CERN openlab Phase VIII

Dr. Maria Girone, Head of CERN openlab

About CERN openlab

For almost 25 years, CERN openlab has been the bedrock of partnership, providing a structured and collaborative framework for industry and research organisations to engage with CERN researchers.

Collaboration is the core of CERN openlab, where industry and scientific researchers co-develop innovative solutions. Together, we embark on **four primary missions**:

Establishing strategic industry collaborations

Fuelling technological innovation

Exposing technology to researchers

Nurturing knowledge and growth in young STEM researchers

R&D Directions

Projects within the CERN openlab framework are dedicated to accelerating computing for science, particularly under the R&D directions of **‘Sustainable Infrastructures’** and **‘Emerging Technologies’**.

Sustainable Infrastructures

- Heterogeneous Computing, Platforms and HPC systems
- Advanced Storage, Data Management and Networks
- Computing Architectures and Software Engineering
- Infrastructures and Techniques for Artificial Intelligence
- Applications for Society and Environment

Emerging Technologies

- New Materials for Long-Term Digital Storage
- Digital Twins

Our members

We aim to enhance industry and research partnerships, in particular within Europe, leveraging on CERN ILOs.

Established Industry and Research Members

ORACLE
micron
PURESTORAGE
SIEMENS
cerabyte
Johnson &Johnson
E4 COMPUTER ENGINEERING
intel
SIMONS FOUNDATION
Pasqal
INFN
UNIVERSITÀ DEGLI STUDI DI TRIESTE

Industry and Research Members in Pre-Agreement Stage

UCL
NVIDIA
Google
IMPERIAL
SURF

Prospective Industry and Research Members

cerebras
Hewlett Packard Enterprise
AMD XILINX
NOKIA

CERN openlab phase VIII Implementation Model

The CERN openlab implementation model relies on **two main approaches**:

Establishing a **managed portfolio of small to medium-size agile projects** with technology providers with clear impact on the CERN IT Technology Roadmap.

Identifying a few collaborations, especially at the level of the computing infrastructures, of high potential impact and act as an **initial incubation step for longer-term collaborations**.

CERN openlab phase VIII
Stakeholders

CERN openlab's primary role is to act as conduit and facilitator for collaboration in computing science and technology between **two categories of stakeholders**:

The science communities
(CERN departments and groups; R&D teams at CERN; Research centres)

Technology providers
(industry)

Sustainable Infrastructures

Heterogeneous Computing, Platforms and HPC systems

Advanced Storage, Data Management and Networks

Computing Architectures and Software Engineering

Infrastructures and Techniques for Artificial Intelligence

Applications for Society and Environment

CERN openlab • micron

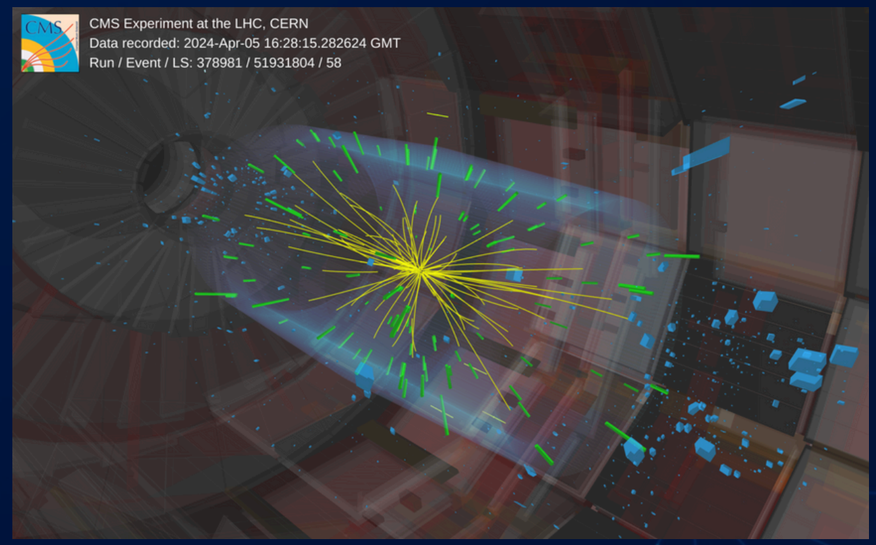
Real-time Data Processing for Level-1 Trigger: Scouting at CMS using CXL Memory-Lake Architecture

