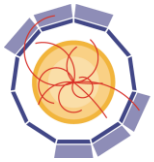

EUDAQ v2
the DAQ software upgrade of testbeam telescope

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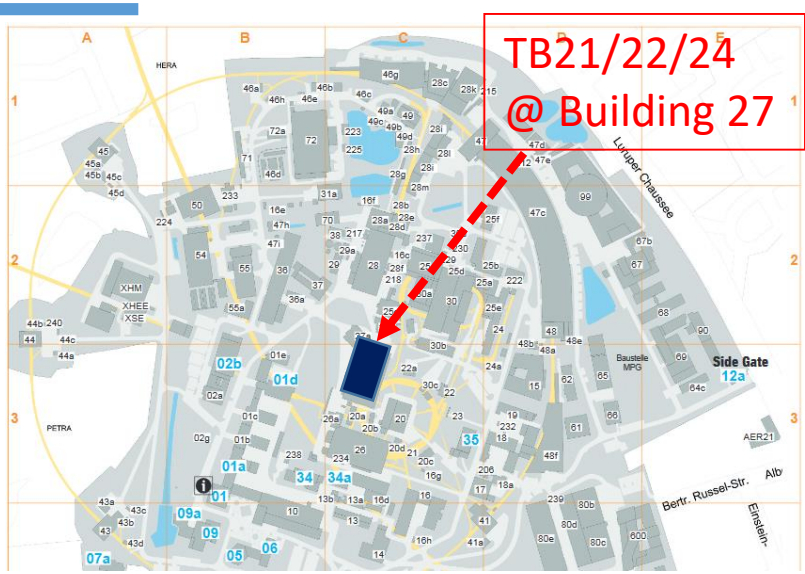
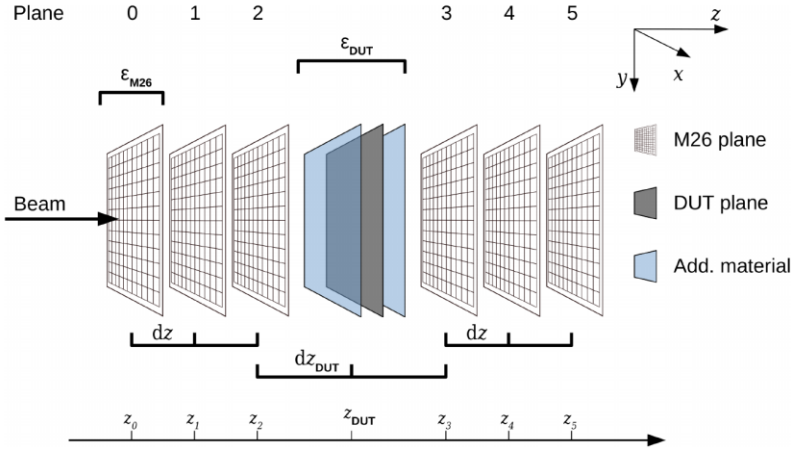
Code repository https://eudaq.github.io

