

# Training in the SMARTHEP ETN

Jamie Gooding *on behalf of the SMARTHEP ETN*

HSF/WLCG Workshop 2024

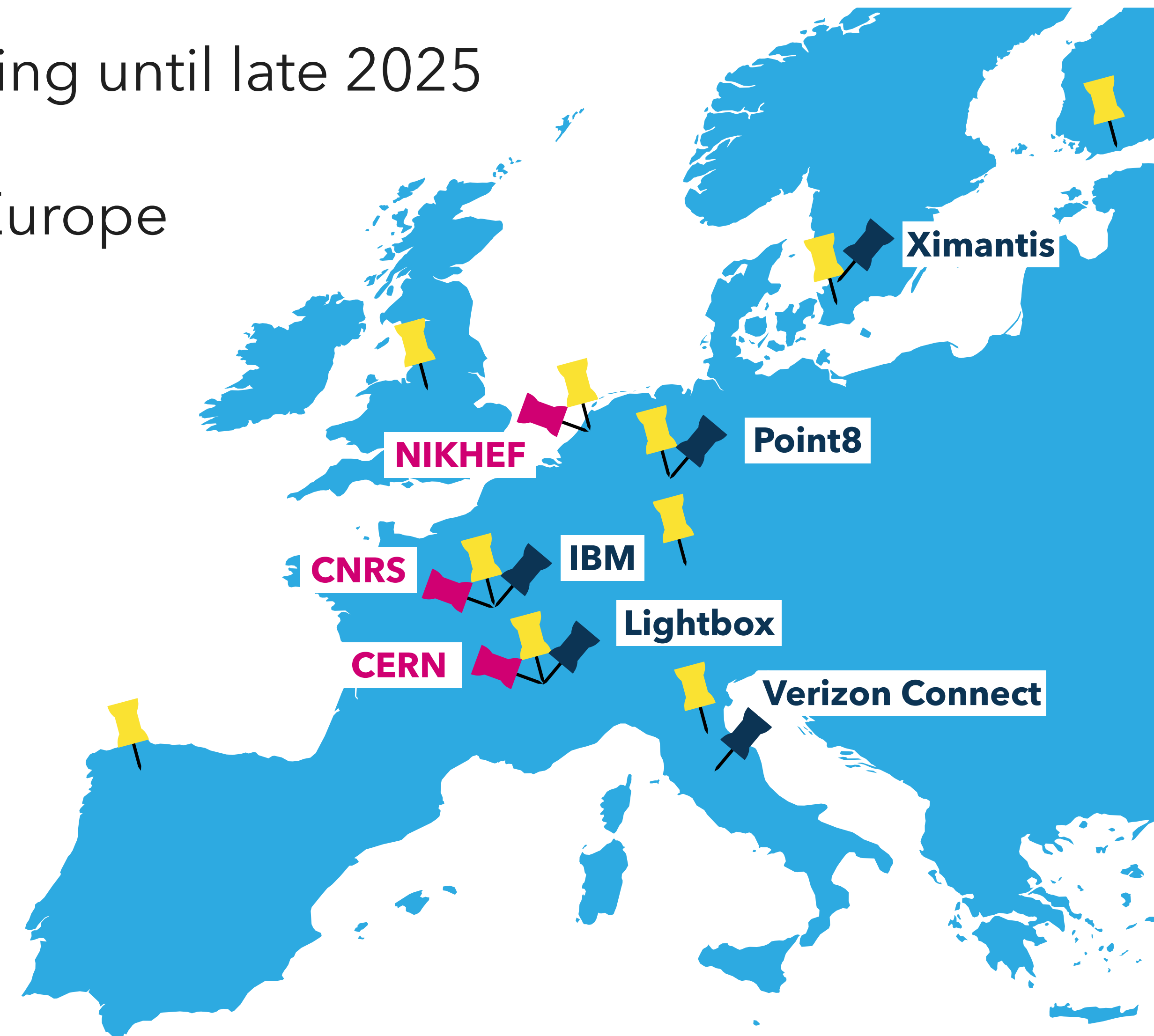
*Training parallel session 15th May*



# The SMARTHEP ETN

- ▶ EU Horizon funded training network running until late 2025
- ▶ 12 Early Stage Researches (ESRs) across Europe
- ▶ 18 institutes involved, including:
  - **10 Universities**
  - **3 Research institutes**
  - **5 Industry partners**