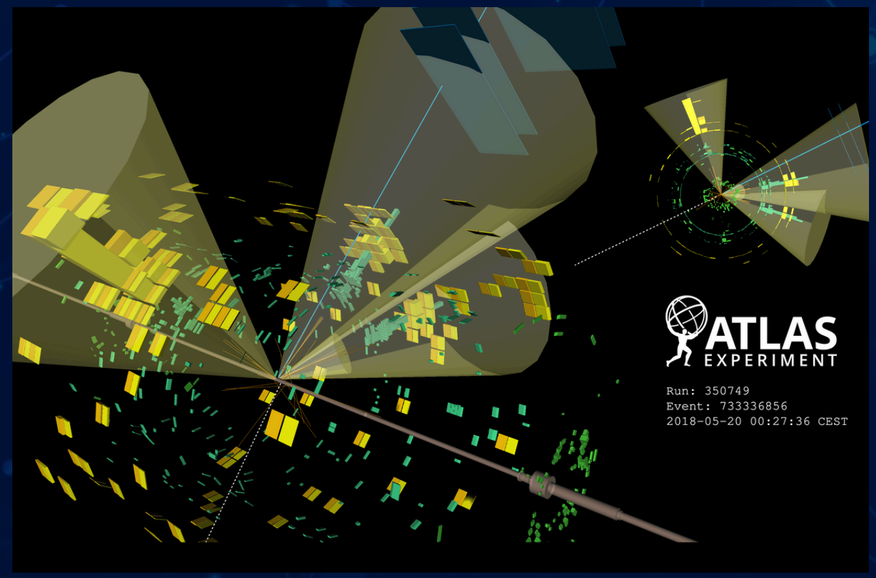
CERN openlab • ORACLE

Anomaly Detection for Ultra-Low Latency Event Selection at the LHC

CERN openlab • SIMONS FOUNDATION

Applied Multi-Disciplinary AI on High-Performance Computing





Sustainable Infrastructures

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CERN openlab • ORACLE

Oracle Kubernetes Operator

CERN openlab • ORACLE

Cost Optimization and Sustainability for Public Cloud Provider

CERN openlab • ORACLE

Integration of Oracle Cloud Resources into CERN IT Business Continuity & Disaster Recovery

