

Towards a CERN AI Strategy



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What happened in 2025

◉ Within CERN

- ◉ Prompted by Council SPC request, previous management created an across-sectors taskforce (CAISC) to establish an AI strategy
- ◉ The research sector (RCS = EP+TH+IT) started a process to create the scientific roadmap, as input to CAISC
 - ◉ Culminating into [a workshop](#) with 160 submissions
 - ◉ All projects from CERN researchers + users
 - ◉ Eight areas of activity were selected
 - ◉ The underlying idea was to propose an R&D program like **EP R&D**

◉ In the community

- ◉ EuCAIF (European consortium for AI in Fundamental Physics, HEP+nuclear+astro+cosmo) submitted a [proposal](#) for an AI-RD program to the European Strategy for Particle Physics (ESPP) group, inspired by the **DRD** program

Proposal for an AI strategy in the RCS sector at CERN

Common AI Solutions for Next-Generation Experiments

A AI path toward FCC

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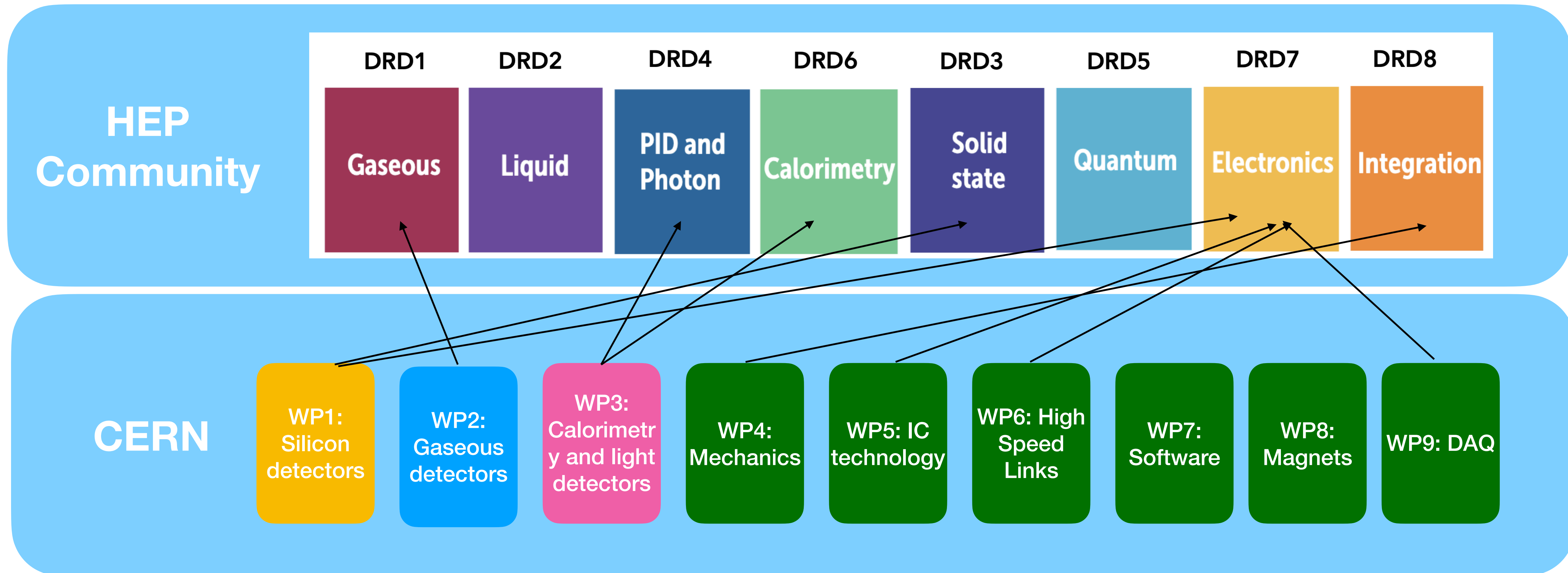
With contributions from Giuseppe Avolio, Davide Ceresa, Jakob Friedrich Finkenrath, Alessndro Di Girolamo, Georgios Karathanasis, Ricardo Rocha, Andreas Salzburger, Michele Selvaggi, Sioni Summers, Harris Tzovanakis, Anna Zaborowska

