

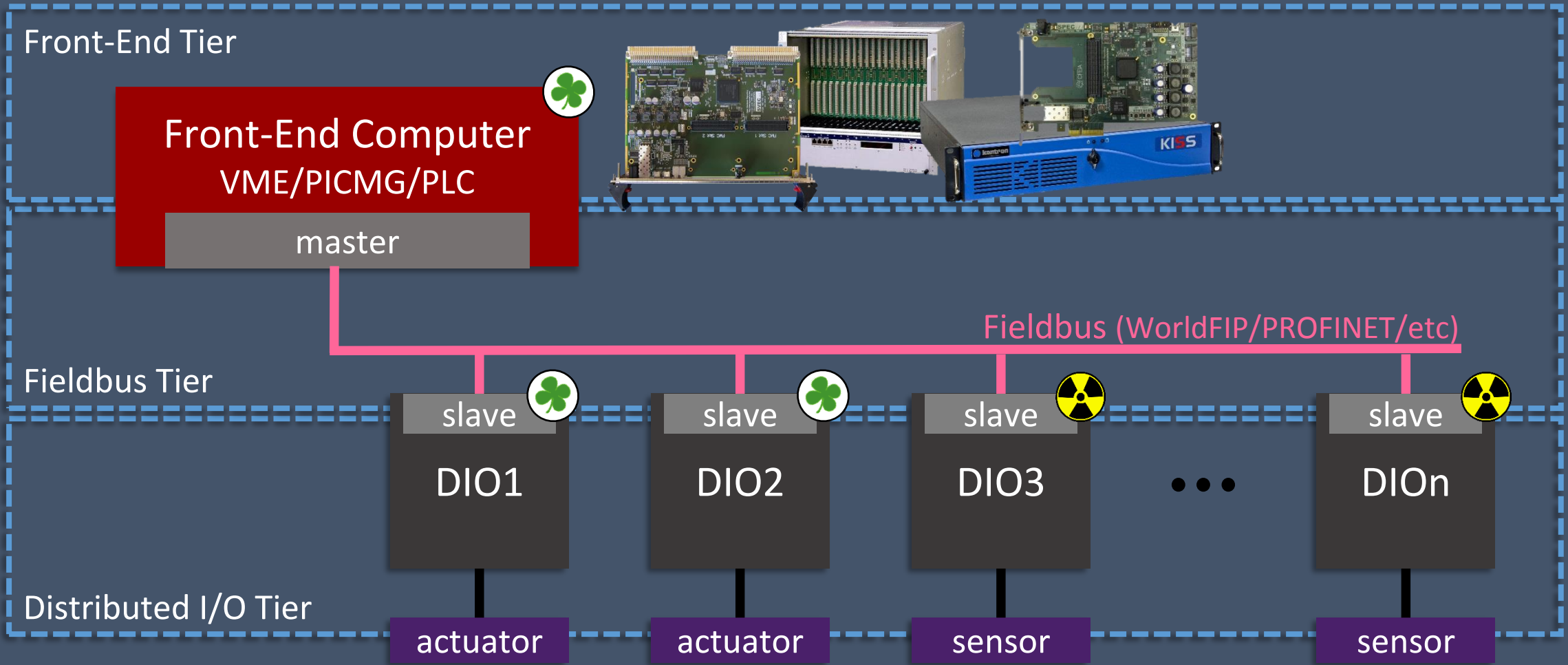


A proposal for a controls and data acquisition demonstrator

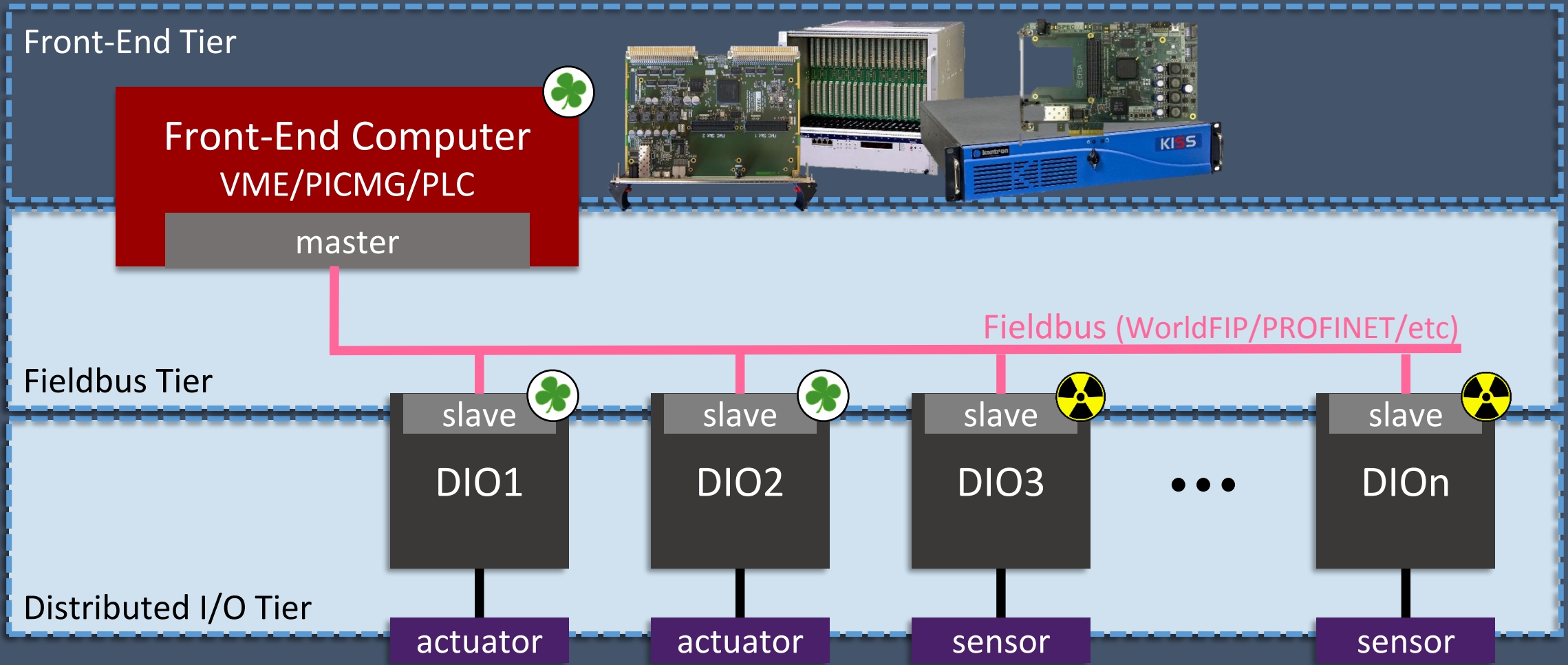
Javier Serrano

(with help from Greg Daniluk, Eva Gousiou and Maciej Lipiński)