**The aim:** *bring together the **tools** and **expertise** of **Real-Time Analysis (RTA)***

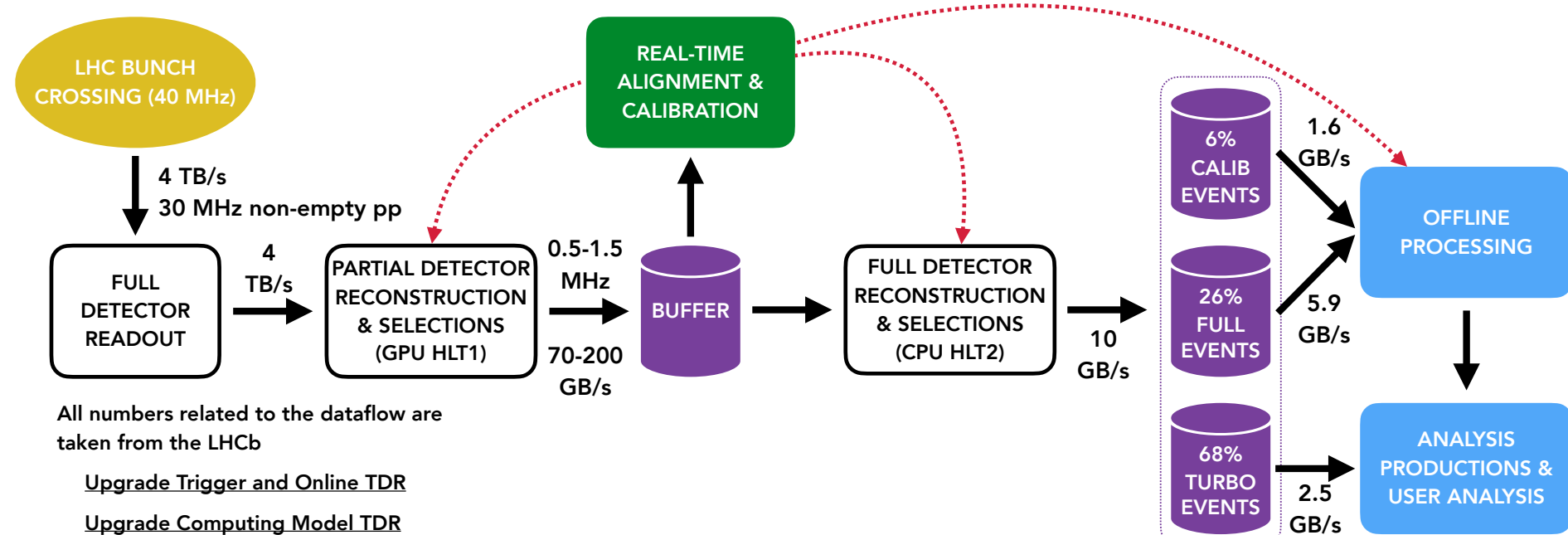


# The SMARTHEP ETN

**The problem:** too much data and not enough time to process it!

## HEP problem

Large amounts of data to be processed immediately



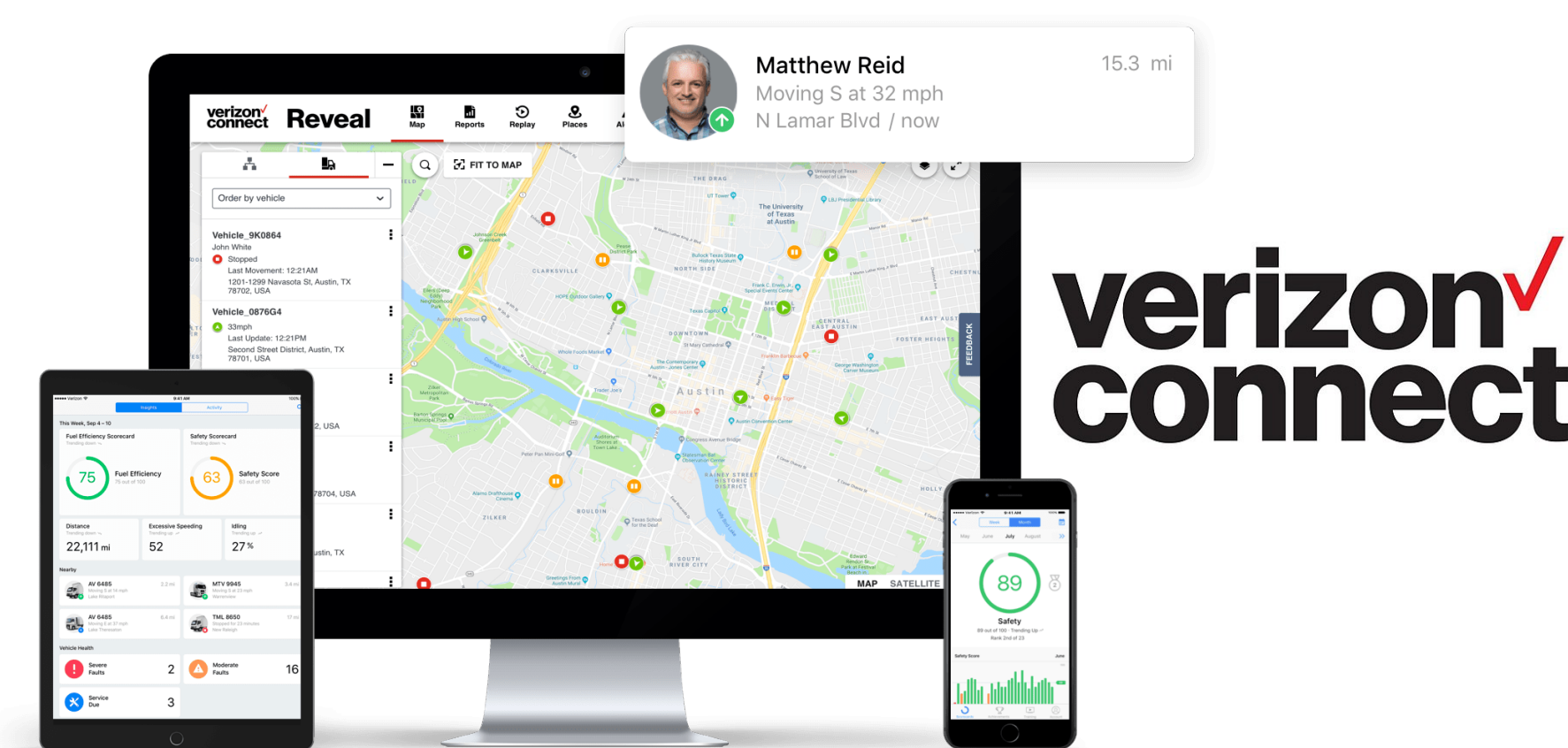
LHCb Run 3 Dataflow, LHCb-FIGURE-2020-016

