A quick introduction to WP18: Controls Technologies

Javier Serrano, BE-CO-HT

With contributions from Greg Daniluk, Eva Gousiou and Chris Roderick

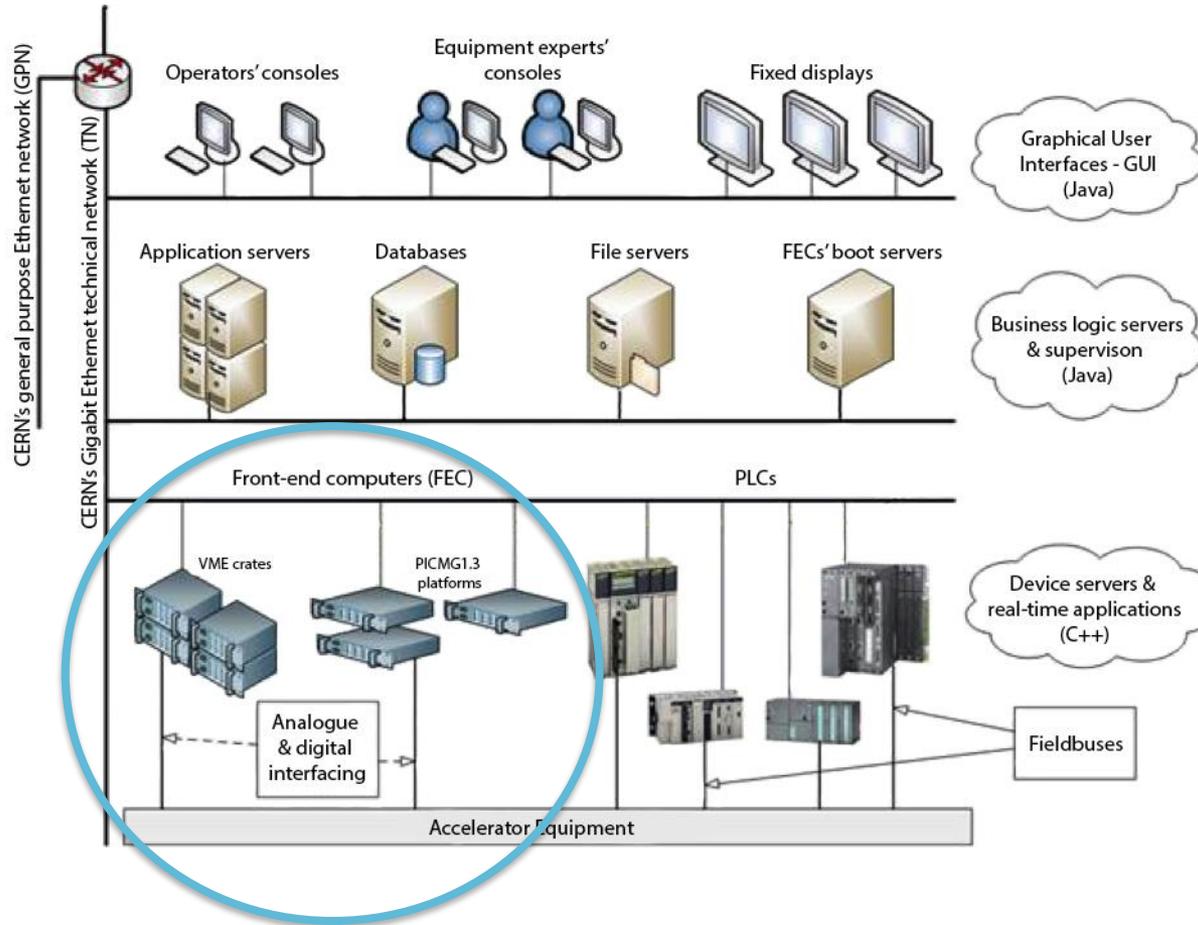HL-LHC TCC – 25 January 2018

Outline

- Background
- Purpose
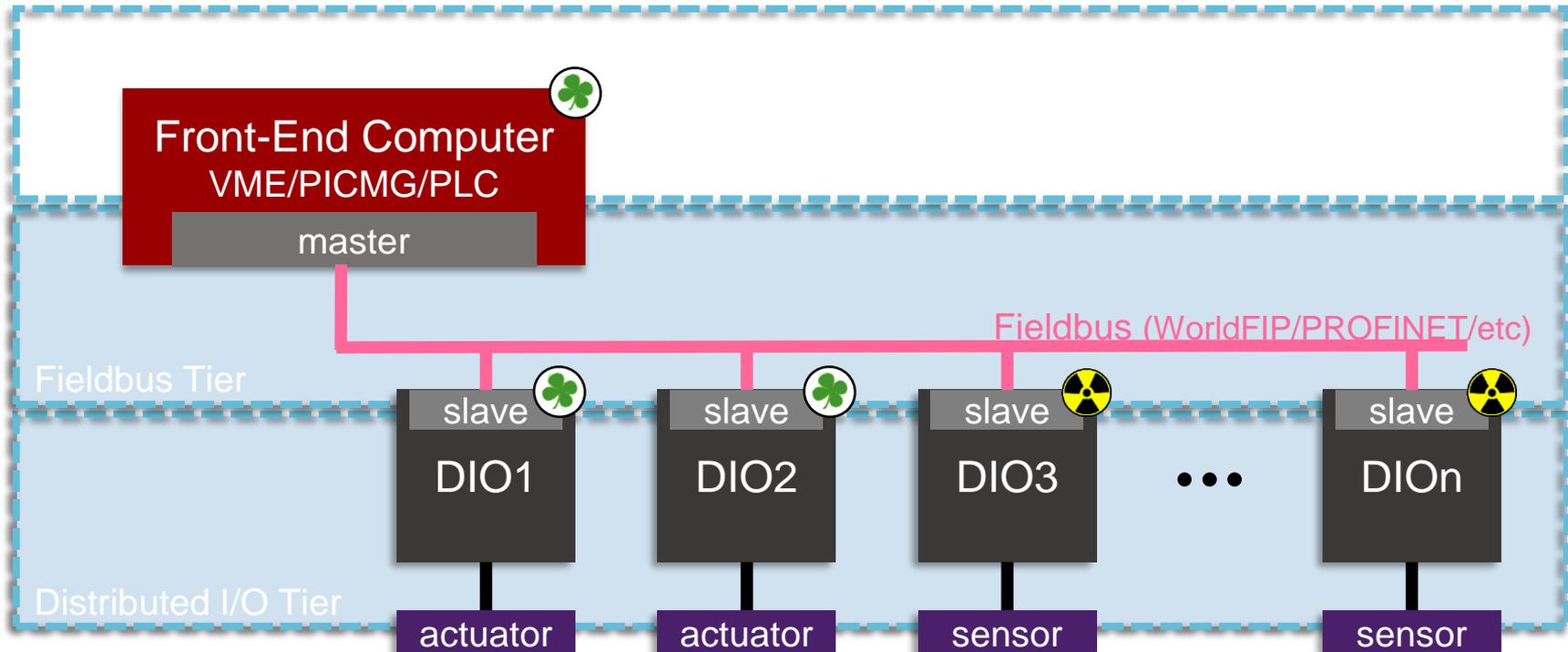- Scope
- Objectives
- People
- Summary

