Clock Distribution and Array Trigger With MUTIN card; Some Architecture Options

Introduction (philosophy)

For the stereoscopic triggering of the telescopes in CTA,
we favour an approach based on :

- Distribution of a high-precision clock from a central location (star-distribution)
- Time-tagging camera events (or partial events) using this clock
- Collecting streams of time-tags in a central trigger crate
  and checking for coincidence in software
- Then sending the streams of coinc. time-tags *either* (depending on bottleneck):
  - to the relevant cameras, to ask for the data to be sent to central, so reducing the stream of data to send over ethernet from telescope to central farm, *or*
  - to the central farm of processors which hold the events in memory, to identify the events to be written to disk and passed on for further processing

Other approaches possible:

- Sending of trigger pulses to central station to be put into time and checked for coinc. Complicated for large # of telescopes, difficult to avoid large dead-time
- All data to central, software search within data to extract time-tags & check for coincidences. Requires high processing capability and much bookkeeping (and needs clock-distribution in any case).

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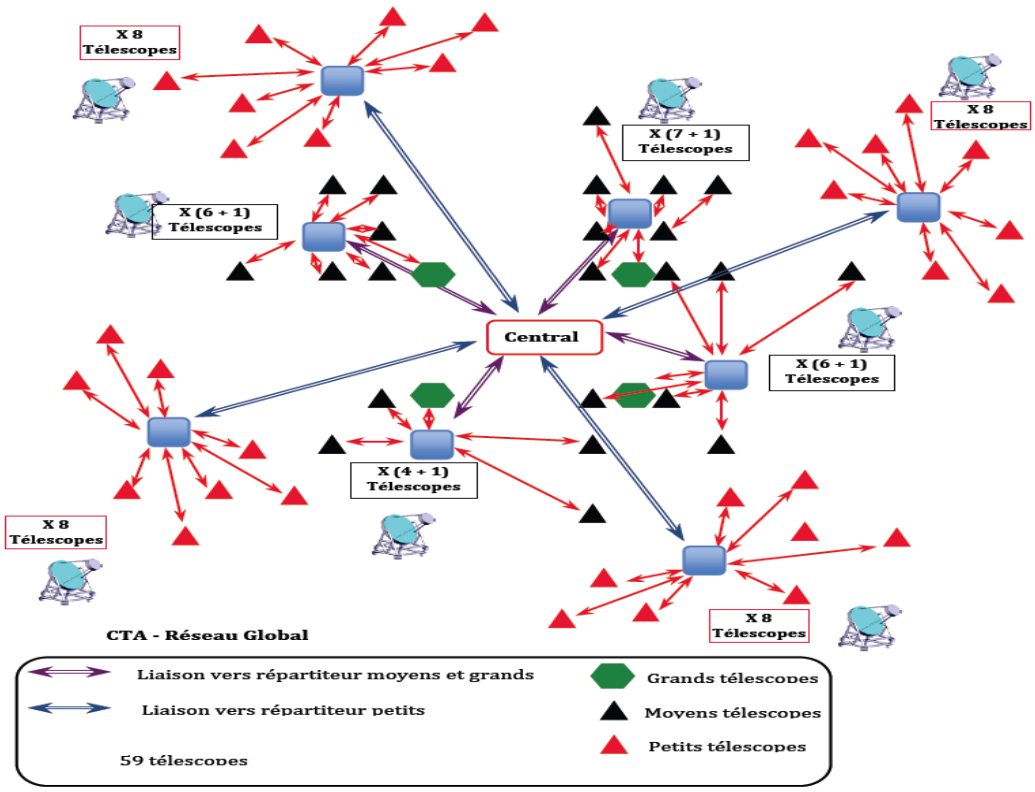
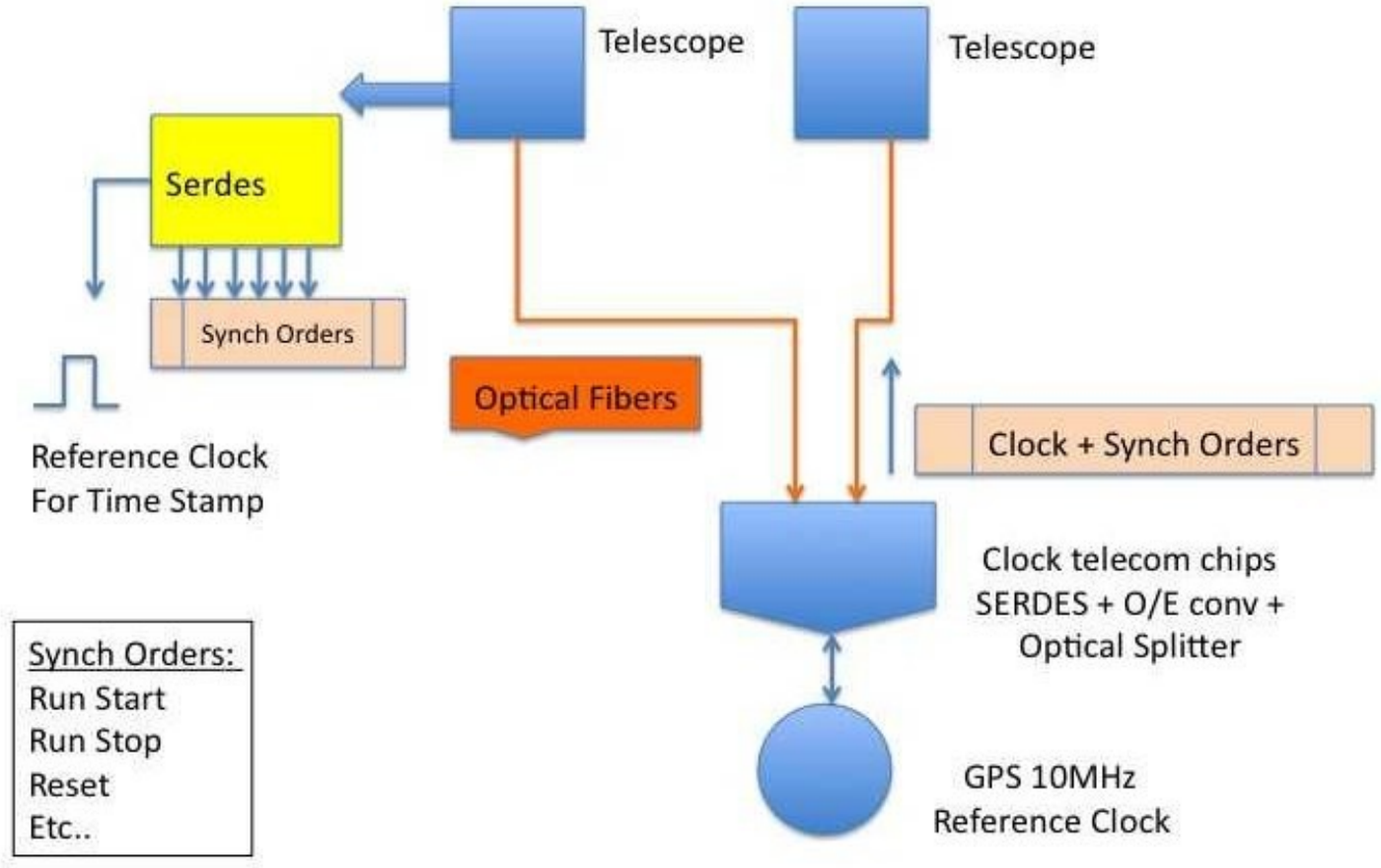