Testbeam/Telescope In DESY

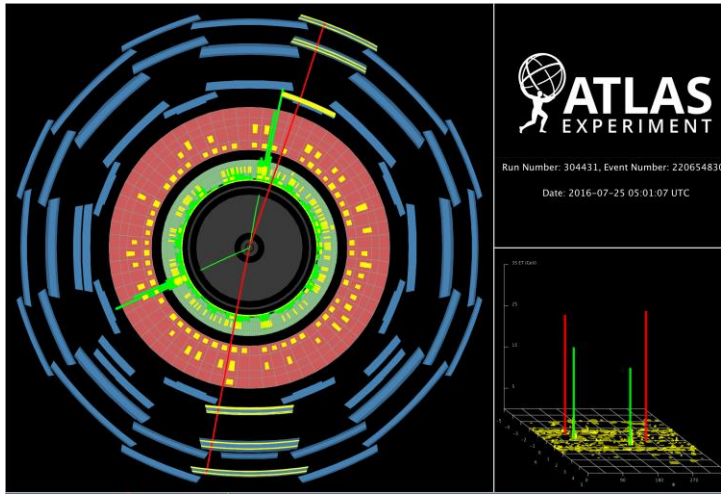
https://telescopes.desy.de

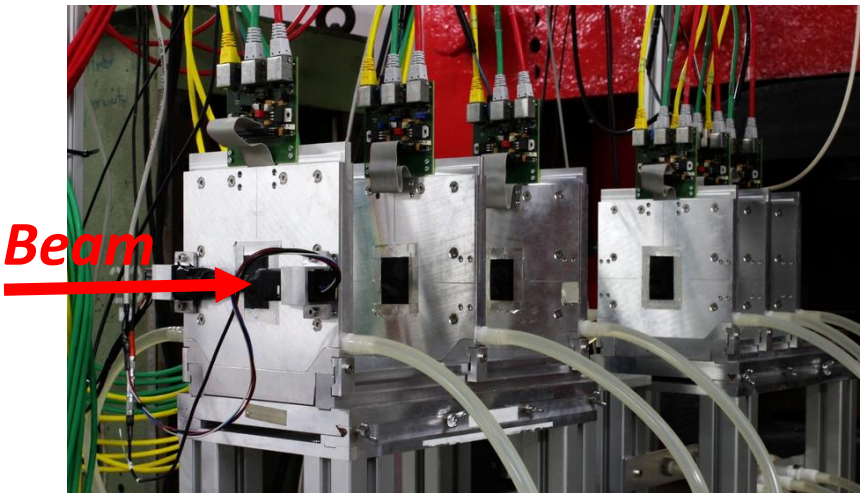
EUDET telescope





testbeam telescope vs collider exp





EUDET telescope

Same:

Be consist of multiple sub detectors running in different speed.

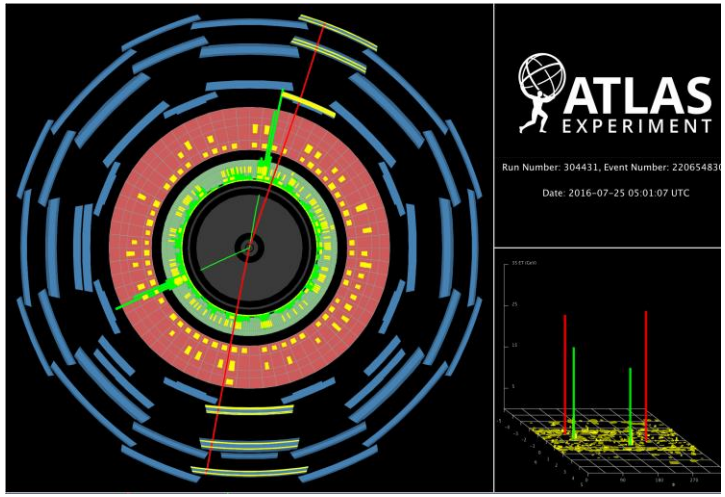
Sub detectors have different spatial resolution.

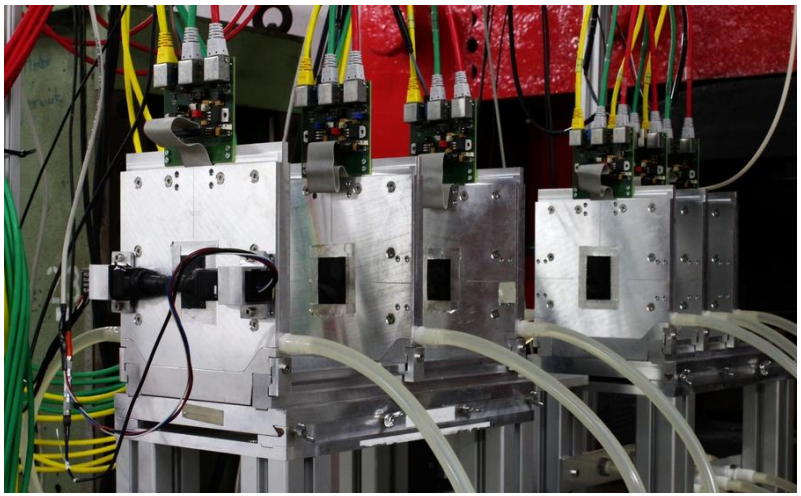
Combine the hit points and fit particle tracks.

