ebg MedAustron

cosylab
CONTROL SYSTEM LABORATORY

REDNET Overview

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Outline

- What does REDNET provide to the users
  - How it looks like
  - How it works (MTG & MTR)
  - Responses - controlling the devices
- What we have done in CWO2
  - Refine the requirements
  - Architecture and design
  - Mock-up demo of the system
- What follows in future CWOs
  - Detailed FPGA and LV architecture
  - Implementation of the system

What does REDNET provide to the users
How it looks like

- prepare data

SCS

- process data in hard real-time

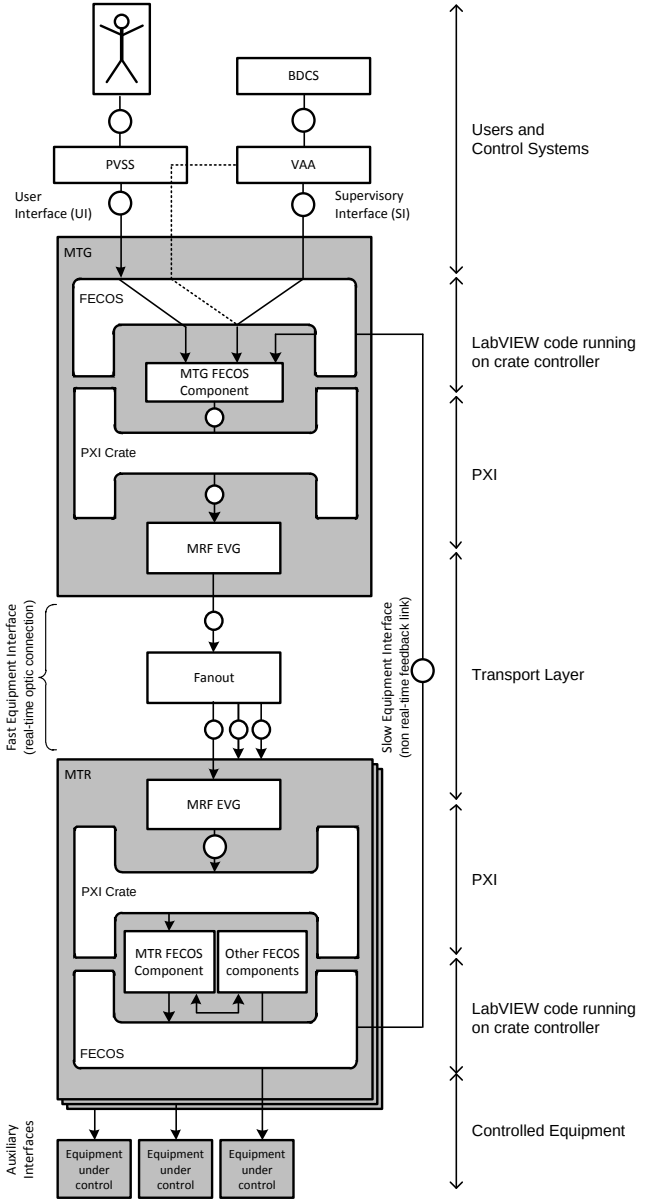
1. MTG

- make sure everybody gets it @ the same time (200m = ~1μs)

2. Transport

- decode events and poke equipment

3. receivers w. equipment



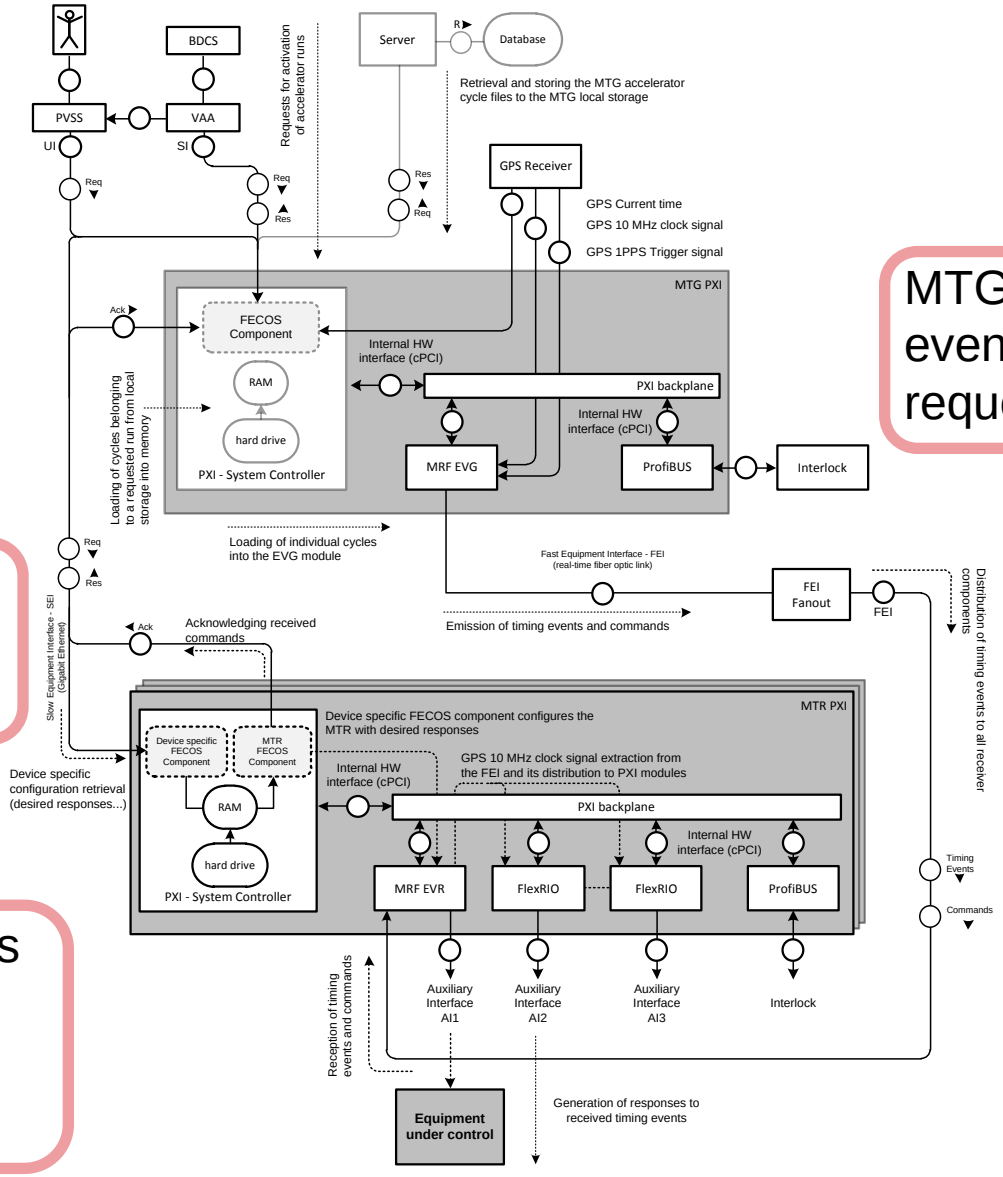
What does REDNET provide to the users
How it works