Sustainable Infrastructures

Heterogeneous Computing, Platforms and HPC systems

Advanced Storage, Data Management and Networks

Computing Architectures and Software Engineering

Infrastructures and Techniques for Artificial Intelligence

Applications for Society and Environment

CERN openlab • SIEMENS

Next Generation Archiver for WinCC OA

CERN openlab • SIEMENS

Data Analytics for Industrial Control Systems

Sustainable Infrastructures

Advanced Storage, Data Management and Networks

CERN openlab ● PURESTORAGE®

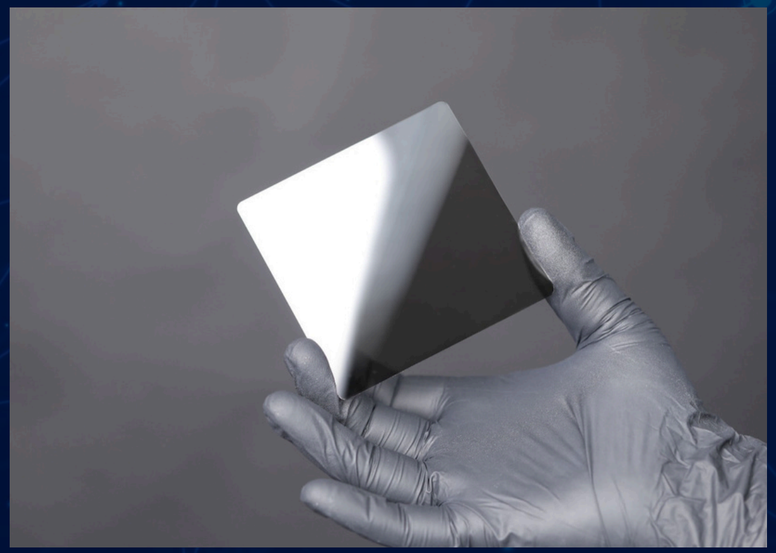
Next-Generation Exascale Flash Storage

Emerging Technologies

New Materials for Long-Term Digital Storage

CERN openlab ● cerabyte

Evaluation of Cerabyte: Archival Data Storage Technology using Ceramic Nanolayers



Sustainable Infrastructures

Heterogeneous Computing, Platforms and HPC systems

Infrastructures and Techniques for Artificial Intelligence

CERN openlab • ODISSEE

Online Data Intensive Solutions for Science in the Exabytes Era (ODISSEE)

CERN openlab • SPECTRUM

SPECTRUM:
Strategical and technical blueprint for an exabyte-scale research data federation and compute continuum for data-intensive sciences