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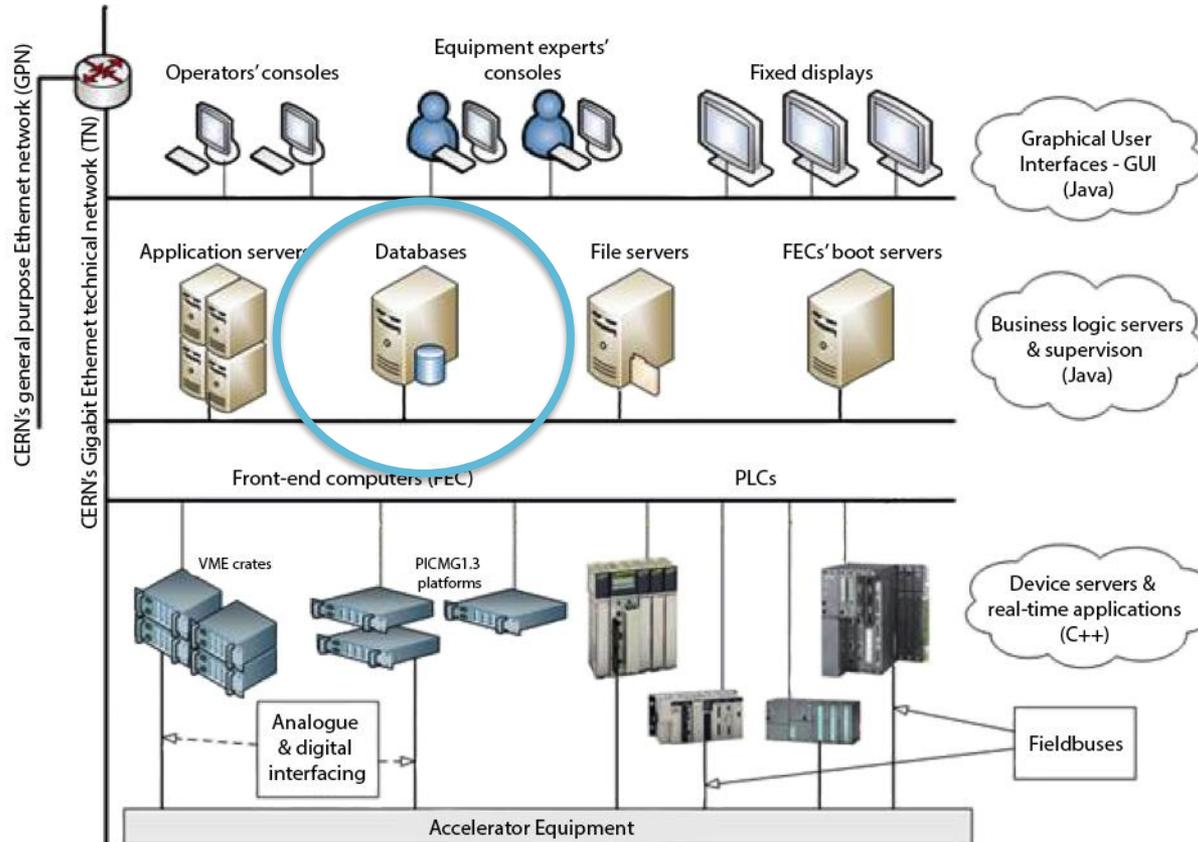- Scope
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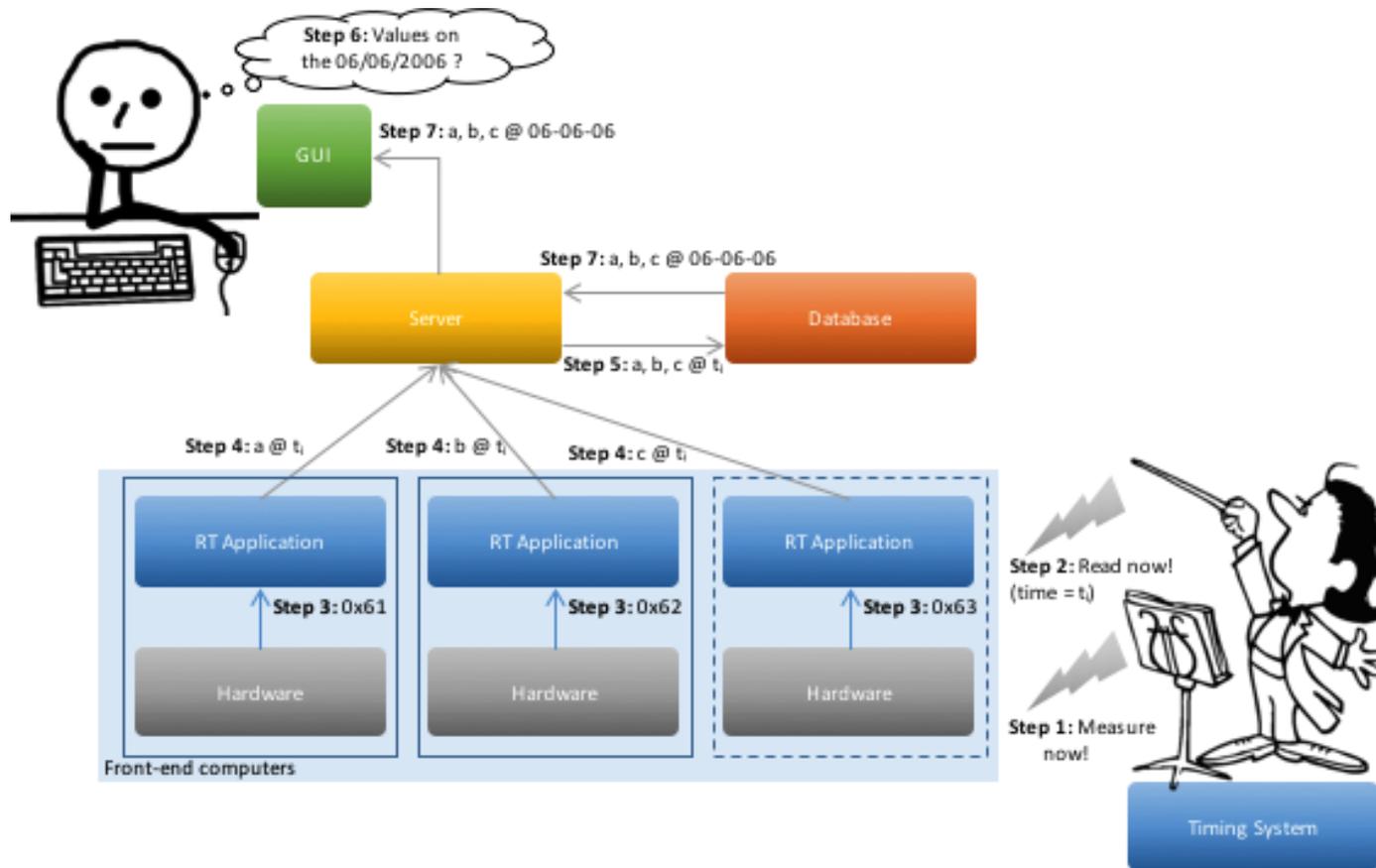- People
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General controls architecture