VAA Activates a Run (+ run file)

MTG redistributes the Run file with a list of cycles

VAA requests the generation of a cycle from the run list

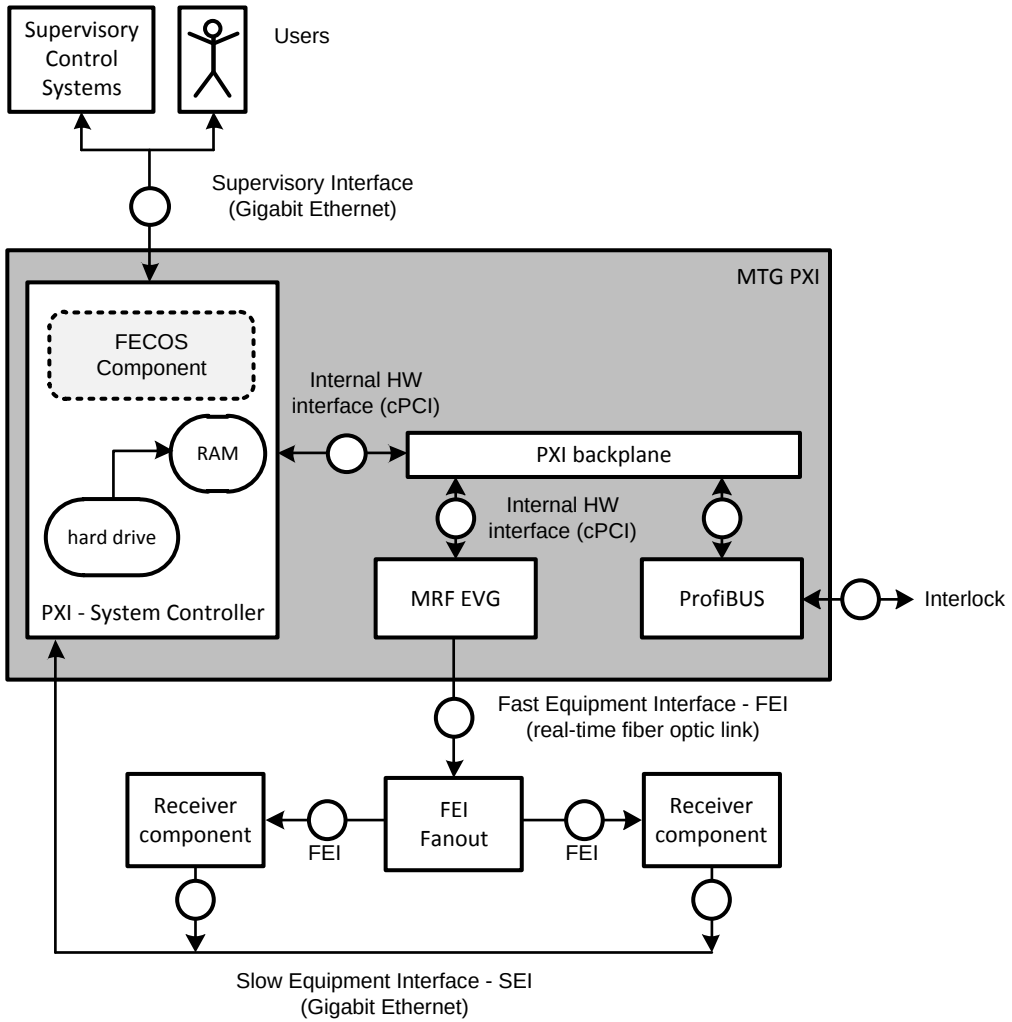
Receiver components generate responses (digital signals, irq, triggers…)