Emerging Technologies

Digital Twins

CERN openlab • interTwin

interTwin: Co-designing and Prototyping an Interdisciplinary Digital Twin Engine

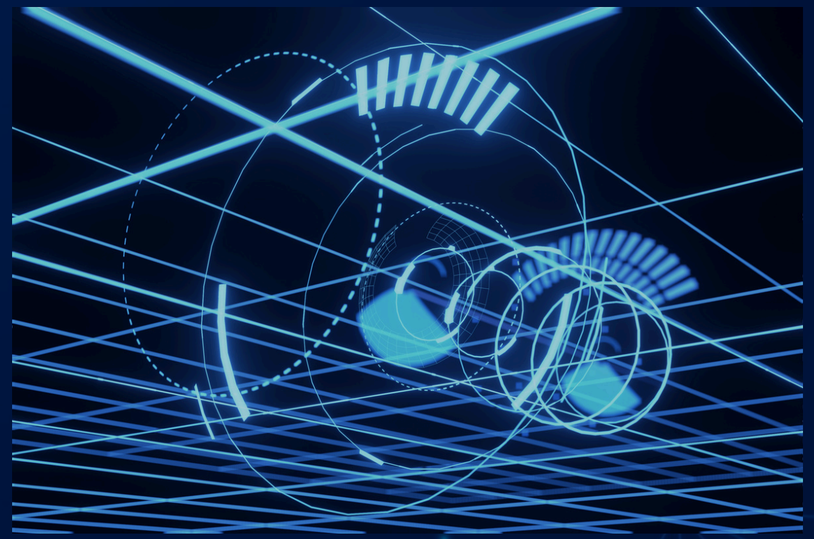
Emerging Technologies

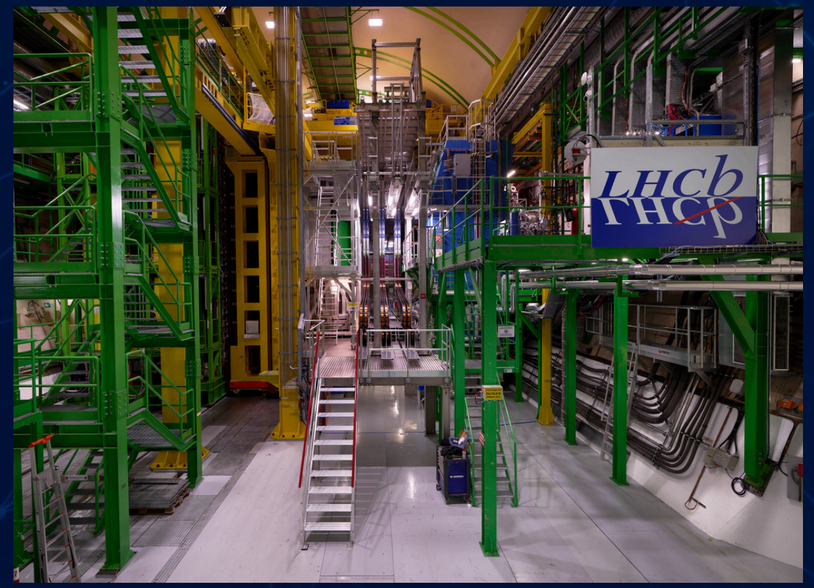
Digital Twins

New Materials for
Long-Term Digital Storage

CERN openlab • Johnson & Johnson

Digital Twin: Data Science Engine





Sustainable Infrastructures

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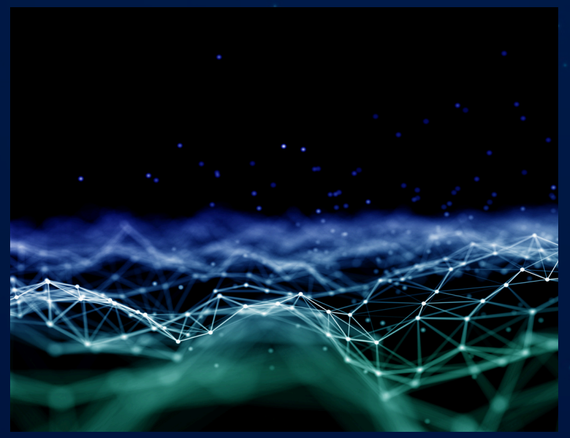

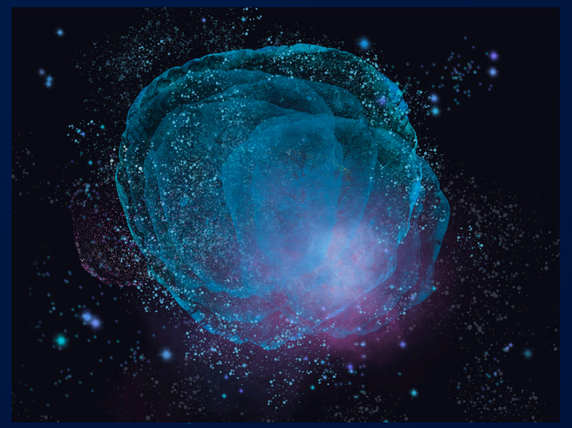

CERN openlab • RAISE Center of Excellence

Center of Excellence on AI and Simulation-Based Engineering at Exascale (CoE RAISE)

CERN openlab •

BioDynaMo: Biology Dynamics Modeller

CERN openlab

EMP2: Environmental Modelling and Prediction Platform

CERN openlab

Strategic Partnership on Artificial Intelligence

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Heterogeneous Architectures Testbed

CERN openlab • SIMONS FOUNDATION • E4 COMPUTER ENGINEERING

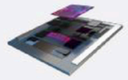
Portfolio: remote hardware

CPU Systems

- AMD EPYC — Genoa, Milan
- arm — Ampere, Fujitsu

Accelerators

- NVIDIA H100



- AMD MI210
- cerebras — AI Acceleration
- GRAPHCORE — AI Acceleration

On premises hardware

CPU Systems

x86

- intel XEON — 6th Gen AP / SP

PowerPC

- IBM — Power 8/9

x86

- intel XEON — 1st - 5th Gen

RISC-V

- SOPHON — SG2042

Accelerators

- NVIDIA T4, L4

- NVIDIA A100
- **Intel Omni-Path** — Fabric
- **NVIDIA Infiniband** — Fabric

- NVIDIA Bluefield

- Intel Flex GPU

- Intel Max GPU

- Xilinx U200

Surveying ILOs for CERN openlab collaboration

Wish to enlarge European industry memberships, we **contacted CERN ILOs**

Benefits of a **proactive approach**: create a wider awareness of CERN openlab activities

Enthusiastic reception of CERN openlab working model

ILOs Interviewed

Norway
Sweden
Finland
Denmark
France
United Kingdom

ILOs planned to interviewed

Germany
Netherlands

Surveying ILOs for CERN openlab collaboration

Observations and Findings

With some exceptions (Nokia - SE, Atos - FR, ASML - NL), Europe lacks large processor manufacturers.