AI-RDs: A EuCAIF proposal to structure AI research in Particle Physics

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The DRD/EP R&D model

Following a recommendation from the previous ESPP, CERN established the DRD program: a set of collaborations on specific detector technologies



At the same time, CERN RCS launched its own set of initiatives, which are CERN direct contributions to specific DRDs(*)

(*) The contribution to DRD5 (quantum sensing) is via the CERN Quantum Technology Initiative, not through EP R&D; WP7 contributes to HSF etc.

The CERN RCS AI WPs

WP7 – Software & Hardware Infrastructure

WP1 – Pattern Recognition & Object Reconstruction

WP3 – Generation & Fast Simulation

WP6 – LLM Assistants for Scientific Production



Towards Large Models & Foundation Models



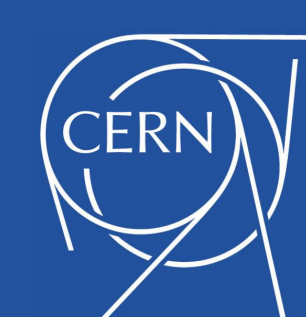
Agentic AI

WP4 – AI for Online Processing (Frontend/Backend)

WP2 – Global Event Interpretation (GEI), Particle Flow and Foundation Models

WP5 – AI for System Control & Operations

WP8 – AI in Theory & Phenomenology (TH AI node)



The AI-RD/RCS AI plan is building up

EuCAIF

WG 1: Foundation models & discovery

WG 2: AI-assisted co-design of future ground- and space-based detectors

WG 3: FAIR-ness & Sustainability

WG 4: Machine Learning and Artificial Intelligence Infrastructure (JENA WP4)

WG 5: Building bridges - Community, connections and funding

Under Discussion: Agentic AI

WP 1: Pattern recognition and Obj ID

WP 2: Particle Flow & Foundation Models

WP 3: Generation & Fast Sim

WP 4: AI for Online Processing

WP 5: AI for Assistant for Scientific Production

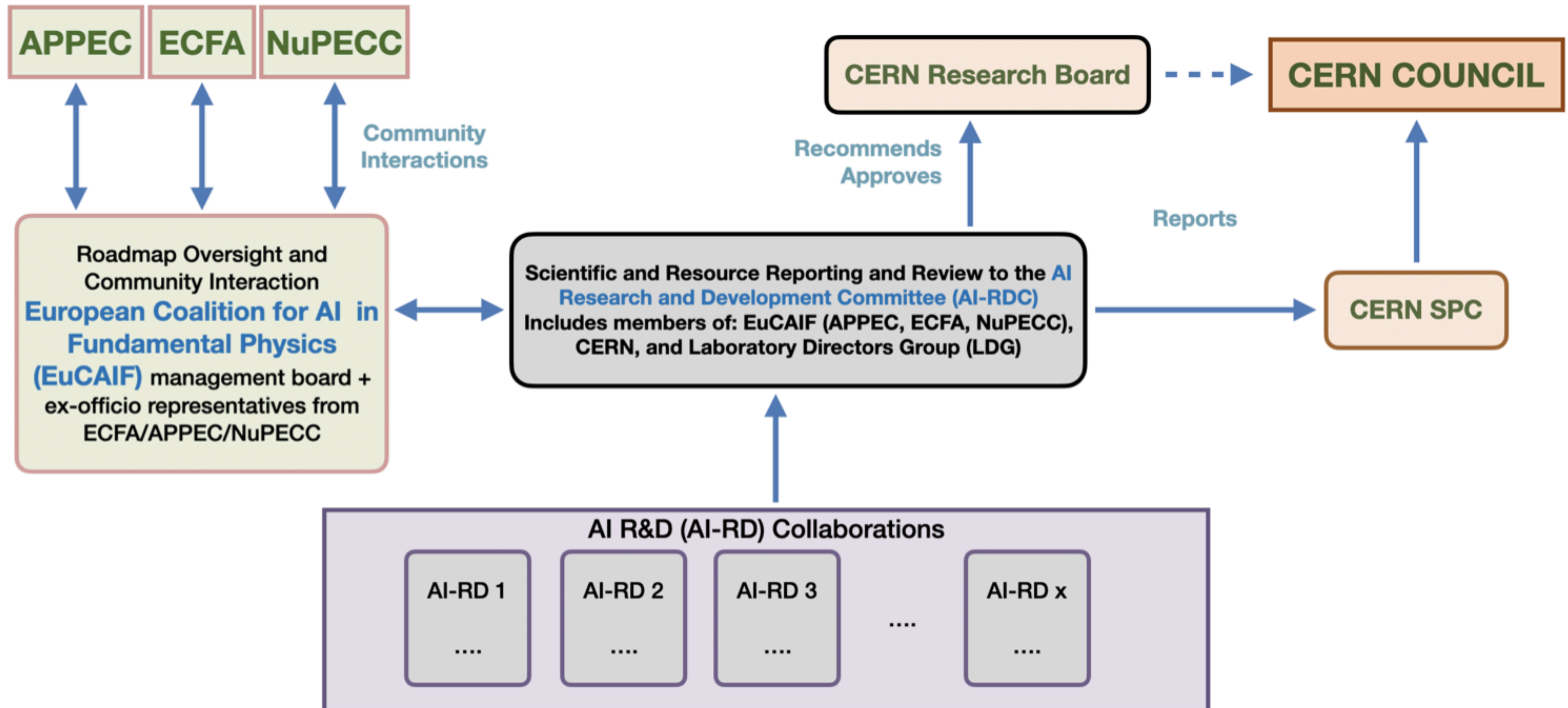
WP 6: AI for System Control and Operations