MTG Generates timing events from the requested cycle

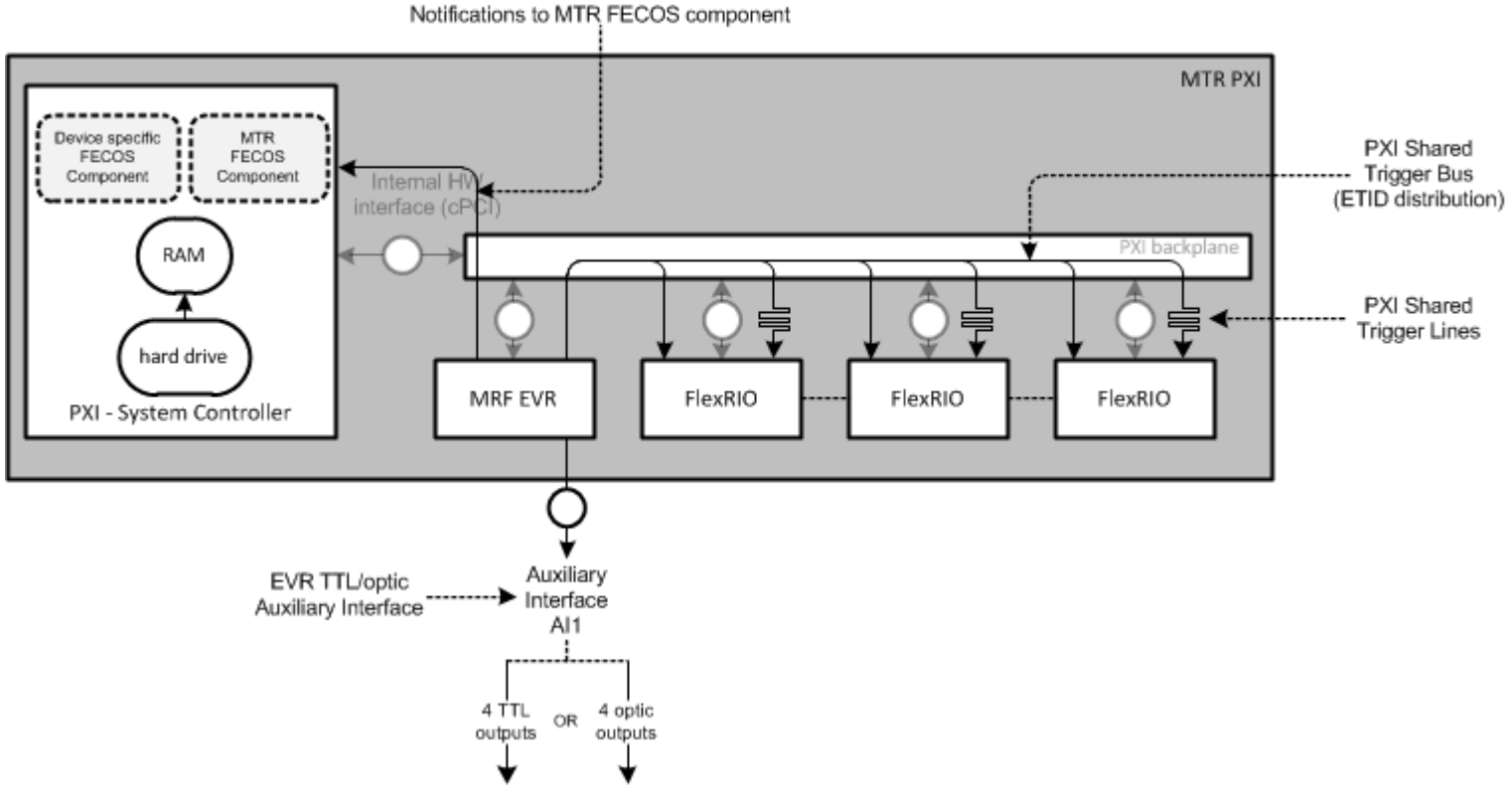
What does REDNET provide to the users MTG

- PXI crate
- Controller
- LV RT
- MRF EVG



- 5 Execution slot tables (priorities)
- 1μs granularity of event emission
- Emission of asynchronous timing events
- 10 Hz heartbeat timing event (time grid)
- GPS time and clock distribution