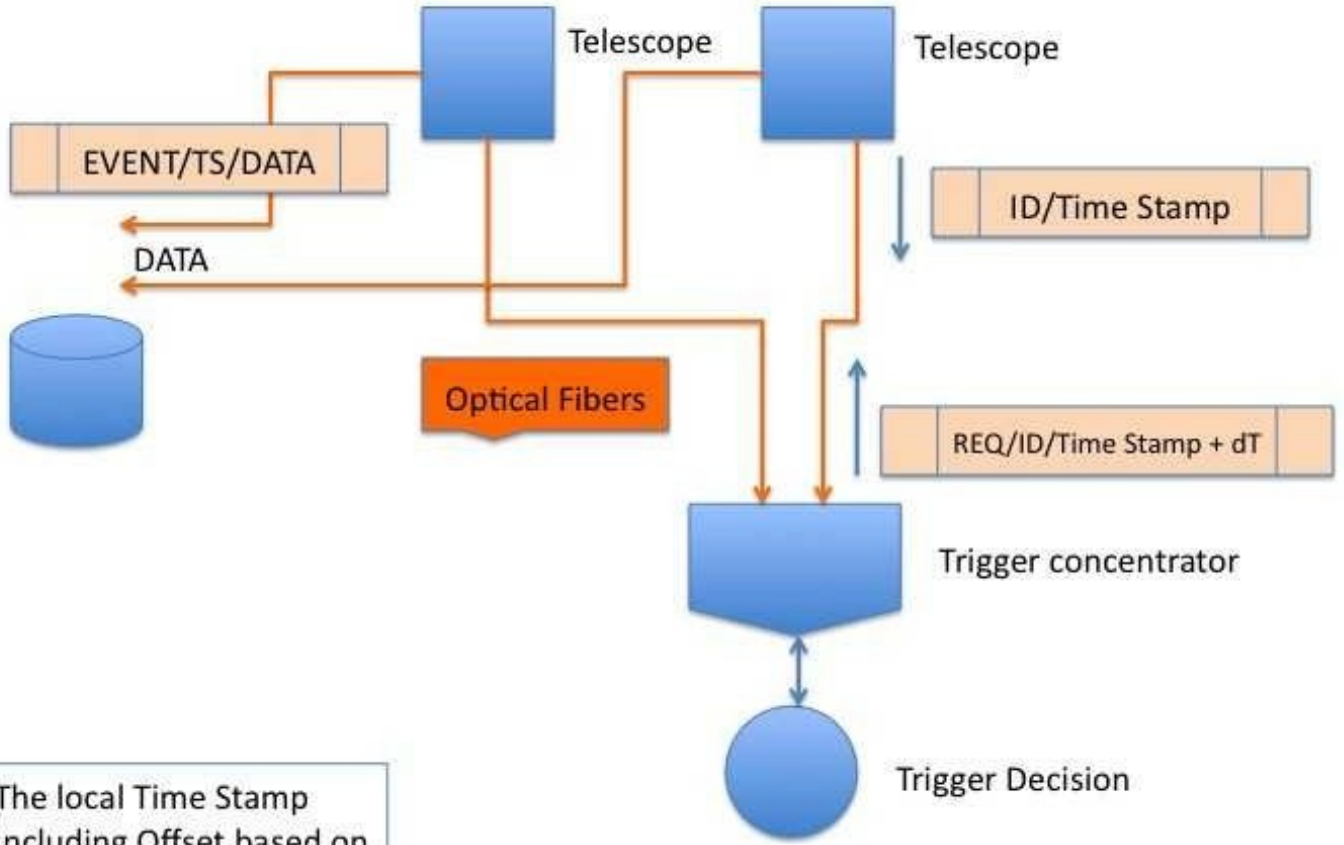
Inter-telescope Trigger; Clock Time-stamping topology

Distribution of reference clock and sync orders
from central location by dedicated fibre