Diff:

multiple trigger-level	one trigger / no trigger
magnetic field	no magnetic field
helical track	straight line track (with multiple scatter)
collision vertex	no vertex

DIFF: testbeam telescope vs collider exp





EUDET telescope

Same:

Be consist of multiple sub detectors running in different speed.

Sub detectors have different spatial resolution.

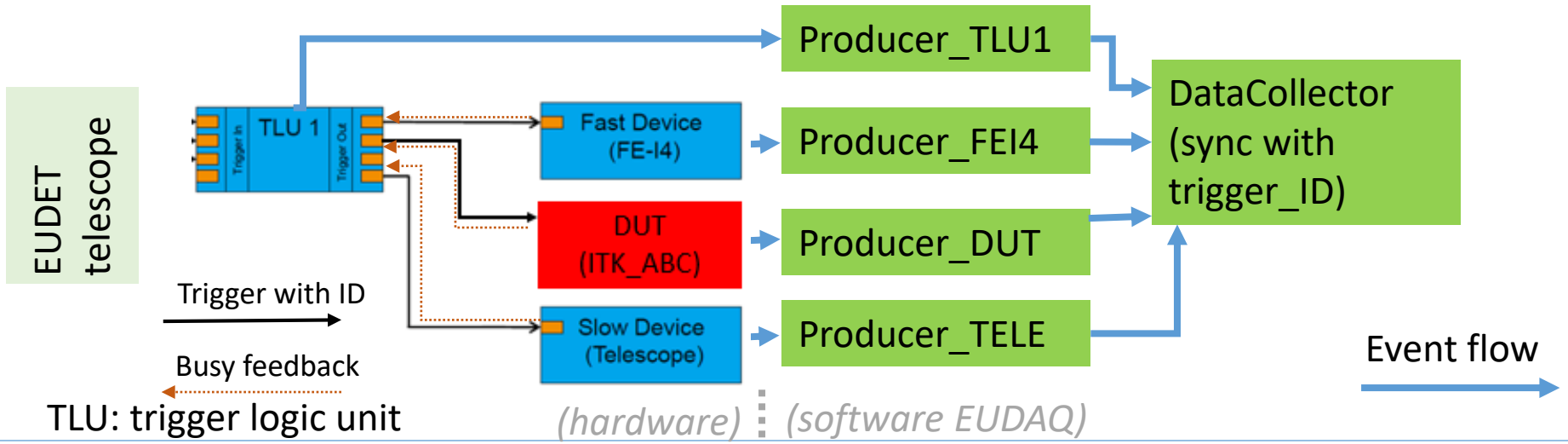
Combine the hit points and fit particle tracks.

DAQ software takes response of …..

Diff:

multiple trigger-level	one trigger / no trigger
magnetic field	no magnetic field
helical track	straight line track (with multiple scatter)
collision vertex	no vertex

Update EUDET telescope to AIDA telescope



EUDET telescope

- A system trigger signal with trigger-ID is distributed in all telescope sub detectors.
- Sub detector reads trigger-ID and insert it to a triggered sub event.
- Trigger-ID is the key to merge sub events.