Custom Electronics Architecture



Custom Electronics Architecture



Rad-tol Communication Technologies



DIOT today



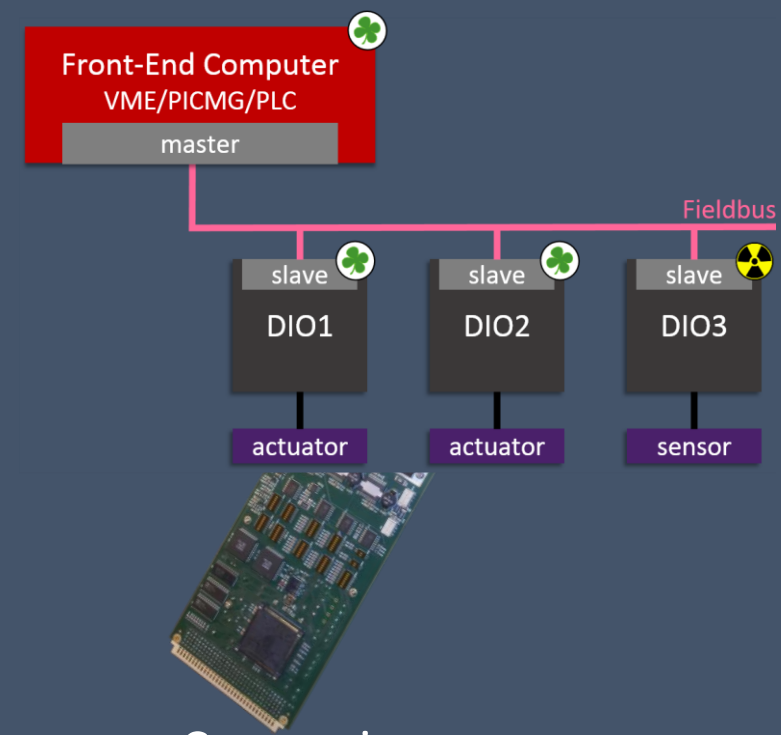
Power Converters

Machine Protection



Beam Instrumentation

Beam Transfer

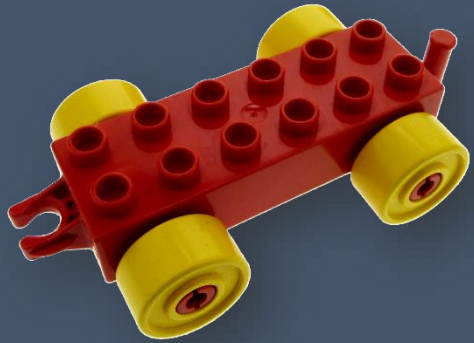


Cryogenics

Magnets Positioning



Future DIOT Recipe



+



=



Machine Protection



Magnets Positioning



Beam Transfer



Beam Instrumentation



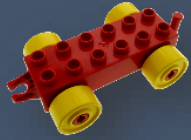
RF

Modular hw kit
Designed with eq.groups
Maintained by BE-CO

App-specific parts
Designed by eq. groups

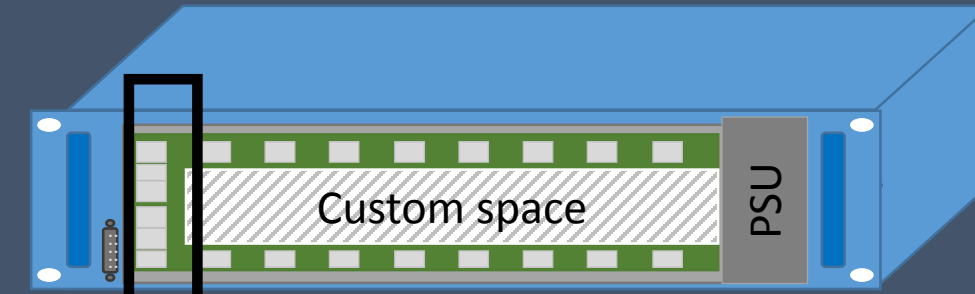
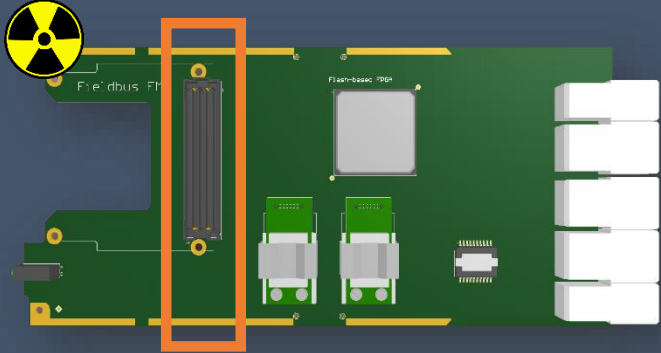
In CLIC we go one step further: all groups share a crate

- More robust designs
- Benefit from existing developments
- Re-use between equipment groups

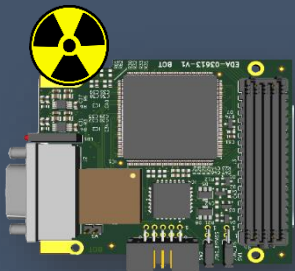
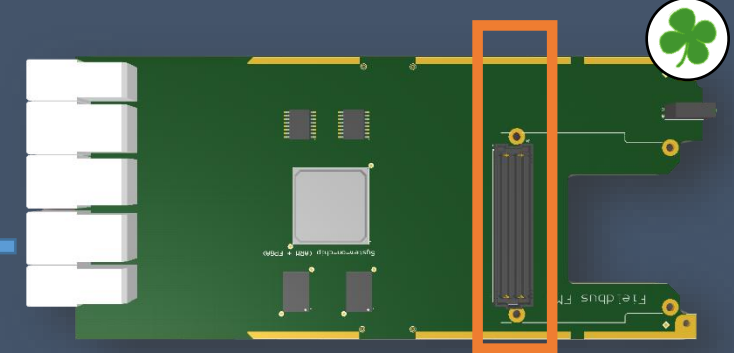