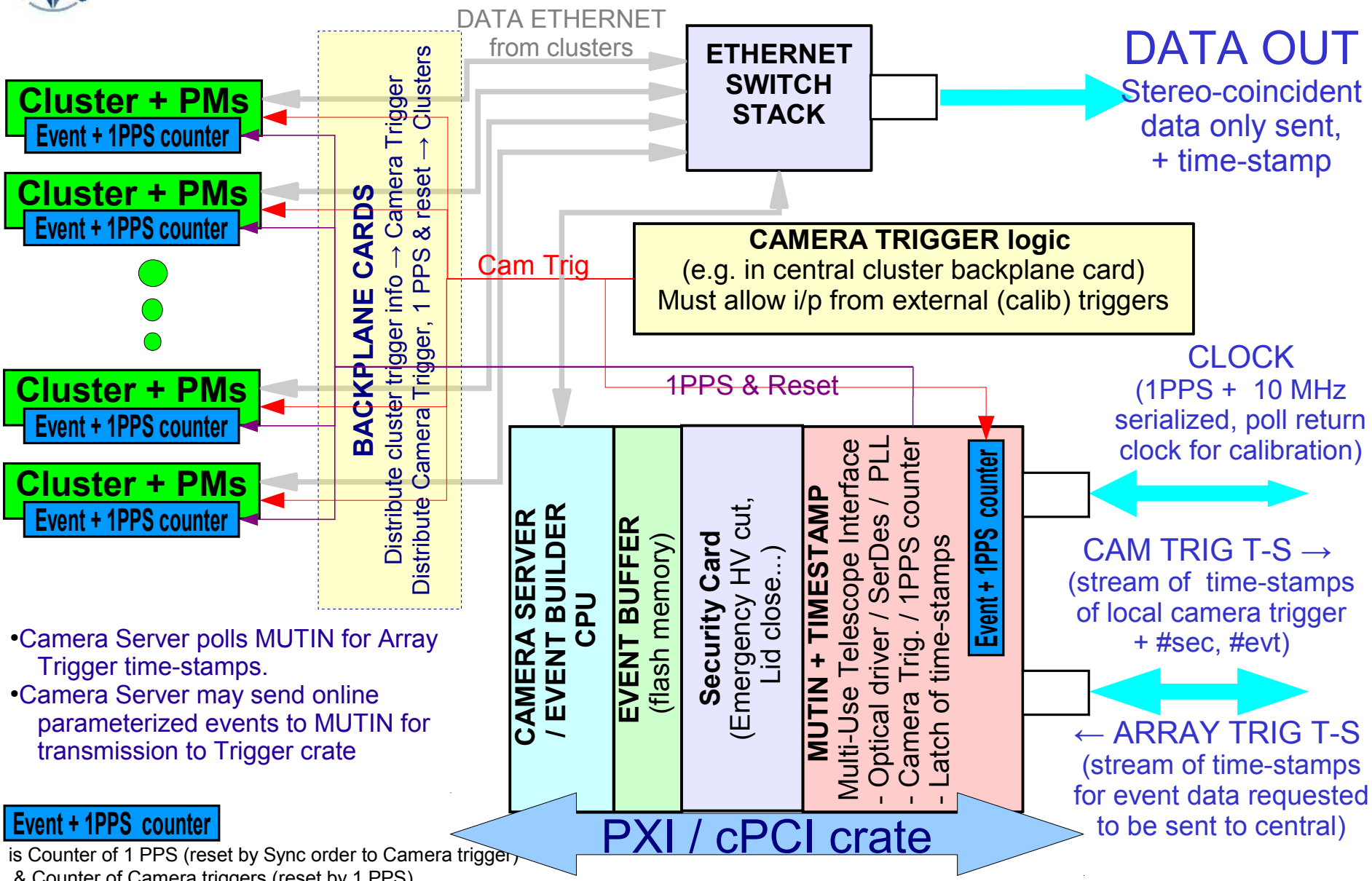


Inter-telescope Trigger topology

Send telescope time-tags stream by dedicated fibre to central, return stream of coincident event time-tags to each telescope