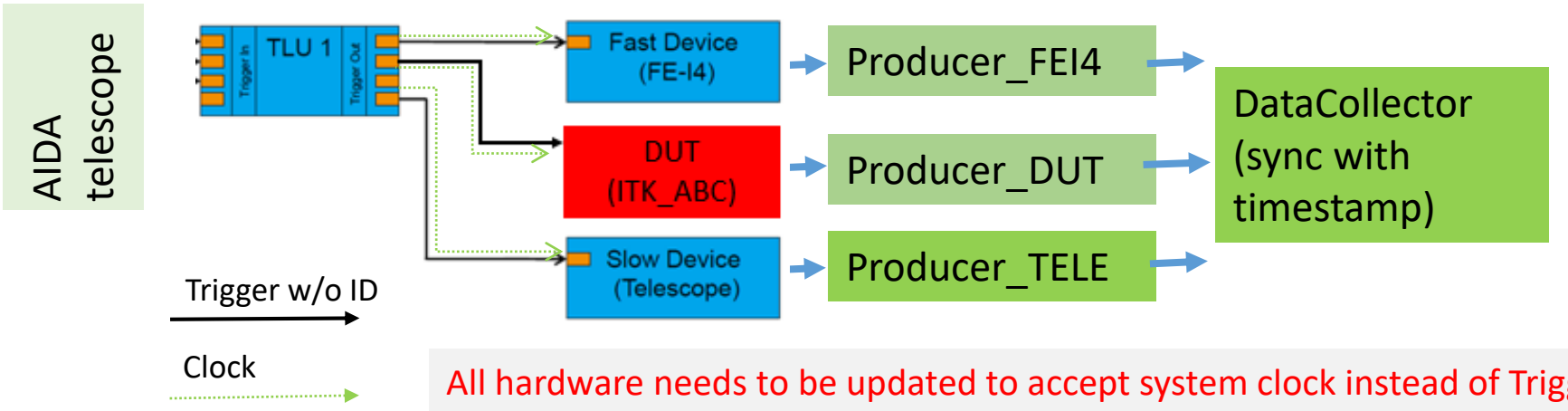
Update EUDET telescope to AIDA telescope

AIDA telescope

- A system clock will distribute to all telescope sub detectors.
- Sub detector counts the clock circle to generate timestamp and insert it to a triggered sub event.
- Timestamp is the key to merge sub events.