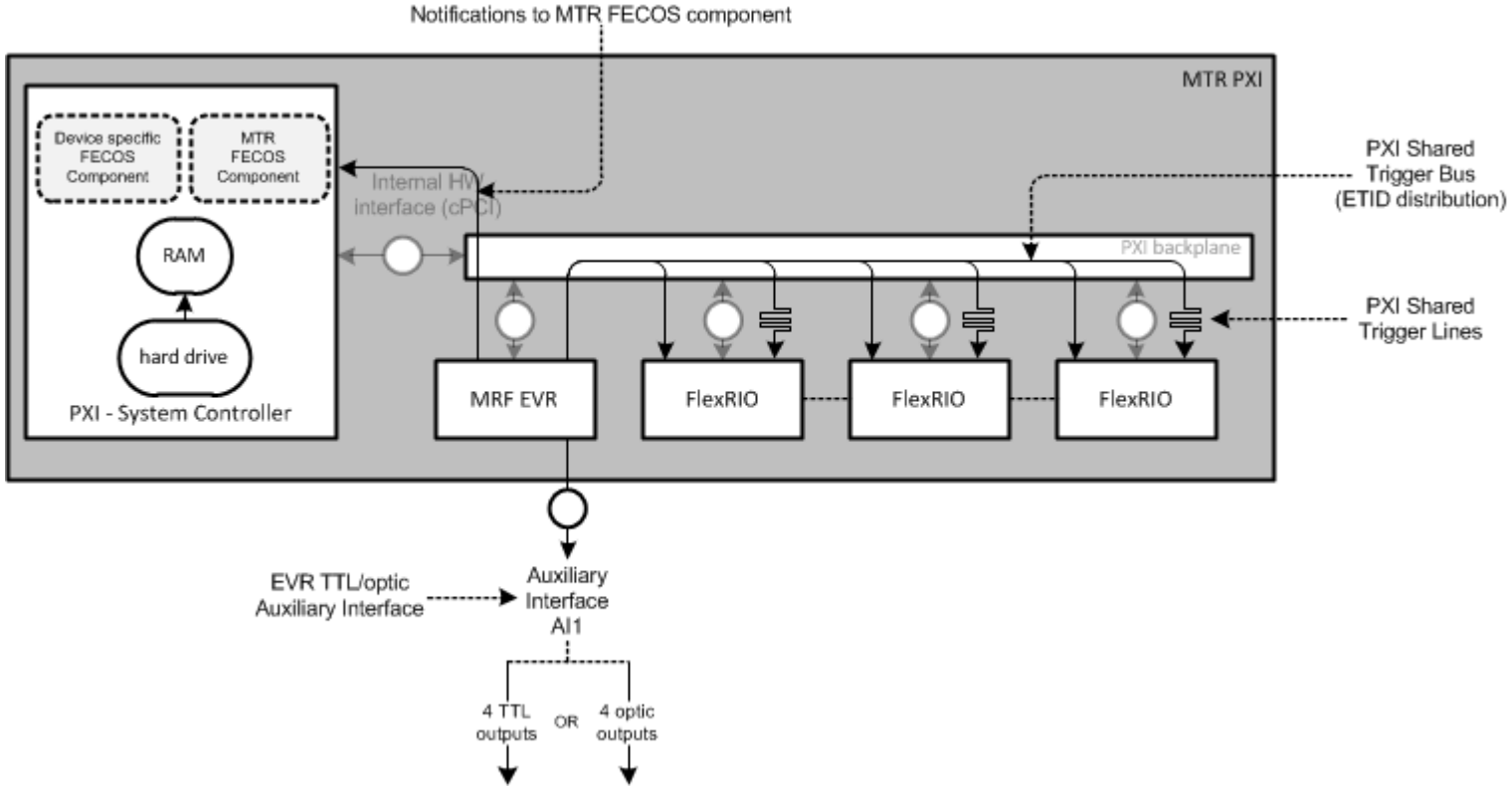
What does REDNET provide to the users
MTR – controlling the devices



- PXI crate
- Controller
- LV RT
- MRF EVR
- Other PXI modules

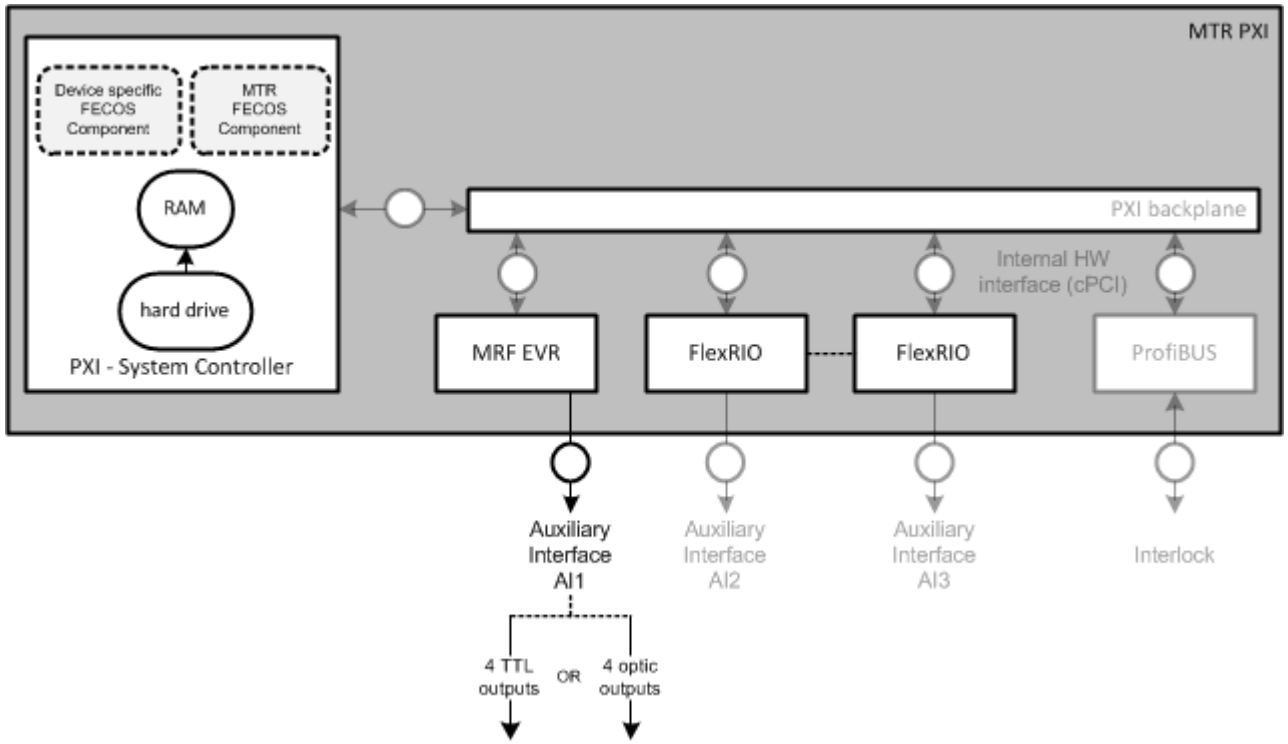
- Digital/optical signals on the MRF EVR outputs
- Re-distribution of timing events to PXI cards
- Trigger neighbor PXI cards
- LabView application notification