Common hardware kit for DIOT

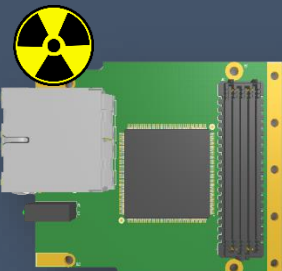
Radiation-tolerant System Board



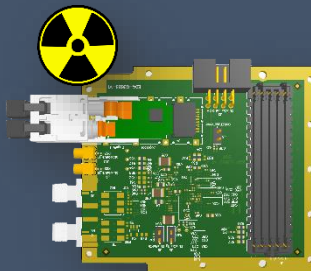
System Board



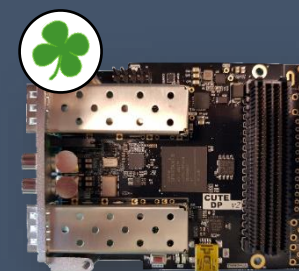
WorldFIP FMC



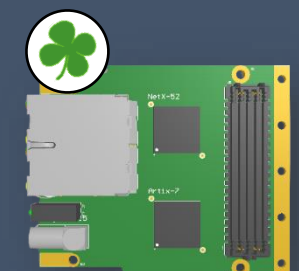
Powerlink FMC



LpGBTx FMC



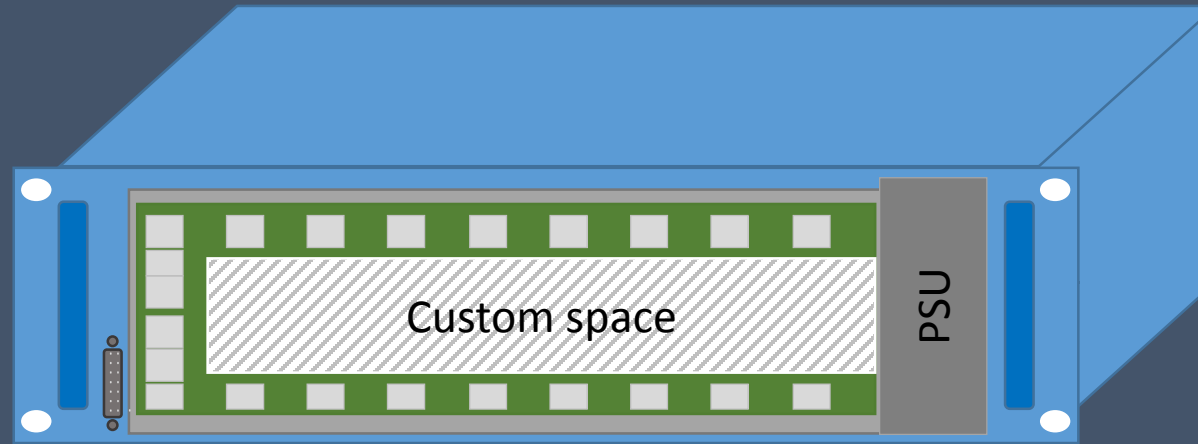
White Rabbit FMC



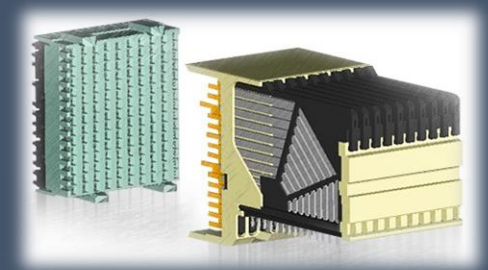
Industrial Ethernet FMC



3U Chassis & Backplane



- Hosts Power Supply, System Board & Application-specific Peripheral Boards
- Low cost crate with 9-slots CompactPCI Serial backplane by default
 - Fully passive
 - Star-topology differential lanes from System to Peripheral
 - AirMax VS connectors
- Application-specific backplanes (with the system slot) possible
- Optional 1U fan tray

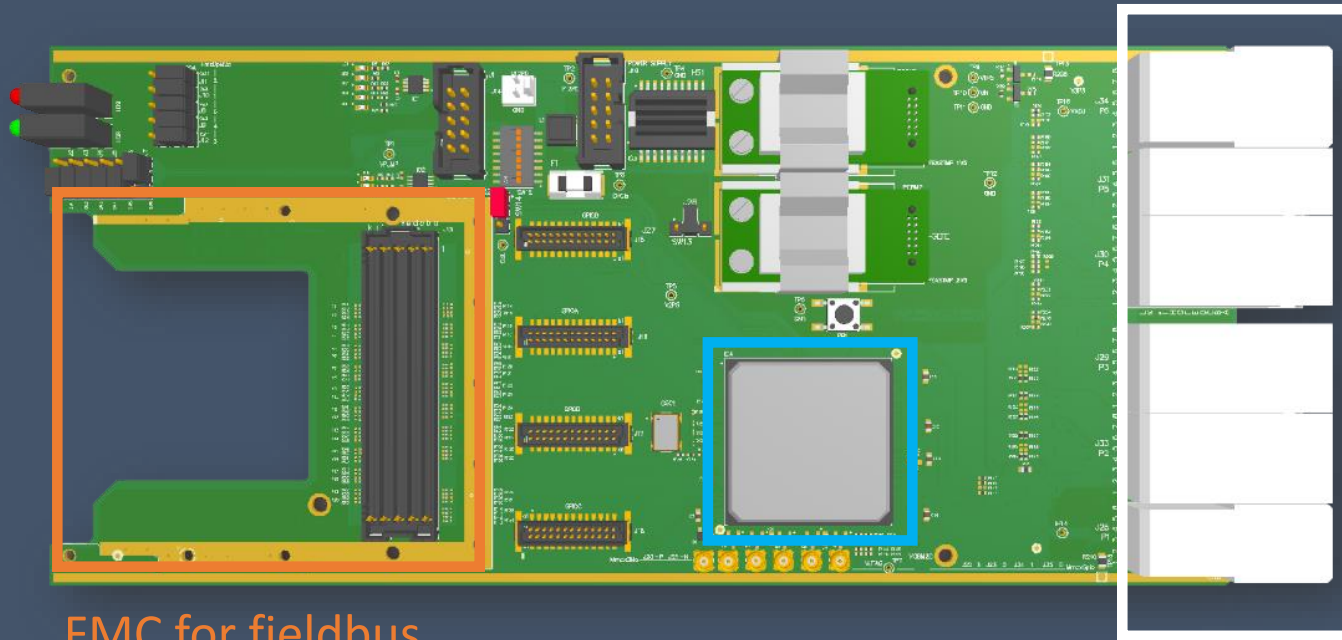




Rad-tol System Board



← 220mm →



FMC for fieldbus

FPGA for

- application-specific logic
- common crate monitoring and diagnostics

Backplane connector:
communication with
peripheral boards



Rad-tol System Board v1.0



EDA-03828

- Redesigned C-GEFE (BE-BI)
- Added backplane connector to communicate with peripheral boards
- Minor fixes (including FMC compatibility)
- Together with: BE-BI, TE-MPE, EN-SMM
- 10 boards produced for lab use
- v2.0 in the future, with NanoXplore or Smartfusion2 FPGA