TLU: trigger logic unit

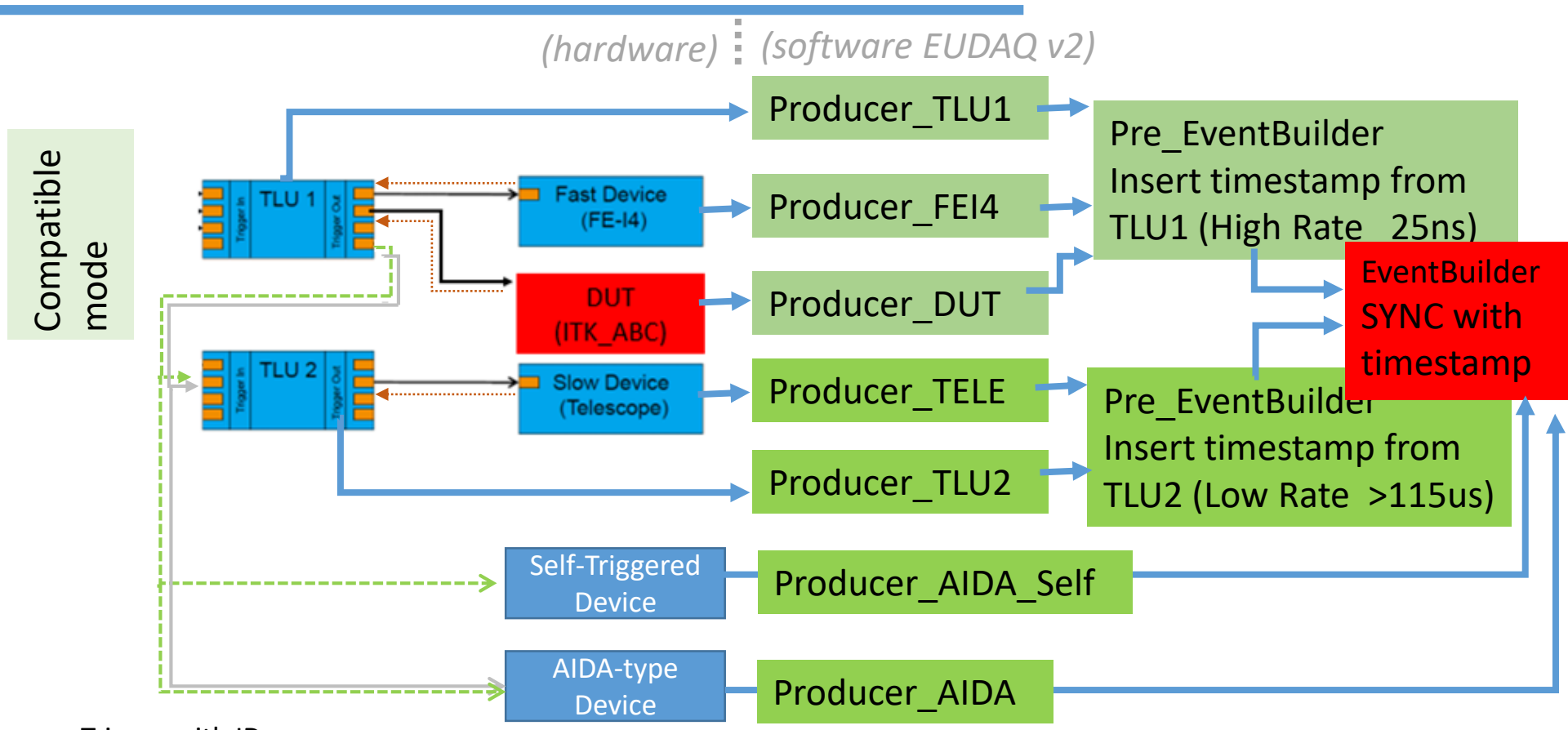
(hardware) ⋮ *(software EUDAQ)*



All hardware needs to be updated to accept system clock instead of Trigger ID.

Hardware can not always available in time, in that case….

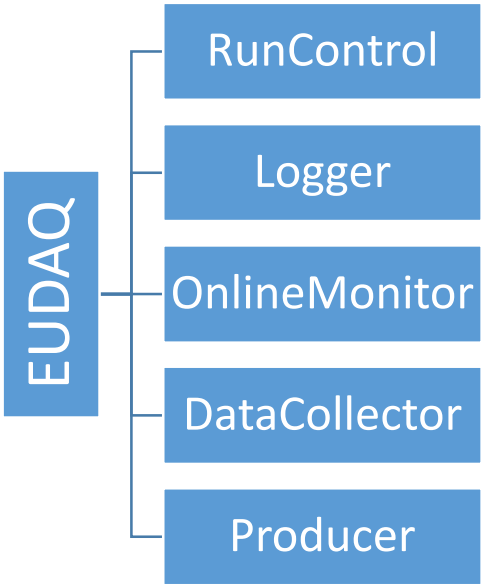
Compatible/Mix mode



- TLU is the only hardware with need to be updated.
- Full compatible with EUDET-type telescope and user DUTs.
- Full compatible with AIDA-type sub detector.
- Full trigger rate

EUDAQ components

- EUDAQ is originally developed as a DAQ system for EUDET-type telescopes.
- Centralized controlling, logging.
- Distributed data acquisition



