




PHASE VIII ACCELERATING COMPUTING FOR SCIENCE



A WORD FROM THE HEAD OF CERN OPENLAB


Maria Gross, Head of CERN openlab

CERN OPENLAB MISSION

Since its inception, CERN openlab has fostered the development of big data scientific research through four primary missions:

- 1 Establishing strategic industry collaborations**
CERN openlab operates as a neutral incubator for collaborations, where they can be formed and longer-term partnerships can be built. They act as the first step in the establishment of strategic collaborations between CERN and other organisations interested in investing in the future of science and technology.
- 2 Fuelling technological innovation**
CERN openlab serves as an incubator for new technologies. It forms a dynamic hub where CERN and its partners collaboratively push the boundaries of ICT technology. This cooperative synergy provides the co-development of new ideas and innovative solutions.
- 3 Exposing technology to researchers**
CERN openlab provides access to new technologies available on the market to its members and the IEP community, supporting critical tests of evaluation, adaptation, and benchmarking.
- 4 Nurturing knowledge and growth in young STEM researchers**
CERN openlab plays a critical role in **connecting science to research**. The CERN openlab supports student programmes, supported through industry contributions, trainee students through internships, courses, multi-disciplinary projects, virtual simulations, and workshops. It equips the next generation of researchers with essential skills required to navigate the complex landscape of modern computing technologies.

To address scientific challenges at the research frontier, CERN openlab has identified two main R&D directions: "Sustainable Infrastructure" and "Emerging Technologies". In sustainable infrastructure, it collaborates on energy-efficient computing platforms, while in emerging technologies, it explores innovations like long-term digital storage materials, scientific digital twins, and quantum computing.

The document explains how CERN openlab has developed how it intends to operate, which communities are targeted, what objectives it sets for itself and its collaborators, and how it proposes to continue delivering impactful results and sustainable collaborations for the year to come.

3 4

THE TEAM

Head of CERN openlab

Coordinates the overall programme and manages the negotiation of contracts between CERN and members with the assistance of the CERN Legal Services.



Maria Girone
Head of CERN openlab

CTO office

Contributions from experts in CERN IT technical groups. Assesses technology for projects. It functions as a central hub for proposals evaluation and project coordination and maintains close ties with CERN technical groups and other CERN departments.



Thomas Owen James
CTO for AI and Edge
Devices



Antonio Nappi
CTO for Platforms
and Workflows



Luca Mascetti
CTO for Storage



Luca Atzori
CTO for Computing



Killian Verder
CTO Office

Communication office

Manages CERN openlab's communication needs, especially agreements with industrial partners about communication.



Mariana Velho
Chief Communications
Officer



Marina Banjac
Junior Communications
Officer

Administrative & Financial office

Handles administrative tasks, including organising the summer student programme and events.



Kristina Gunne
Chief Administrative Officer



Fariza Oulashova
Junior Project Assistant



Joelma Tolomeo
Chief Financial Officer

CERN OPENLAB

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Four primary missions:



1

Establishing
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2

Fuelling
technological
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3

Exposing
technology to
scientists

4

Nurturing
knowledge and
growth in young
STEM
researchers

COLLABORATION MODEL

CERN openlab operates within **structured three-year phase cycles** designed to systematically assess technological evolution, anticipate future needs, and delineate overarching thematic priorities.

LHC START

Large industrial partners

x86 64-bit processors, multi-core devices, high-performance networking, peta-byte storage, highly-available databases

LHC STEADY OPERATIONS

Broader portfolio of companies, dynamic market

Multi-core devices, accelerated hardware, specialized architectures, fast disk storage, cloud infrastructures

PREPARING FOR HL-LHC

Focussed and agile projects, strategic partnership incubator

Sustainable infrastructures, heterogeneous architectures, energy-efficient computing, advanced storage, AI applications and algorithms, emerging technologies

INCEPTION
I-IV
2003-2014

CONSOLIDATION
V-VII
2015-2023

THE NEXT
PHASES
VIII-X
2024-2034

CERN OPENLAB PHASE VIII

Objectives, R&D Directions and Activities

To address scientific challenges at the exascale level, CERN openlab has identified two main R&D directions “**Sustainable Infrastructures**” and “**Emerging Technologies**”.

High-level: Accelerating Computing for Science

Pioneering sustainable and emerging computing and storage solutions

Harnessing heterogeneous computing and AI for a greener future

Fostering synergies and technology transfers between industry and sciences

OBJECTIVES

R&D DIRECTIONS

Sustainable Infrastructures

Heterogeneous computing platforms and infrastructures

Computer architectures and software engineering

Storage and data management

Artificial intelligence algorithms, platforms and applications

Applications for society and environment

Emerging Technologies

New materials for long term digital storage

Digital twins

Quantum computing and networks

R&D ACTIVITIES



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.