Custom electronics architecture

General controls architecture

Logging system

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Purpose: what are the problems we need to solve?

- Increase availability/reliability in a more challenging context:
  - New technologies in accelerator equipment.
  - More radiation (in some cases).
- This results in the need for:
  - More robust electronics.
  - More and better remote monitoring and diagnostics.
  - Faster links to push diagnostics data up.
  - Ways to store larger amounts of data.
  - Ways to process that data and reach conclusions faster.

Custom developments in DIOT

Power Converters

Beam Instrumentation
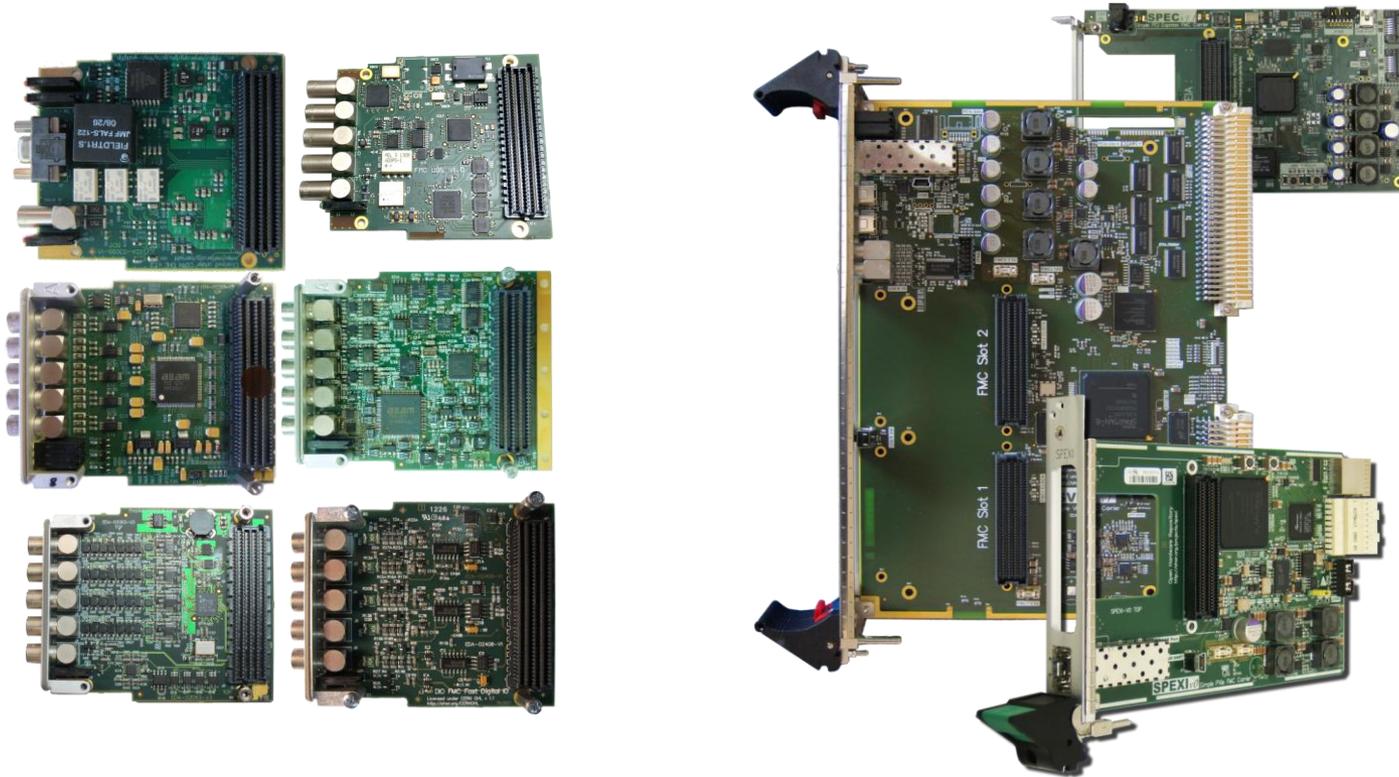
Cryogenics

Machine Protection

Beam Transfer

Magnets Positioning

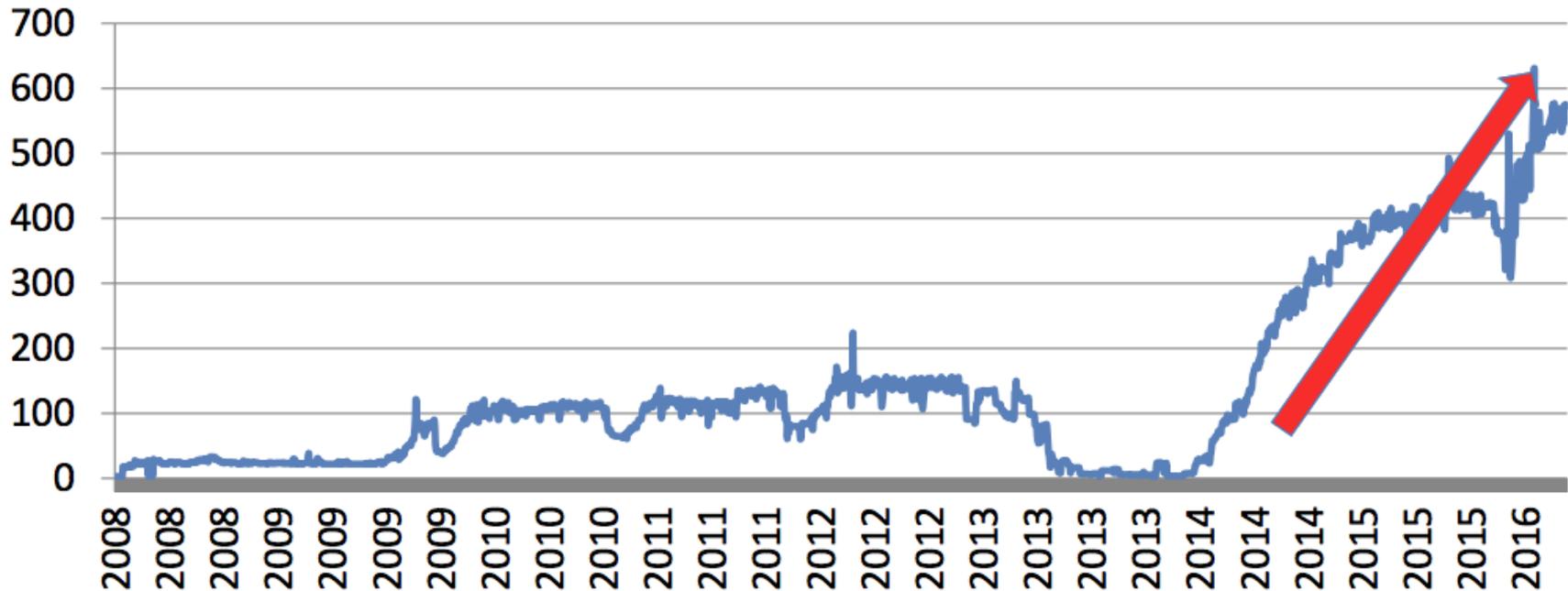# Existing hardware kit in Front-End

We are missing a similar kit for the DIOT tier

Logging system

Storage Evolution

Size in GB / day

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Recipe for Distributed I/O hardware