WP 7: Software and Hardware Infrastructure

WP 8: AI in Theory and Phenomenology

CERN RCS Strategy

AI-RD: the EuCAIF proposal



Review structure similar to what is in place with experiments (the AI-RDC would be what the LHCC is for the LHC experiments)

The Role of the Community

- *The AI-RD collaborations could enable international collaboration like the experiments do*
- *Countries will get organized in WGs/Projects, similarly to what is happening in EuCAIF. Themes are common, and forces could be joined*
- *Having in place an AI-RD model would allow to collaborate on various projects, similarly to what happened within the experimental collaborations*
- *The experimental collaborations should keep a strong presence in these AI-RD, so that the shared development could be ported within the experiments when matured products become available (see FastML with ATLAS & CMS, within NGT and beyond it)*



What is happening since January

- *In January, the new CERN management took over*
 - *In particular, the newly created CIO is coordinating AI activities in a coherent framework*
 - *Structured effort across laboratory (science, admin, etc)*
 - *Seeking fund opportunities*
 - *Establishing collaborators*
 - *Under CIO proposal, a Task Force was created to establish the AI roadmap of this management*
 - *The RCS-specific content was inherited from the documents written for the previous management*
 - *Funds were requested as part of the CERN Mid Term Plan*
 - *~ 8 M CHF/year for five years, for personnel, licence and infrastructure*
 - *We hope to receive funds for ~ 50% of the estimates*
 - *A CERN AI Program Group will be created, linking the CIO and CERN management to the AI activities in the various sectors (notably RCS and the accelerator sector, ATS)*

Going beyond this plan

- ◉ *In a competitive environment like AI research, ambitions should be proportional to funds and partnerships*
- ◉ *The CIO office is engaging in establishing this*
 - ◉ *Mobilising resources from institutional and private organisations, such as EC or Foundations*
 - ◉ *Building collaborations with major AI players, leveraging the CERN “brand attractiveness”*
- ◉ *Possible areas of development go beyond the current plan*
 - ◉ *large scale training of custom foundation/agentive models*
 - ◉ *new infrastructure design (magnets, detectors)*
 - ◉ *...*
- ◉ *This could bring expanding existing CERN WPs or creating new ones, to feed resources into the AI-RD scheme*