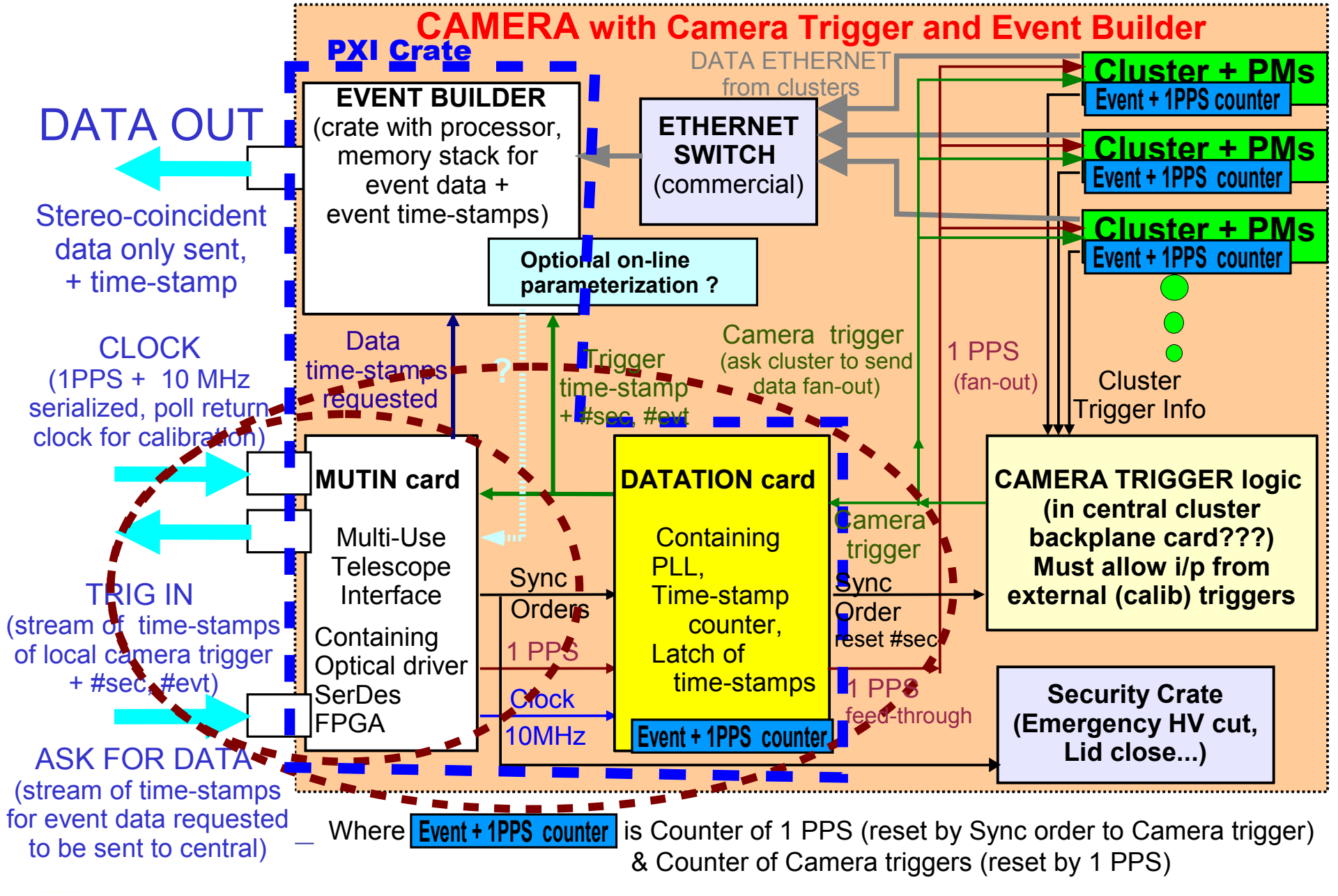
Ambitious option for Camera Architecture



- Camera Server polls MUTIN for Array Trigger time-stamps.
- Camera Server may send online parameterized events to MUTIN for transmission to Trigger crate

Event + 1PPS counter
is Counter of 1 PPS (reset by Sync order to Camera trigger)
& Counter of Camera triggers (reset by 1 PPS)