What does REDNET provide to the users
MTR - controlling the devices



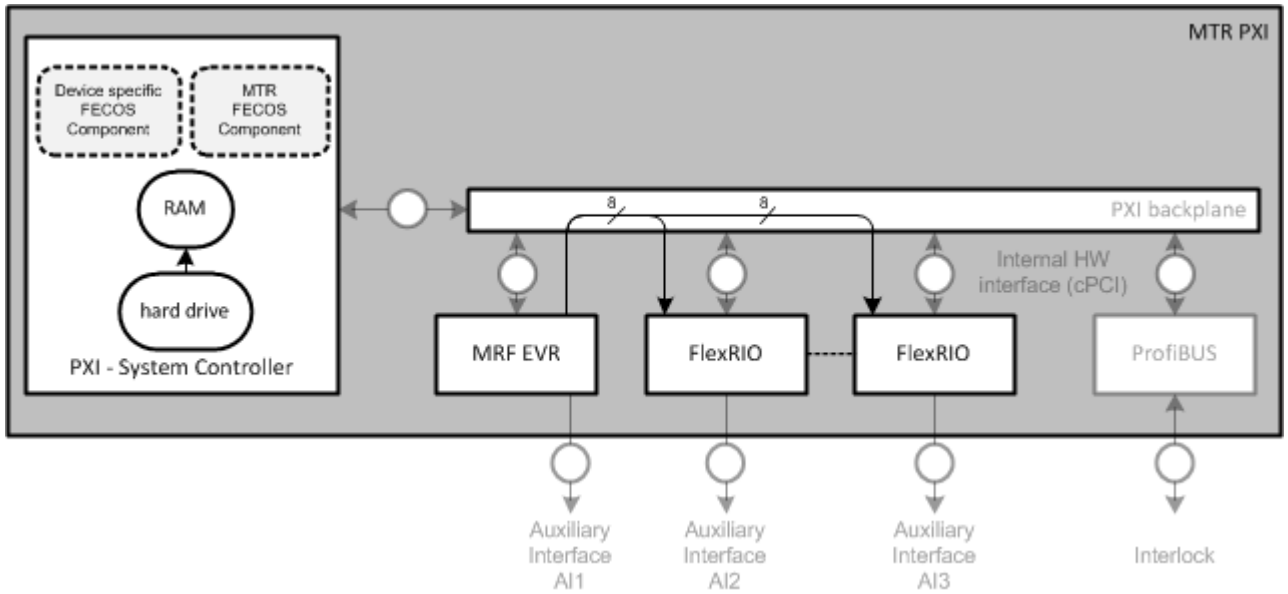
- No configuration files are needed.
- Device specific application requests the MTR which responses it needs (+ parameters such as timing event, pulse delay, width…)
- Multiple interfaces can be used concurrently
- Global propagation delay compensation parameter (<10ns steps)

What does REDNET provide to the users
Responses – Auxiliary interface outputs



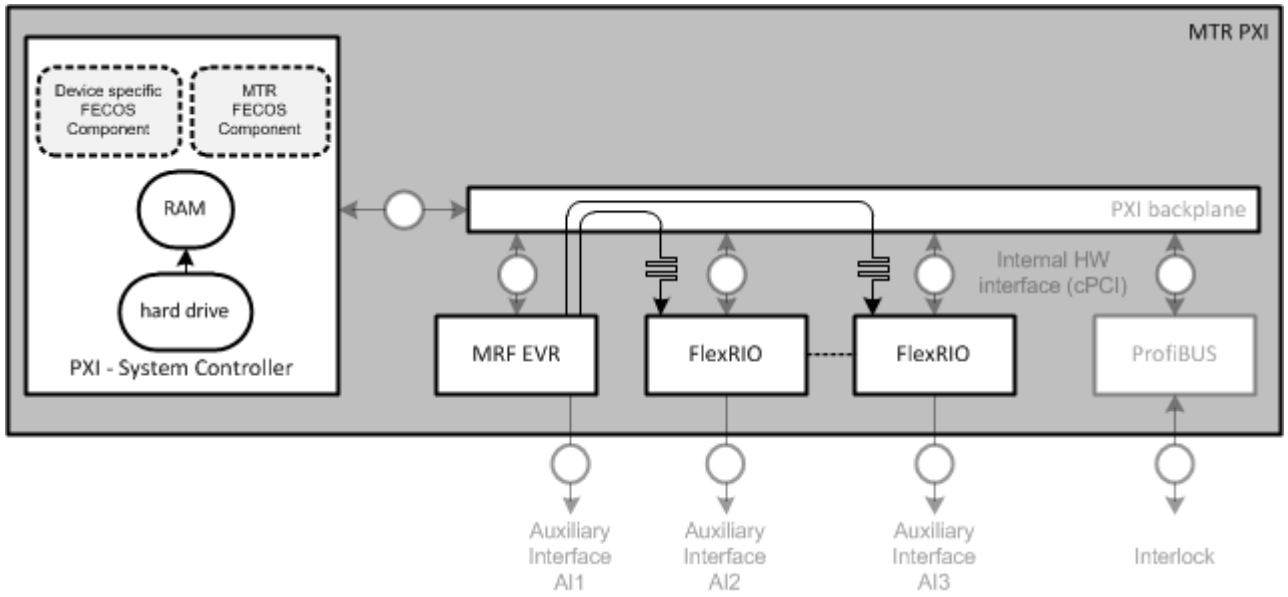
- Pulses or output toggle
- Configurable pulse delay and width (< 10 ns steps)
- Each digital/optic output can have different configuration (ES, event, delay, width, type)