The SME and startup segments contain innovative players possibly suitable for collaboration. Cost of participation can be prohibitive for these segments.

National HPC sites form attractors for companies of interest (Finland’s LUMI, CINECA, JSC, BSC,...)

Several companies suggested by the ILOs have HQ in the United States but strong national presence (DDN - FR, Atmel - NO)

Surveying ILOs for CERN openlab collaboration

Next steps

Establish contact with selected companies via ILOs (Eviden, Atos, Sipearl, Nokia)

Engage ILOs in further CERN openlab events

Ensure a presence of CERN openlab at national tech conferences and forums as most efficient route of familiarisation

Annual Technical Workshop

CERN openlab holds an yearly Technical Workshop where members of **CERN openlab engage with industry members and the ICT community to showcase the work being done**, review of the R&D projects carried out during the past year and **discuss future plans**. This event features technical talks, poster sessions and technology tracks dedicated to our industrial partners with invited speakers.

2025 CERN openlab Technical Workshop happened between the 04th & 06th of March, **welcoming over 170 enthusiastic participants onsite and online**.

Communication & Outreach

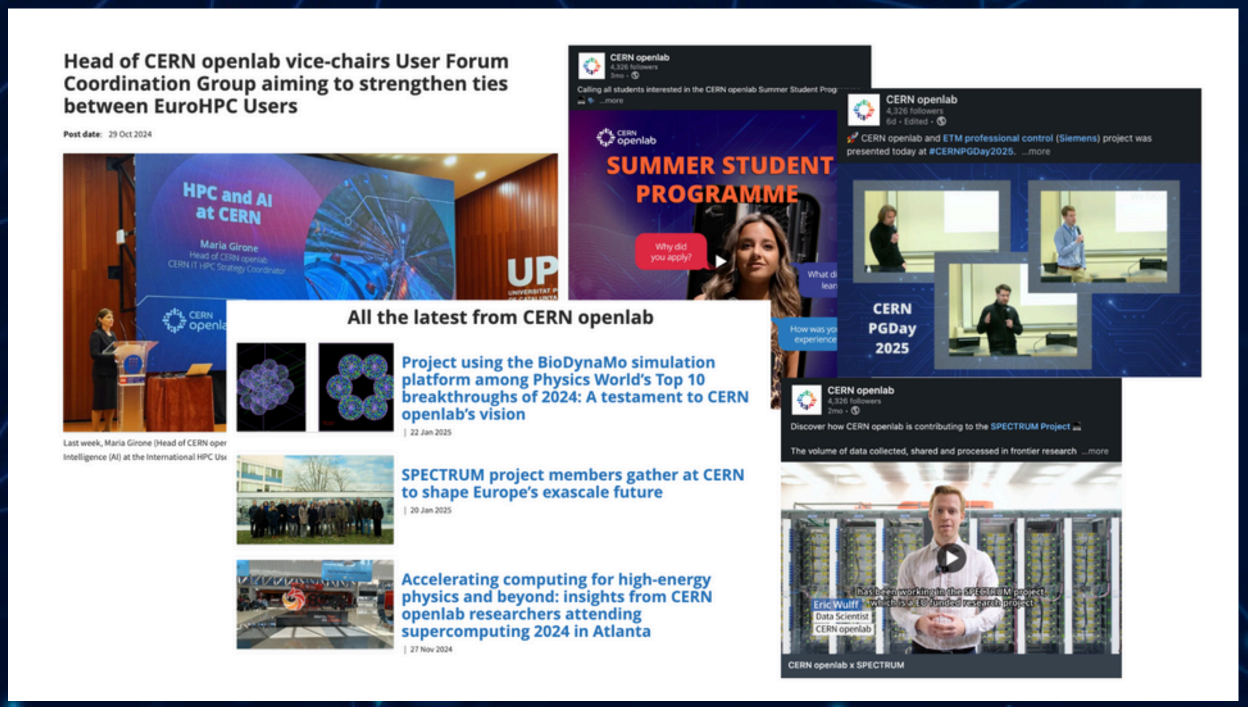
The CERN openlab **annual report** was revived, a vital tool for communication and outreach, serving as a comprehensive showcase of the collaboration's achievements, initiatives, and future aspirations. The **CERN openlab Phase VIII Strategy** document was also finalised and launched on our website.