Ambitious option for Camera Architecture



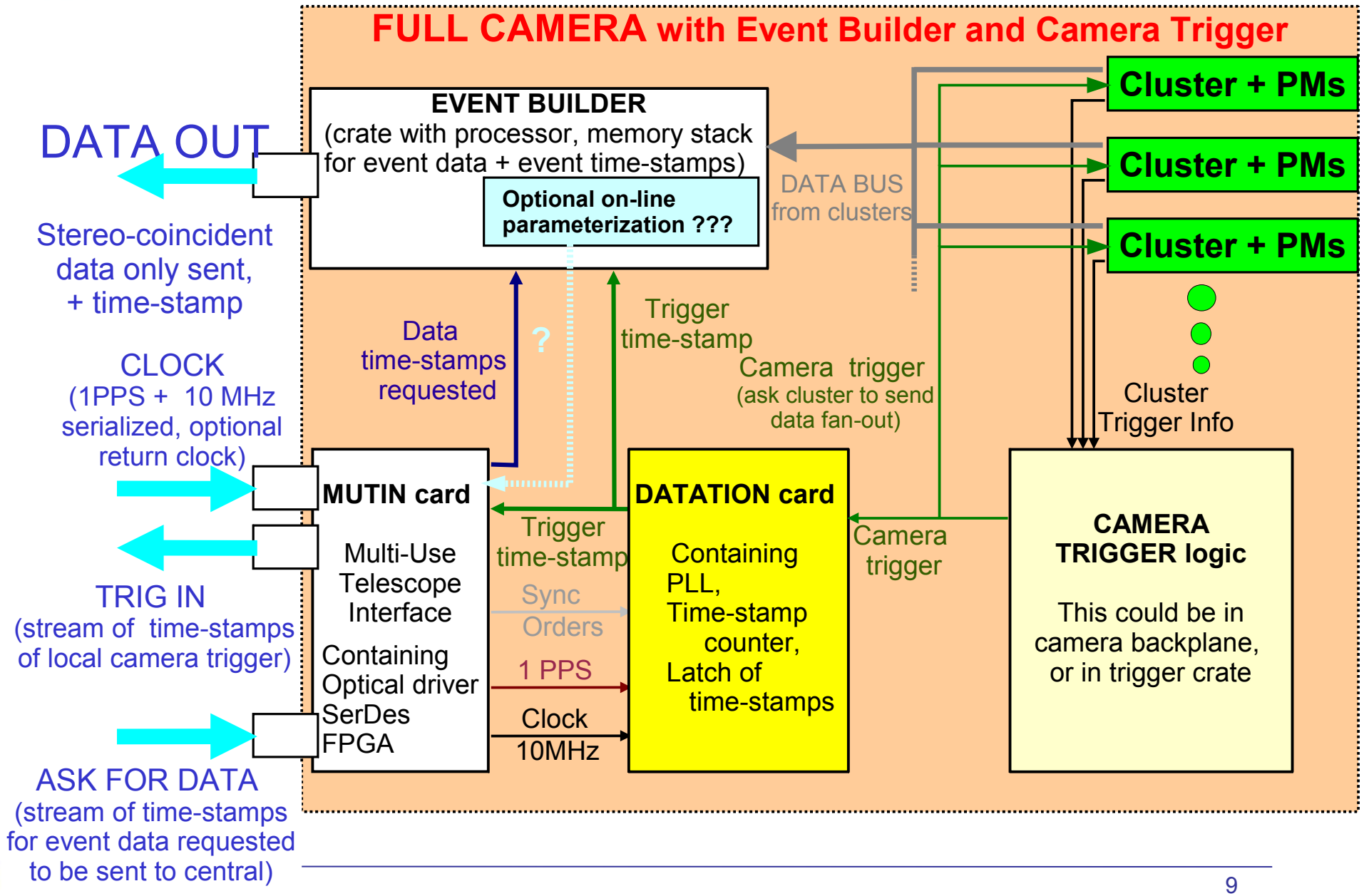
Where **Event + 1PPS counter** is Counter of 1 PPS (reset by Sync order to Camera trigger) & Counter of Camera triggers (reset by 1 PPS)