Rad-tol Power Supply

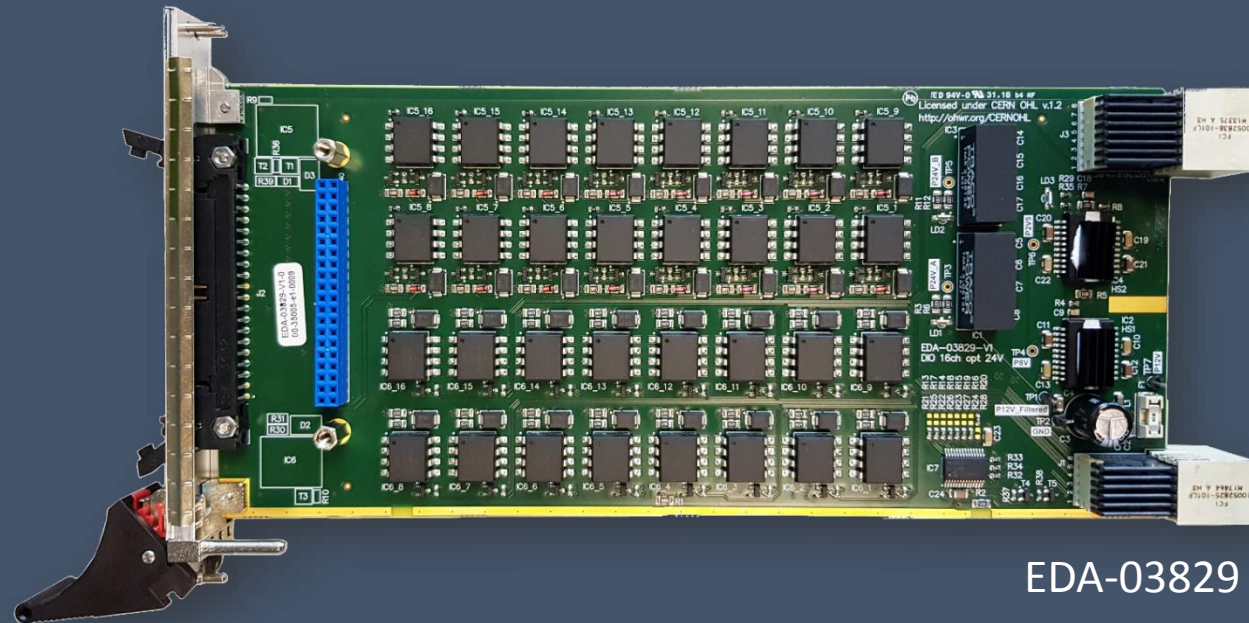


- Lalit Patnaik (FELL) dedicated to this task – R2E and HL-LHC funding
- Collaboration with R2E and TE-EPC
- Survey of currently used rad-tol power supplies
- Gathering requirements and drafting specs
 - 230V AC → DC +12V, +5V, 100W
 - TID > 500Gy (1kGy?)
 - Redundancy
 - PMBus monitoring interface
- First lab prototype using FEAST chips as controller of switched supply
- Components selection and qualification planned for 2019