What does REDNET provide to the users
Responses – Redistribution of events to PXI cards



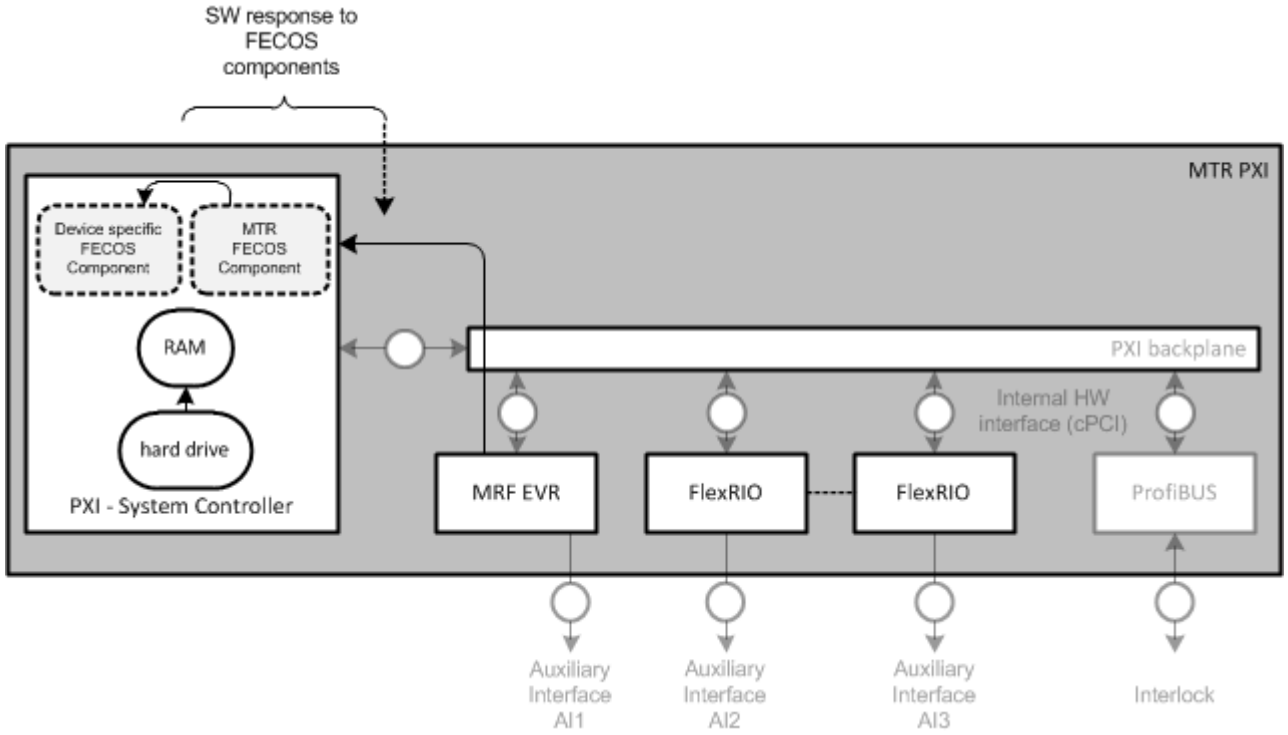
- Each received timing event can be distributed to other PXI modules
- EVR distributes timing event value and execution slot to which the event belongs

What does REDNET provide to the users
Responses – Triggering PXI cards



- Trigger pulses generated on PXI star trigger lines
- Useful for simple devices (ADC cards etc.) which only need trigger signals

What does REDNET provide to the users
Responses - LabView application notification