Control all EUDAQ components

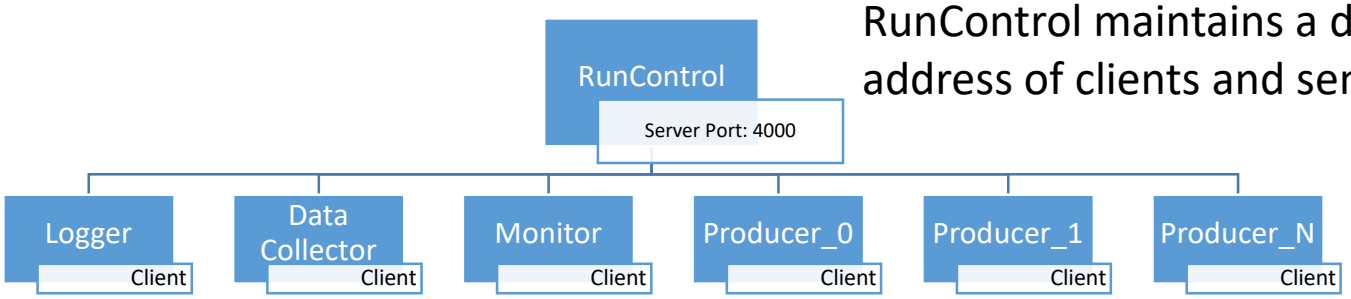
Log the message

Display hit information online

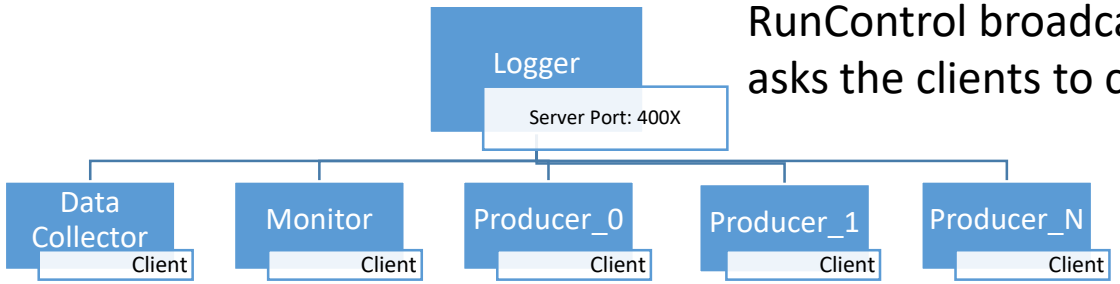
Merger the sub events to a physical event.

Talk to device and send sub events

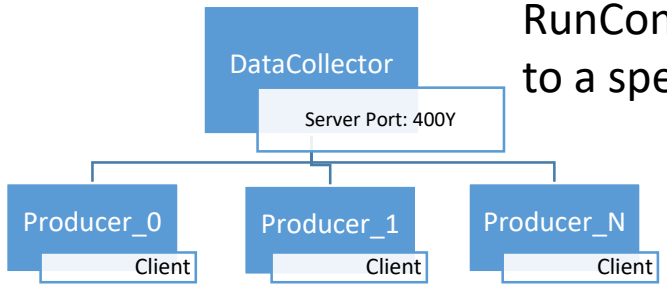
Network layout (by IP/TCP)



RunControl maintains a database about the address of clients and sends command to them.



RunControl broadcast the logger address and asks the clients to connect to logger



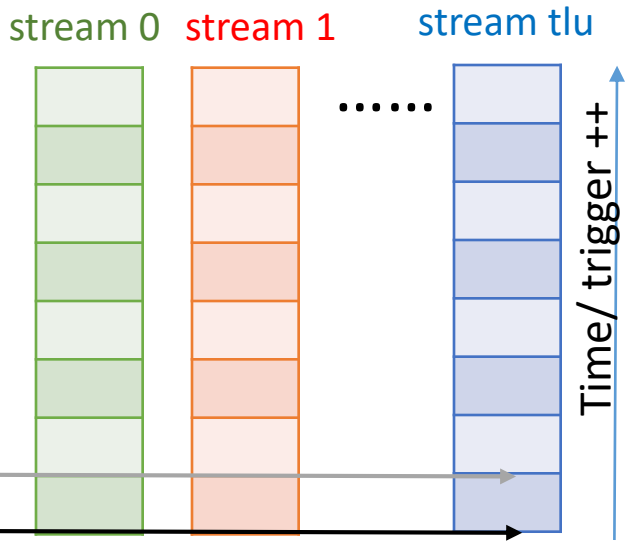
RunControl asks the producer to send its data to a specific DataCollcetor.