<https://wikis.cern.ch/display/DIOT/Rad-tol+power+supply>



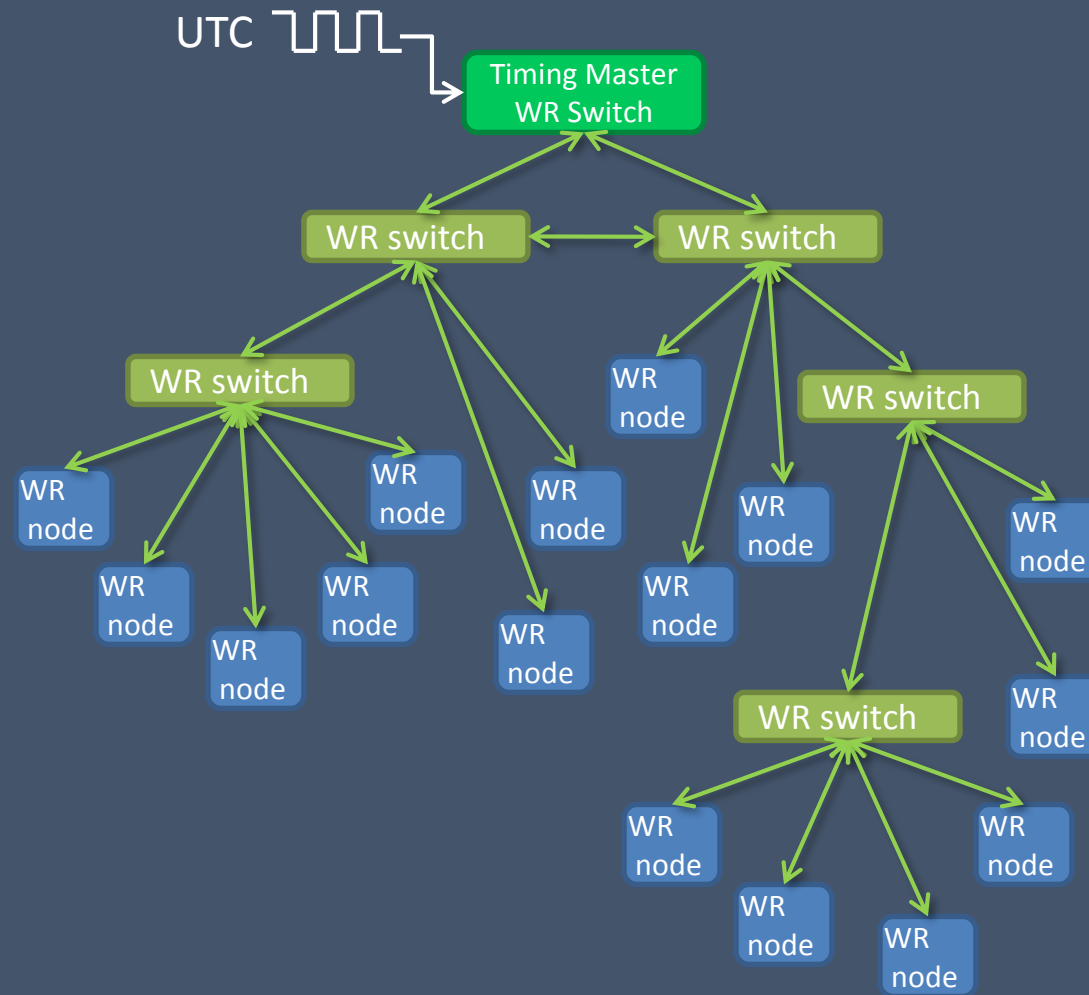