core hardware kit with BE-CO support

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application-specific parts designed by equipment groups
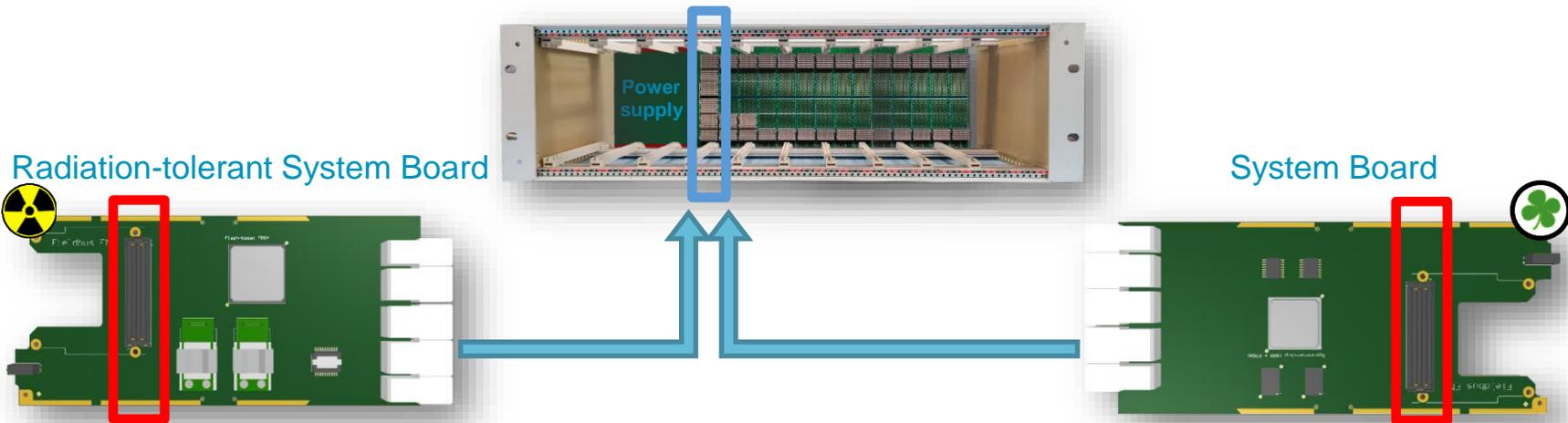
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Power Converters

Magnets Positioning

Beam Instrumentation
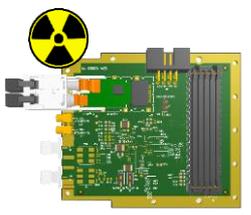
Machine Protection

Recipe for Distributed I/O hardware

Radiation-tolerant System Board

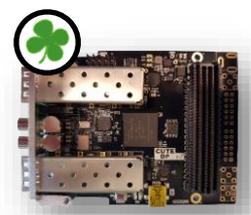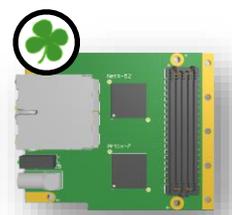Power supply