Foster strategic industry-science partnerships

Maximise technical impact

Harness the potential of innovative technologies

Amplify CERN openlab core strengths

R&D ACTIVITIES PLAN

Focussed, agile projects

Strategic partnership incubator

Heterogeneous architectures testbed (x86, Arm, GPUs, FPGAs, AI accelerators)

AI workflow optimization on HPC

AI applications in low latency environments

Real-time data processing on CXL architectures

Advanced storage solutions

Analysis facilities on the cloud

New materials for long-term storage

Foundation models

Low-latency interconnects

Data compression acceleration

AI on edge devices and SoCs

Digital Twins of accelerators and detectors

Hybrid HPC and QCS integration

Generative AI

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)

CURRENT INDUSTRY AND RESEARCH MEMBERS

intel.

COMTRADE

E4
COMPUTER
ENGINEERING

INFN

ORACLE

Micron



UNIVERSITÀ
DEGLI STUDI DI TRIESTE

SIEMENS

Fermilab

Roche

INDUSTRY AND RESEARCH MEMBERS IN PRE-AGREEMENT STAGE

cerabyte

Johnson & Johnson

nVIDIA

PURESTORAGE

SIM NS
FOUNDATION

COMMUNICATION, EDUCATION & OUTREACH

As a part of the education and training programme, CERN openlab runs various initiatives that support participation of young scientists and other research organisations

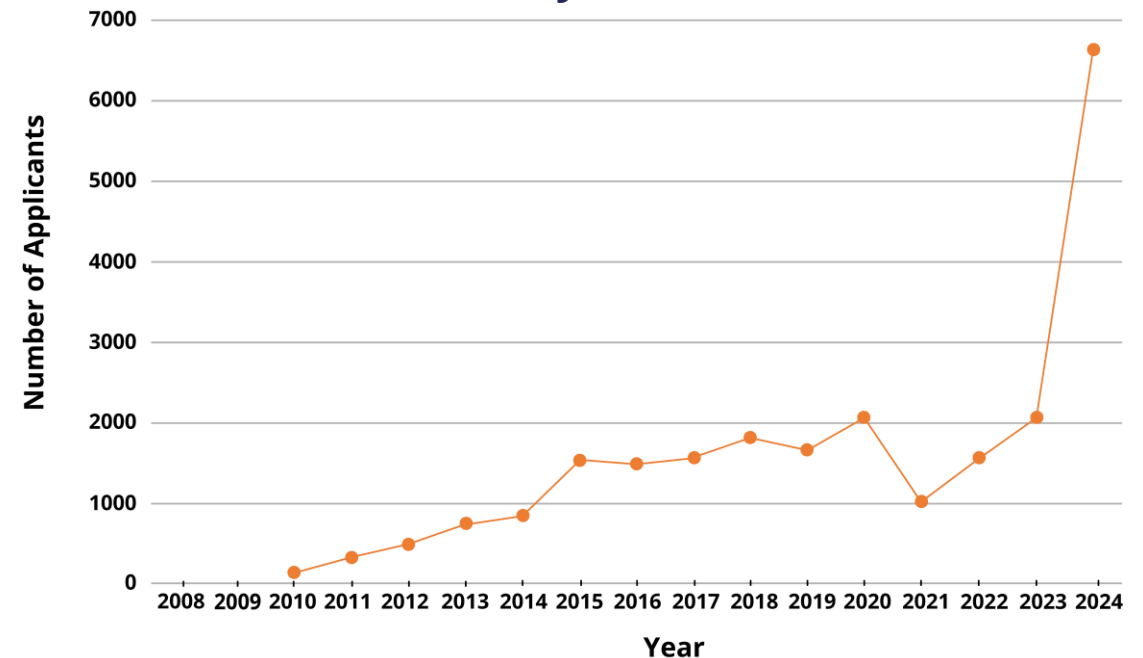


Summer Student Programme

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

This year there was a record of more than 6600 applicants!

Number of CERN openlab Summer Student Programme applicants throughout the years



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Throughout the year, CERN openlab summer student program had more than 20,000 applicants and received more than 400 students.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Applicants	NI*	NI*	92	330	490	750	850	1540	1479	1580	1820	1658	2074	1022	1568	2067	6626	23946
Selected	13	15	15	15	15	22	23	40	39	37	41	40	39	27	32	30	30	473

NI* - No Information

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Lectures & Training

Open access to CERN openlab lectures that cover a wide range of computing topics, from AI to exascale computing and quantum technologies. Regular specialised technical training to members of the scientific community

TODAY!!

Technical Workshop

Annual workshop to review the R&D projects carried out during the last year and discuss **future plans**. The event features technical talks, a poster session and a technology track dedicated to our industrial partners

CERN openlab relies on Communication, Education & Outreach actions





THANK YOU!!!!!!