Template Peripheral Board



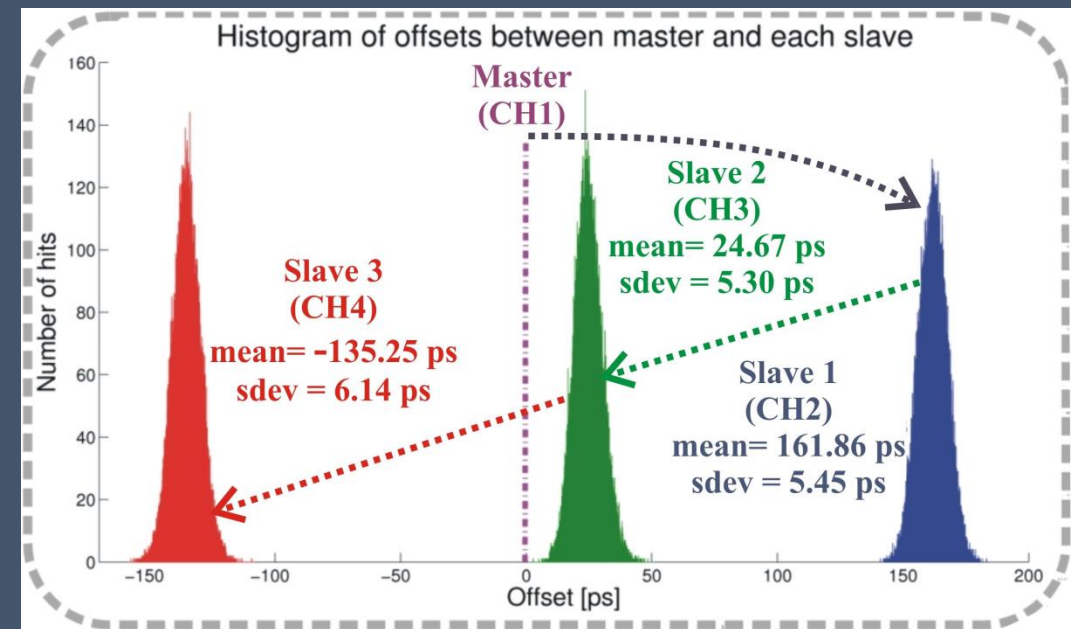
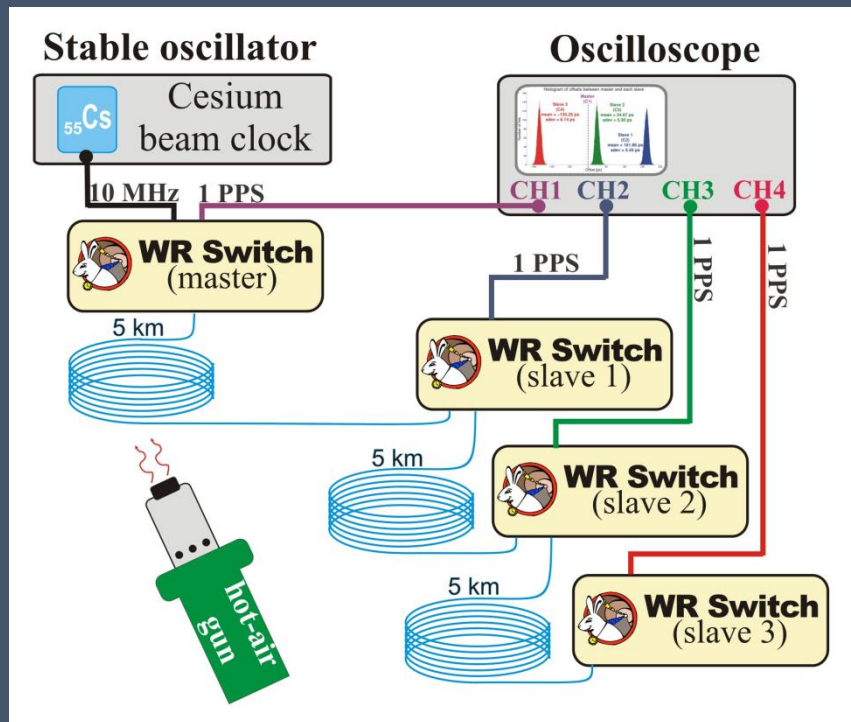
EDA-03829