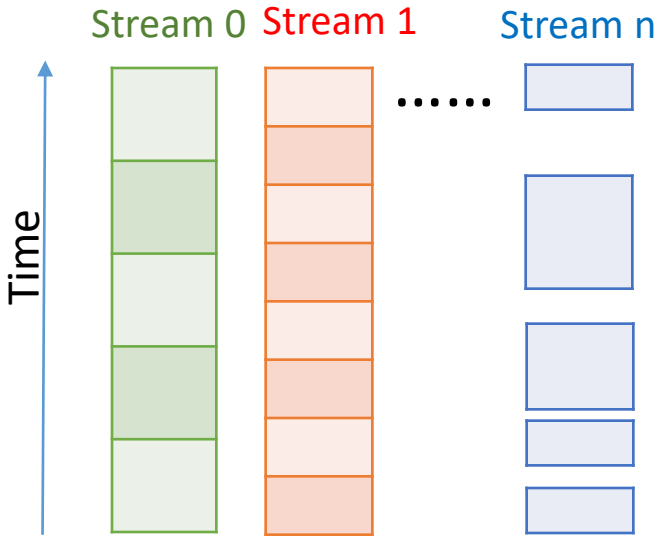
EUDAQ2:
Producer can send data to more than one DataCollcetors.

Event Synchronization

EUDET mode (sync by Event Number).

Event_Number is checked to know if sub events from different streams are belong to a same trigger signal.