New website!

We have significantly enhanced our social media presence with the launch of the **CERN openlab LinkedIn account**. Through LinkedIn, we have shared **multiple articles** highlighting our projects, achievements, and opportunities, broadening our reach and fostering connections with stakeholders.

Phase VIII Strategy

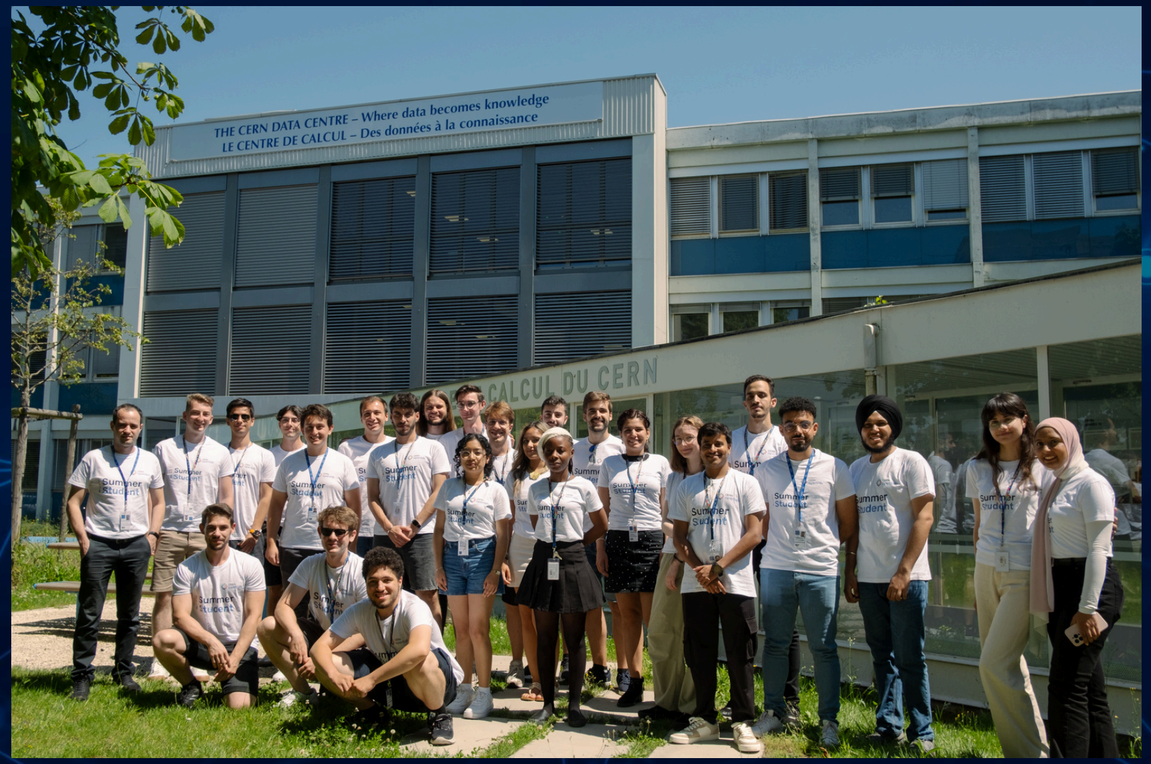
2024 Annual Report



CERN openlab Summer Student Programme

The CERN openlab summer student programme **provides undergraduate and master's level students with an opportunity to work on one of the R&D projects for nine weeks** under experts' supervision.

CERN openlab joined forces with **ideas4HPC** to sponsor a CERN openlab Summer Student, **promoting the participation of women in high-performance computing research**. CERN openlab is committed to improve girls' participation in ICT and will continue championing for more women's involvement in ICT.



Thank you!

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