- I/O board based on requirements for Warm Interlocks application (TE-MPE)
- 24V generation (TRACO)
- 16 opto-coupled current loop inputs (HCNR200)
- 16 opto-coupled relay driving outputs (HCNR200)
- Template for future application-specific Peripheral Boards
- Radiation tests in 2019

White Rabbit



White Rabbit Performance



White Rabbit Switch

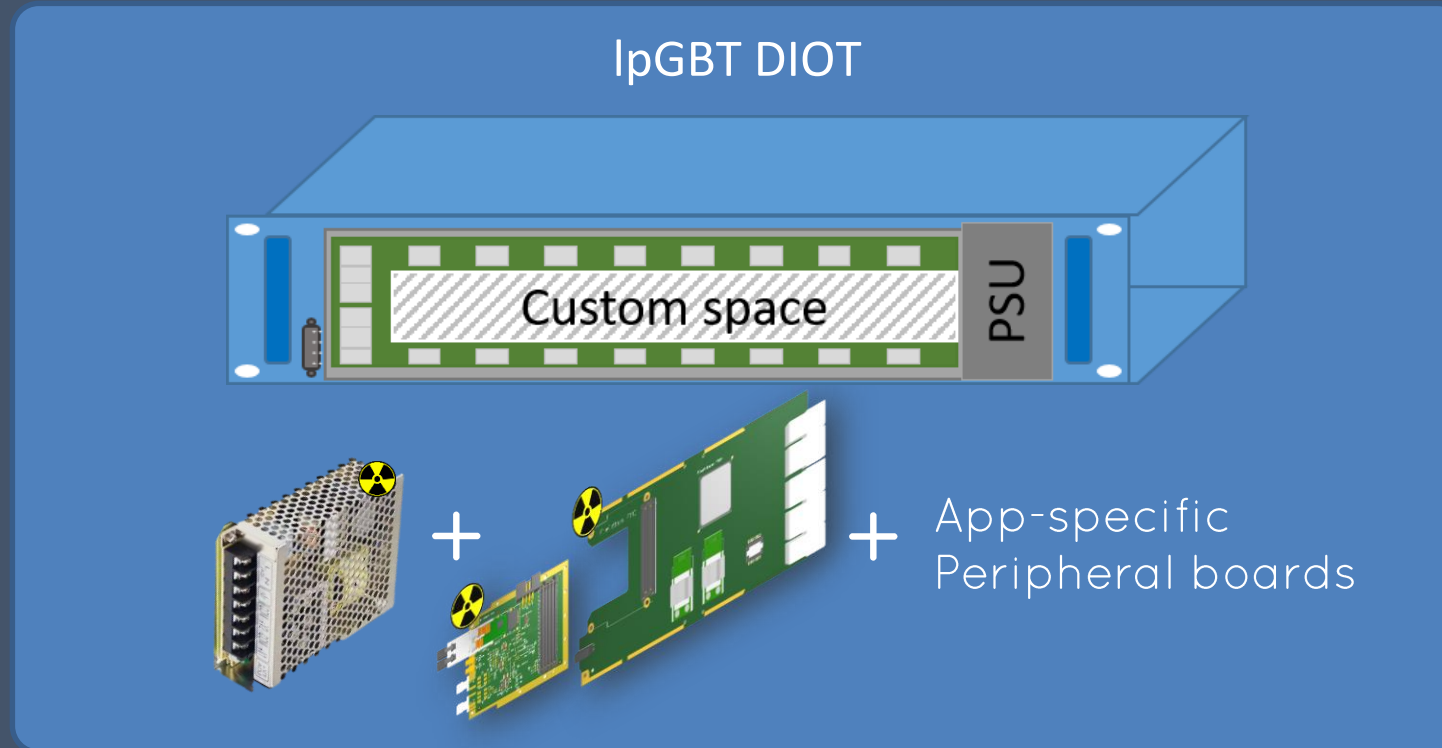


Proposal

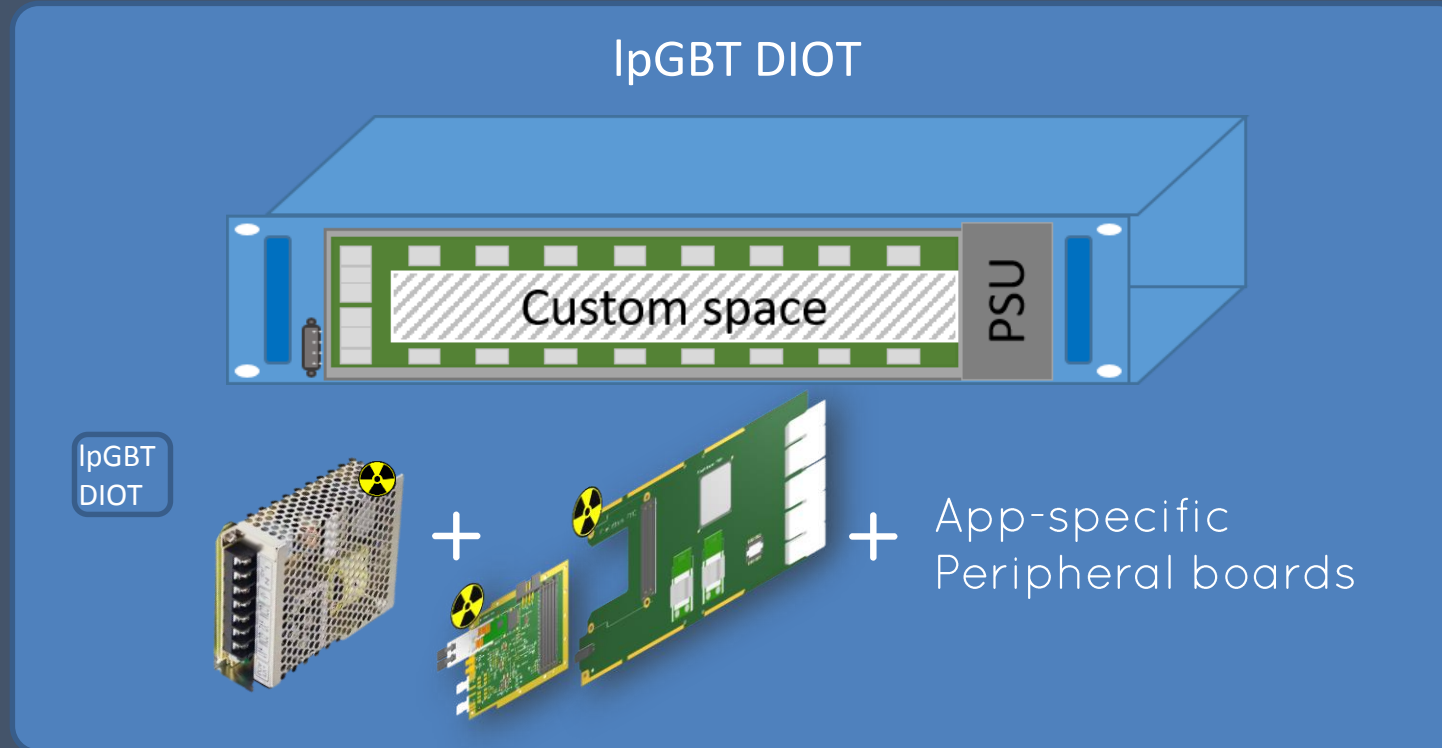
- Make a version of the WR switch which can use IpGBT protocol (clocked by an RF-related clock signal) for the physical layer (Q1 2021)
- Design IpGBT mezzanine for DIOT system board (Q1 2021)
- Identify a use case in CLEAR in collaboration with BE-BI (Q4 2019)
- Test (Q4 2021)
 - Radiation tolerance
 - Power consumption (and possibly power cycling scheme)
 - Beam-synchronous acquisition and time-stamping
 - Possibilities for daisy-chaining to reduce fibre costs

The resulting demonstrator will provide answers to outstanding questions regarding radiation tolerance, power consumption and cabling costs, and will allow to fine-tune our proposed strategy for controls and data acquisition in CLIC.

Proposal



Proposal



Proposal