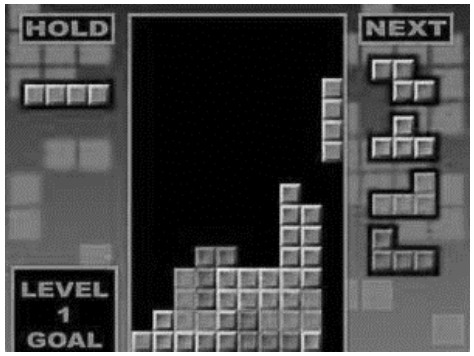


AIDA mode

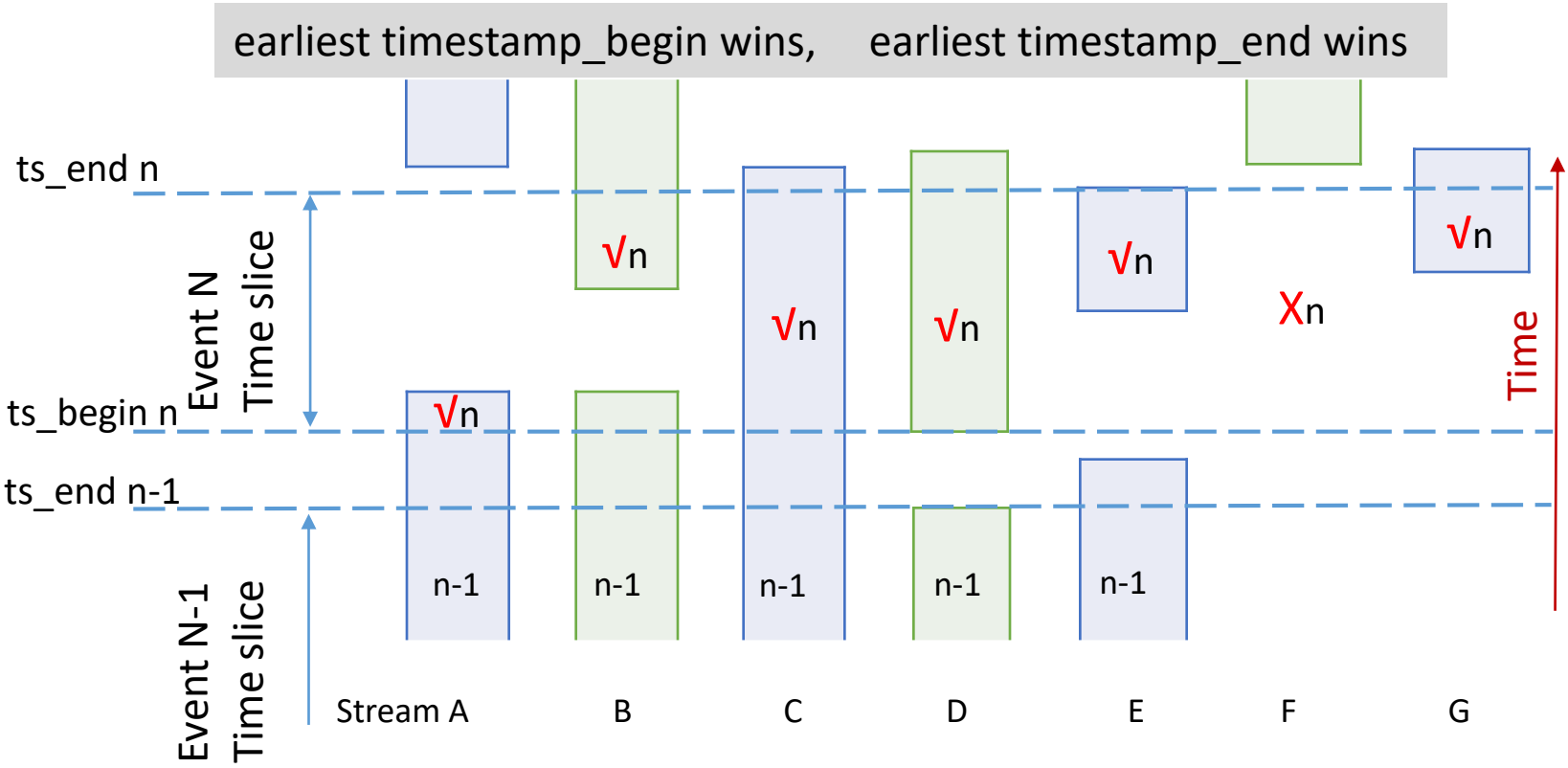
In generic case, sub events can arrives in any random time.
How to defined a physical event?
How to defined a valid trigger?
Which detector is the trigger device?

Event Synchronization (by TimeStamp)

Tetris



- Time length of sub events are flexible.
- Time slice of merged event is decided event by event.
- All streams are equal to each others
- Streams can be empty. (some subdetectors are very slow)



Processor framework

If we want to do more than data merging online (eg. filtering, track fitting…..)
Event processing code can be encapsulated as a Processor.

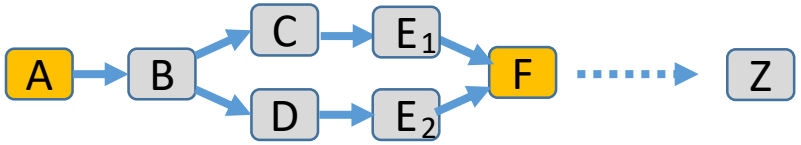
Processors are linked to a chain to processing data.

Processor chain can be forked and rejoined

Run Independently

"I do everything myself."

Multiple threads capability and safety.



Using Processor

- Processor framework is intended to be used in “Event Builder”, and make the Event building/synchronizing more flexible.

What’s more:

- “Producer”, “Data Collector” can be also be implemented as a chain of processors or just one processor.

- If link the chain of “producer”, “Data Collector” and ”Event Builder” we get a full standalone DAQ running locally.

Extend its use case as common DAQ

- Key features to be a common DAQ
  - Distributed data taking
  - Central Control and configure interface.
  - Data collector/builder and data converter
  - GUI, Monitor
  - Extendable
  - Cross platform

In EUDAQ 2
√
√
√
√ *
√
√

EUDAQ2 has almost all required key features to be a common DAQ,

(*) except its OnlineMonitor was designed for EUDET hardware.