Previous slides with three possible architectures

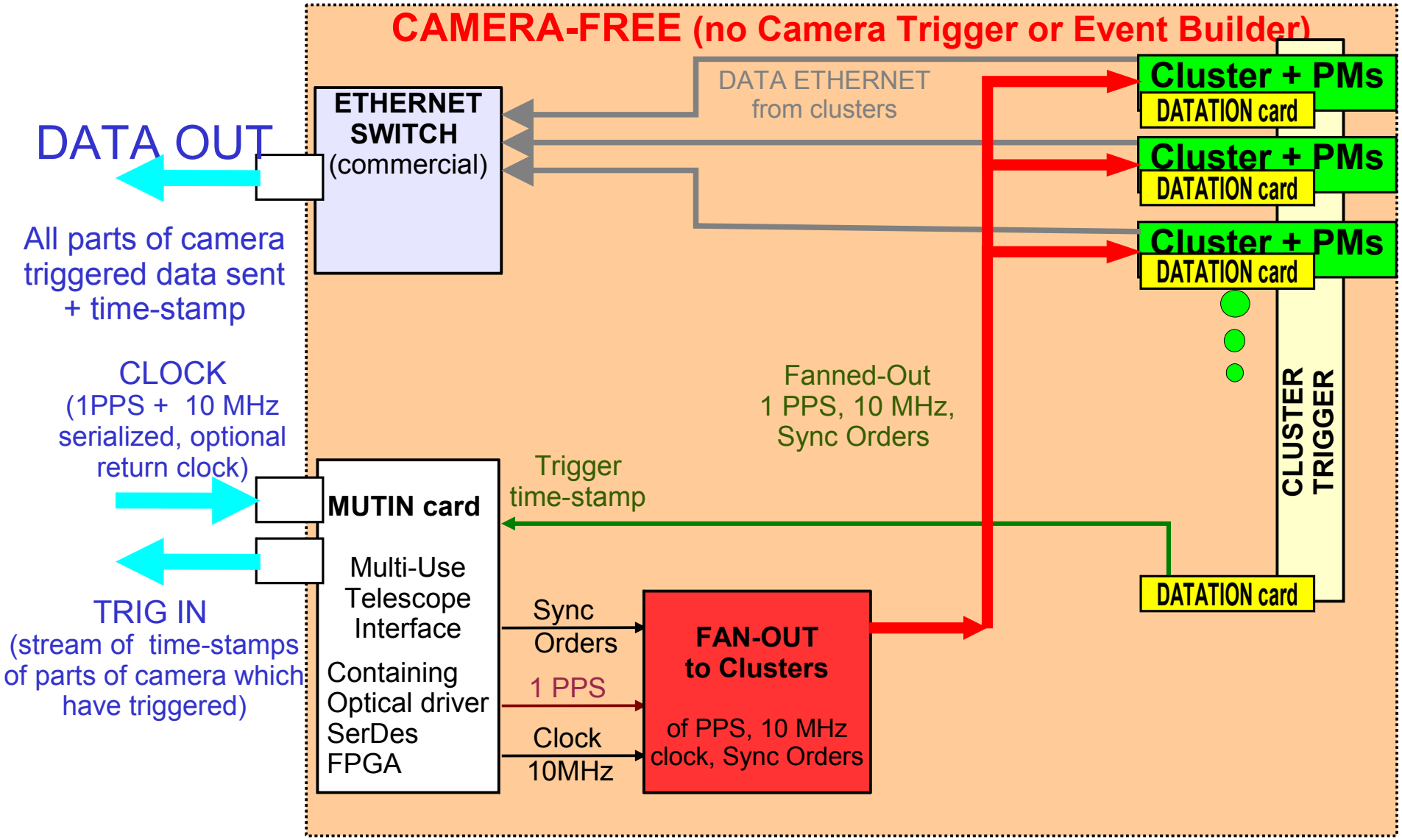
(note, at that time the datation was not integrated in the MUTIN)

⇒ Have to update these slides of the architecture to reflect “new” options (camera server on the ground)

The interface view from the Camera: Option "Full Camera"