System Board

WorldFIP FMC   Powerlink FMC   LpGBTx FMC
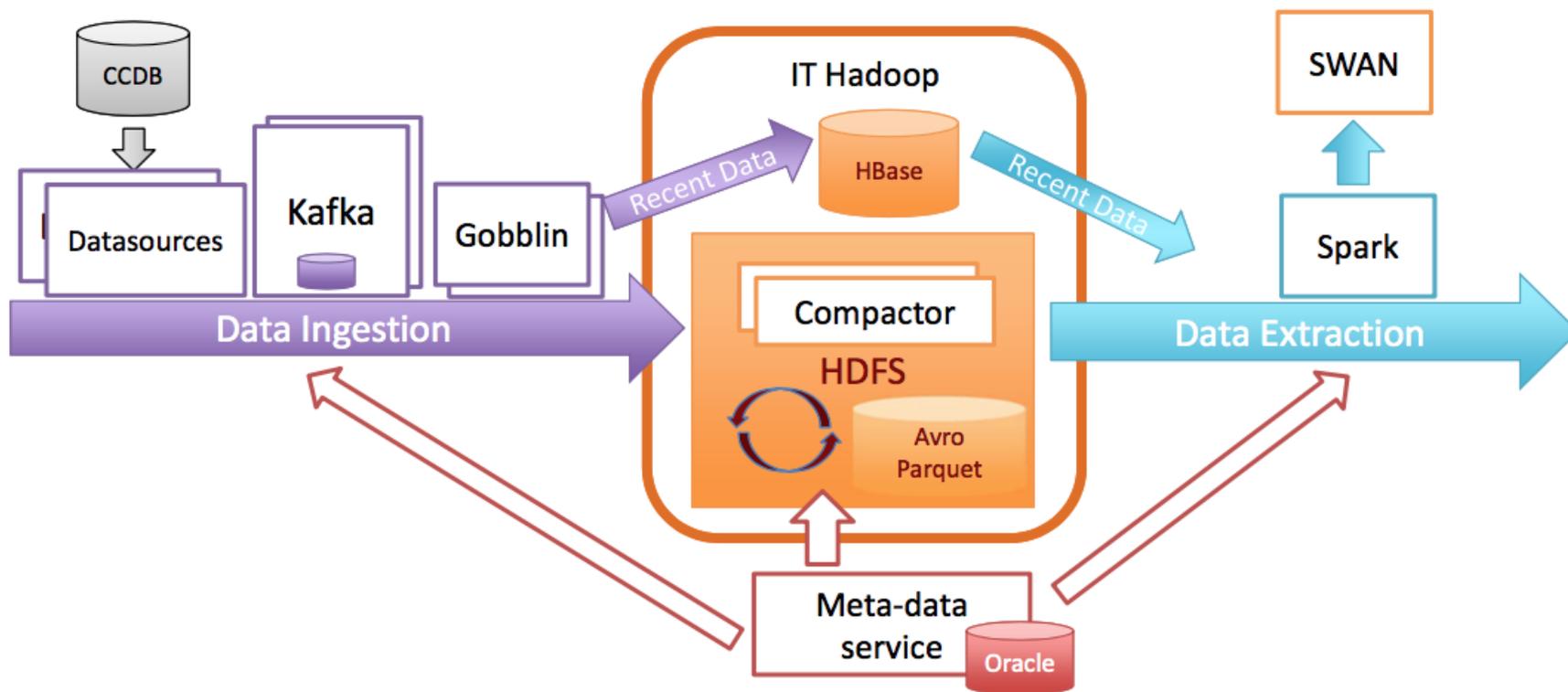
White Rabbit FMC   Industrial Ethernet FMC

Outside the scope of WP18

Next-generation logging system

NXCALS Architecture

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Selected set of milestones

- **June 2018:** First DIOT demonstrator with WorldFIP support.

- **June 2020:** High-bandwidth rad-tol fieldbus mezzanine designed, produced and tested.

- **December 2020:** NXCALS extraction and analysis demonstrated and supported as a service.

- **December 2021:** Final DIOT platform available.

- **June 2023:** reliability for DIOT and fieldbus designs assessed, improved and tested.

- **June 2025:** New infrastructure for logging deployed.

- **December 2025:** End of WP18.

See more details and progress at https://issues.cern.ch/browse/CS-404 now, and in the HL-LHC EDMS in the coming weeks.

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People and roles in WP18

- BE-CO GL and deputy of WP18: Eugenia Hatziangeli.

- WP18 leader: Javier Serrano.

- WP18 task leaders:
    - DIOT electronics: Greg Daniluk.
    - Rad-tol fieldbus: Eva Gousiou.
    - New logging system: Jakub Wozniak.

- LHC Machine Controls Coordinator (MCC): Marine Gourber-Pace.
    - Entry point in BE-CO for all LHC operational issues and requests.
    - Emphasis on operation.
    - I will make sure we stay in sync.

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Summary

- Three axis of action to cope with needs derived from HL-LHC:

    - A rad-tol Distributed I/O Tier platform.

    - A rad-tol high-speed fieldbus.

    - Modern logging and analysis technology.

- Developed collaboratively with users. Ultimately services provided by BE-CO.

- Emphasis on robustness to cope with availability requirements.

- First deliverables in 2018. Mature solutions after LS2.