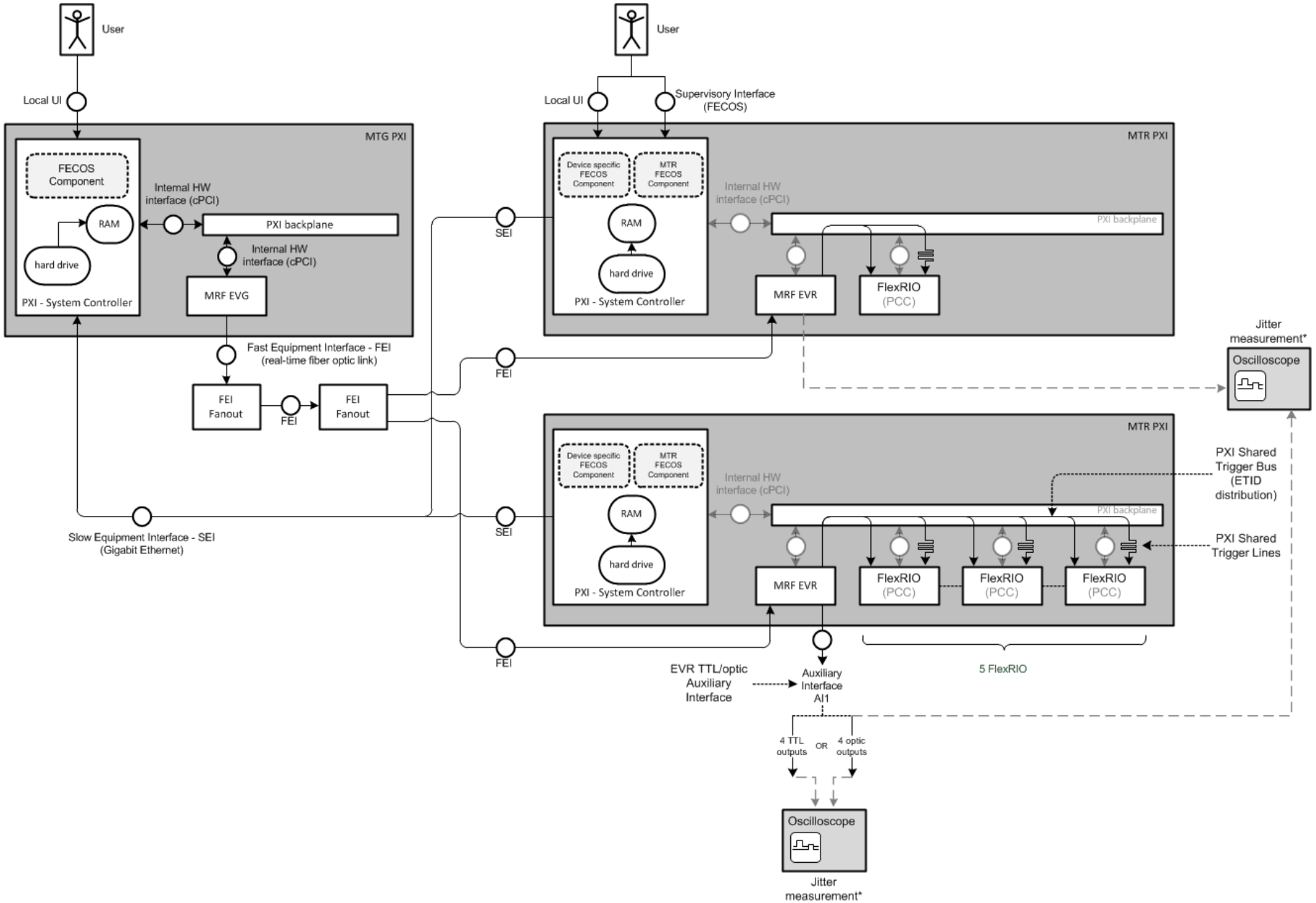


- EVR issues an IRQ when a specific timing event is received
- MTR distributes the received event to all subscribed device specific applications as a FECOS event

What we have done in CWO2

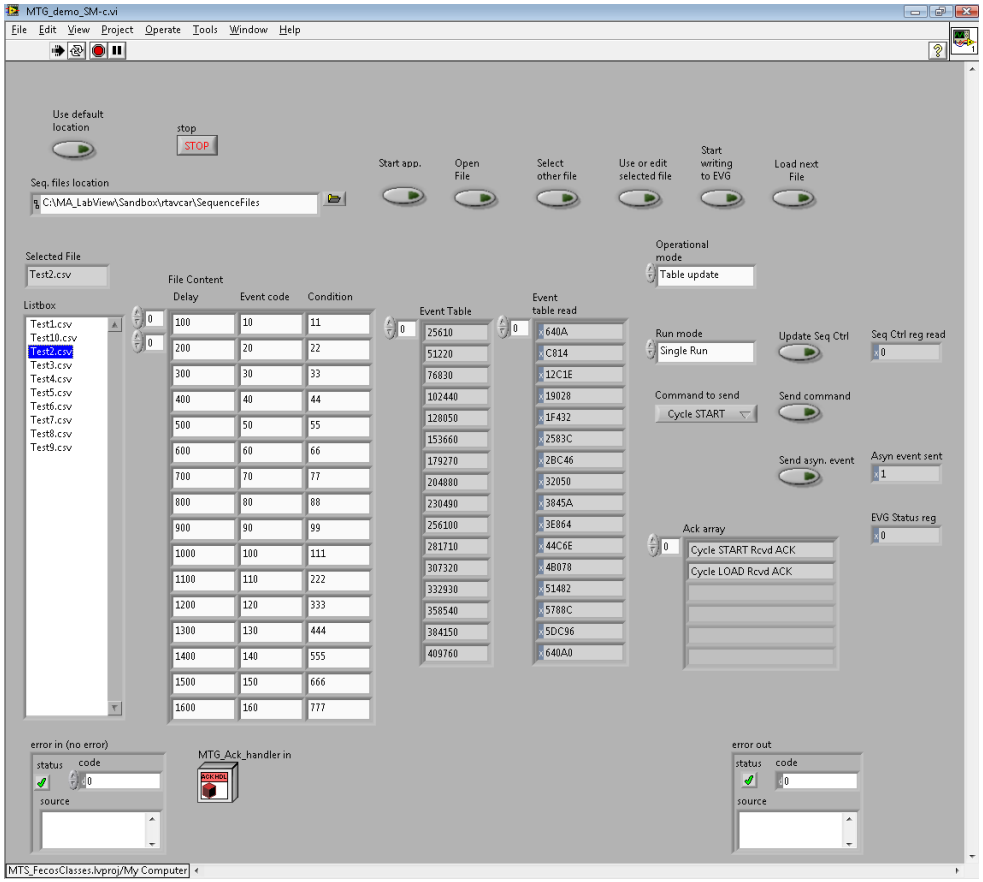
- Documentation
  - Refined the requirements in detail
  - Finished top level architecture and design
  - All documents are ported to Enterprise Architect models
    - All requirements covered by the top-level architecture
    - Traceability
- Fully mastered the MRF EVG and EVR cards
  - FPGA + 2.5 Gbps
  - LabView support for MRF
- Made mock-up demo of the system
  - Emission of timing events, commands, asyn. events, acknowledgments, uses FECOS…
- Defined tasks for future CWOs