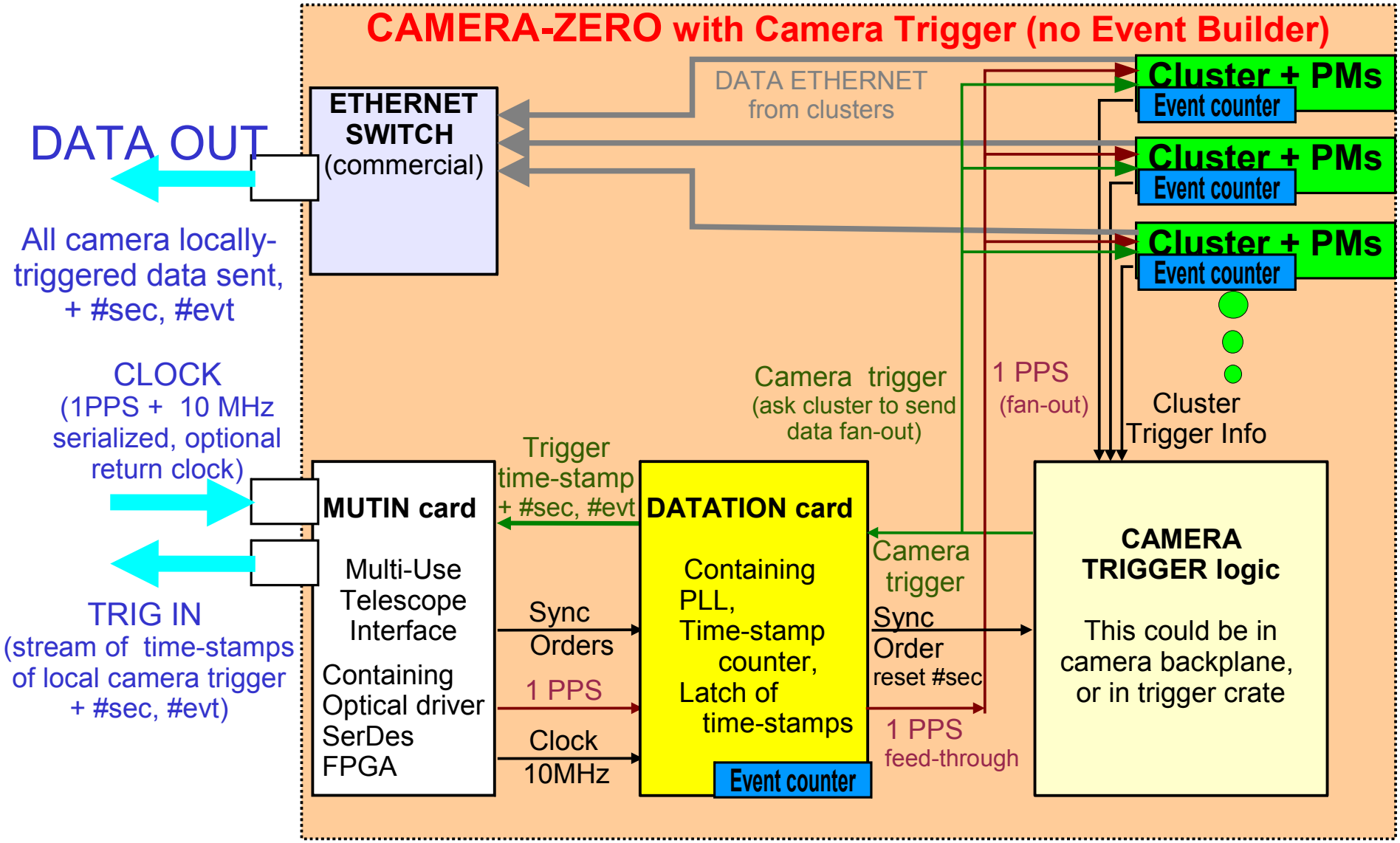


The interface view from the Camera: Option "Camera-Free"



Where **DATATION card** containing PLL, Time-stamp counter, Latch of time-stamps …
Must be duplicated in each Cluster

The interface view from the Camera: Option "Camera-Zero"



Where **Event counter** is Counter of 1 PPS (reset by Sync order to Camera trigger) & Counter of Camera triggers (reset by 1 PPS)