*e.g. LHC event triggering*

## Industry problem

Detailed results required with short time-to-insight

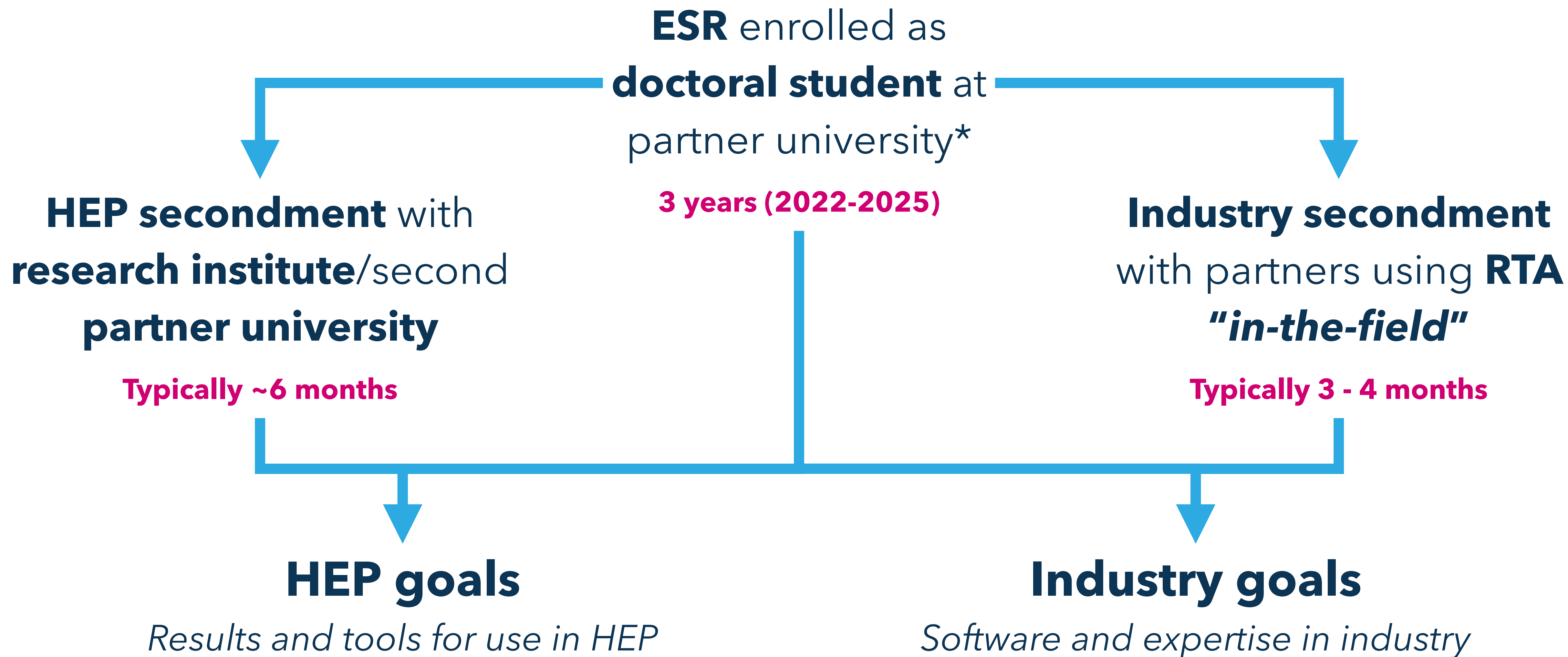
Two sides of the same coin



*e.g. real-time vehicle monitoring*




# Early Stage Researchers





# Secondments

- ▶ Each ESR has two associated secondments (1 industrial, 1 academic)
- ▶ Academic secondments allow ESRs to explore broader range of topics
  - Exchange of ESRs between universities facilitates exchange of ideas
- ▶ Industry secondments match industry technologies to ESR expertise
  - Example: industrial secondment at Lightbox 
    - Completed by ESRs Sofia Cella and Leon Bozianu (UniGe + ATLAS)
    - 3 month secondment working on market analysis
    - Project on using ML to inform financial strategies
      - Makes use of ESR experience in using ML to analyse time-series data



# Network events

- ▶ Annual meeting
  - Nov. '22 in Manchester 🇬🇧, Nov. '23 in Lund 🇸🇪,  
~Oct. '24 in Milan 🇮🇹
  - Training integrated into annual meeting:
    - Review paper writing workshop in 2022
    - Presentation and visualisation training in 2023
- ▶ Network schools (*next slide*)
- ▶ Training courses:
  - C++ course at University of Manchester
  - Collaboration with HSF + Swift-HEP 🤝





- ▶ SMARTHEP School on Collider Physics & Machine Learning (UniGe, Jan. 2023)
  - Introduction to particle physics (Torbjörn Sjöstrand)
  - Introduction to LHC physics (Anna Sfyrla)
  - Statistics and machine learning (Maurizio Pierini)
  - Evening seminars on multi-messenger astronomy (Teresa Montaruli) and the CERN experimental programme (Jamie Boyd)
- ▶ Planned schools:
