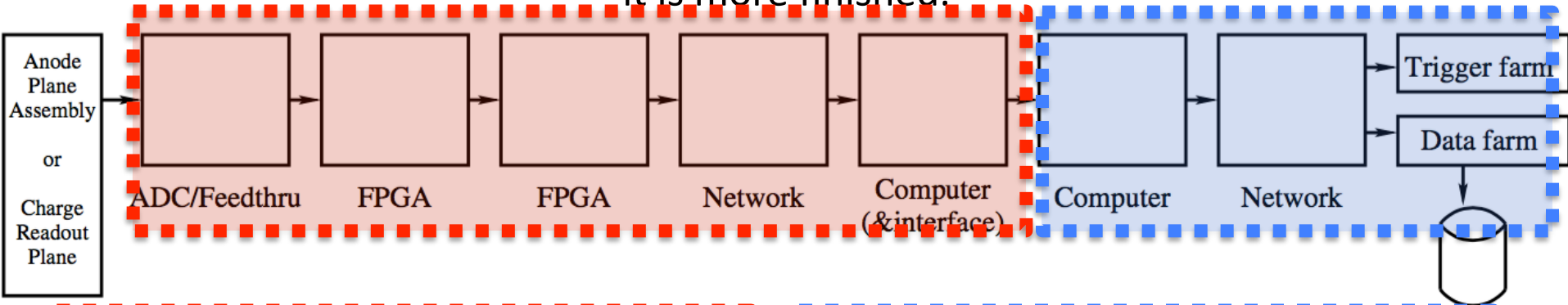
## High level requirements

- Accumulate data from beam particles according to the protoDUNE proposal or any update of it (better to copy the requirement here and update it).
  - Use zero suppression to reduce the data size, but only in accordance with specification from the physics analysis groups.
  - High data throughput, consistent with the design for the far detectors (i.e. special features that are only needed for protoDUNE encouraged, but with moderation from cost considerations).
- Accumulate a cosmic ray sample
- Accumulate calibration events
- Data from beam detectors (TOF, BPM, ...) should be able to be associated with the TPC and PD data from protoDUNE.

It is NOT required that the protoDUNE DAQ be a final production prototype of the DUNE FD DAQ – freezing our technology choices can occur later.

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## Near front-ends:

- Receive digital signals from cryostat reliably
- Merge data from each cold board to (approx) 1 APA (Merge 80 links to 1 or 2 computers)
- Provide trigger primitive information (for FD mode of operation)
- Remove some data in triggered mode: retain only data in a time window around the trigger time.
- Provide time synchronization – each pulse time should be known with respect to the SPS spill start time.
- Have a backpressure mitigation policy
- Have the ability to start sending data at a coordinated time (start of run) and to finish data taking cleanly.

## Near or in computers:

- Initialize hardware and software components for data taking according to a managed set of configuration parameters.
- Merge data into event units in a scheme that is compatible with the offline programs (event building).
- Allow software trigger selection and other data reduction techniques to be applied while the data is in computer memory (either before or after event building).
- Store the data ready for sending into the EOS system (Maxim, have I got that right?)
- Have a backpressure mitigation policy
- Have the ability to start sending data at a coordinated time (start of run) and to finish data taking cleanly.