What have we done in CWO2
REDNET Mock-up demo



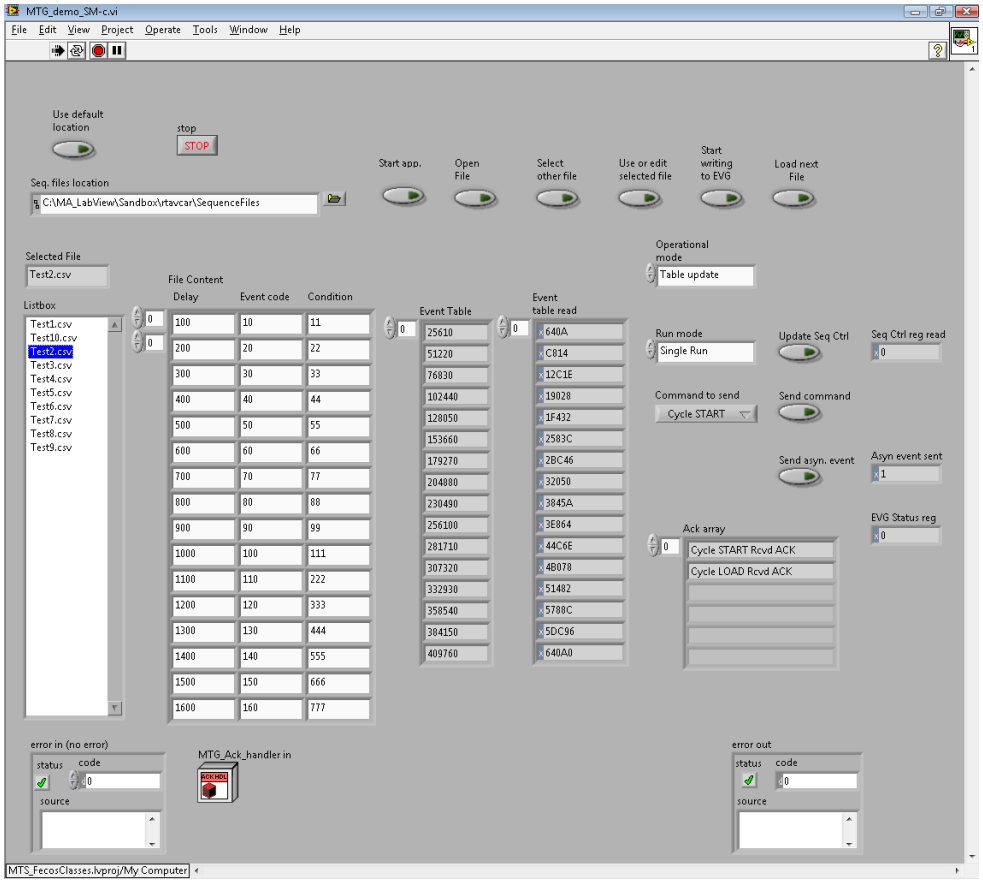
What have we done in CWO2 REDNET Mock-up demo

- Listing of available sequence files on HDD
- Sequence file editing
- Emission and reception:
  - Timing events
  - Commands
  - Asynchronous timing events
    - (Emitted at any time)
- Acknowledgments
  - Each MTR sends ACK
  - MTG lists all received ACKs



What have we done in CWO2 REDNET Mock-up demo contd.

- Response generation:
  - I/O signals on MRF EVR
  - Distribution of received events over PXI RT trigger bus (to PCC)
  - SW notifications
  - User can configure which responses are generated for received events



What follows in future CWOs

- Internal architecture design for the MTG and MTR:
  - LabView application
  - FPGA (MRF EVG & EVR)

- Implementation of the system
  - Full size accelerator cycles
  - Execution slot support
  - Full auxiliary interface outputs support
  - Synchronization with GPS
  - Heartbeat event generation
  - MTR & MTG configuration (xml files)
  - …

Thank you for your attention

Questions?