  - Training on Edge ML at University of Geneva coming in September 2024
  - More to be planned for 2025... 🙄🙄



# Conclusion

- ▶ Network approaches training from several angles:
  - Secondments → real-world experience, often outside of ESR's day-to-day focus
    - Provide ESRs with insight in industry and industry with ESR expertise
  - Network events → integrate training into annual network meetings
    - Supplemented by additional training sessions in between
  - Network schools → dedicated meetings for developing ESR key knowledge
    - Schools enable development across broader details of topics
- ▶ Open question: how can we increase cross-talk with HSF training?

**Thank you for your attention**

Slides based heavily on talk at CHEP 2023 *"The SMARTHEP European Training Network"* ([EPJ Web of Conferences 295, 08022 \(2024\)](#))

# Backup



# Real-Time Analysis

**The problem:** too much data and not enough time to process it!



...or how to drink from a firehose

*C. Fitzpatrick, Mar. 2017*



# A handful of our ESRs

**ESR**

**Main affiliation**

**HEP secondment**

**Industry secondment**

**ESR2**



Laura Boggia

Automated decision-making for fraud detection, collaboration detecting anomalies/patterns to classify HEP observations.

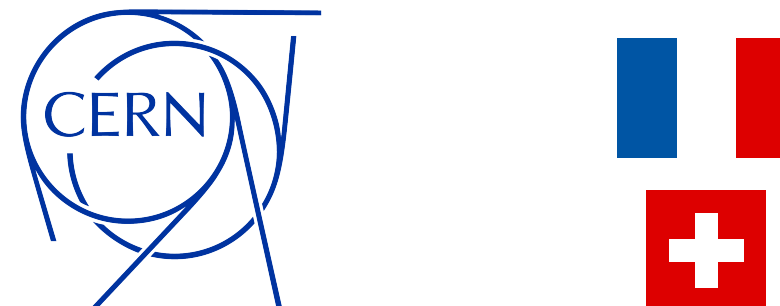
**ESR9**



Carlos Cocha

Real-time dark photon candidate selection at LHCb, collaboration processing vehicle video and sensor data in real-time.

**ESR10**



Joachim Hansen

Online calibration of ALICE time-projection chamber, collaboration with Ximantis monitoring/forecasting traffic information in real-time.