



CERN openlab **A successful public- private partnership**

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A long, dimly lit tunnel, likely part of the CERN particle accelerator. The tunnel is filled with complex machinery and pipes. On the left side, a large, cylindrical structure, possibly a superconducting magnet, is visible. The floor is marked with a white line, and the walls are lined with various equipment and cables. The overall atmosphere is industrial and futuristic.

CERN: A UNIQUE ENVIRONMENT TO PUSH TECHNOLOGIES TO THEIR LIMITS

CERN openlab in a nutshell

A science – industry partnership to drive R&D and innovation with over a decade of success

Evaluate state-of-the-art technologies in a challenging environment and improve them

Test in a research environment today what will be used in many business sectors tomorrow

Train next generation of engineers/employees

Disseminate results and outreach to new audiences

PARTNERS



ORACLE

SIEMENS

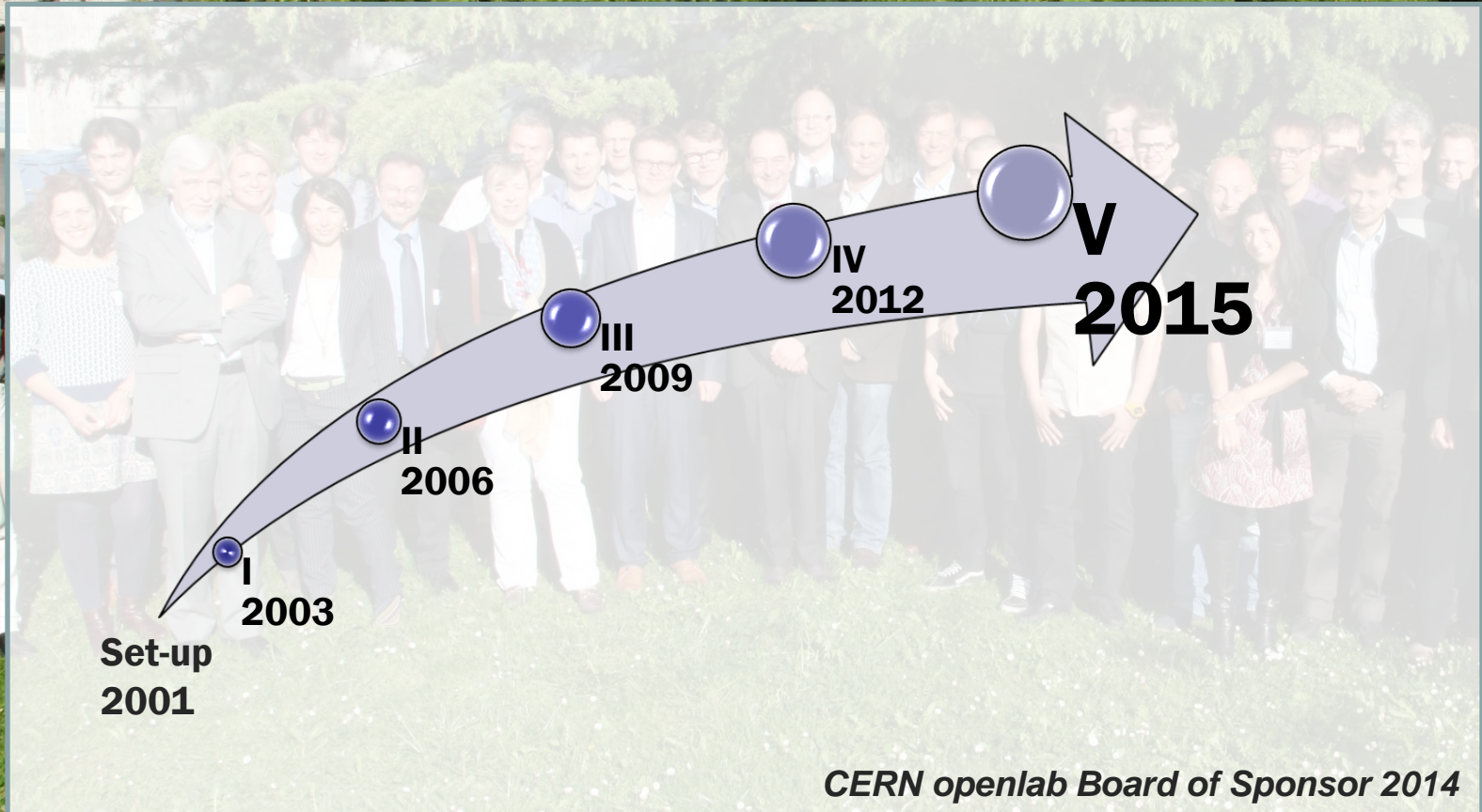
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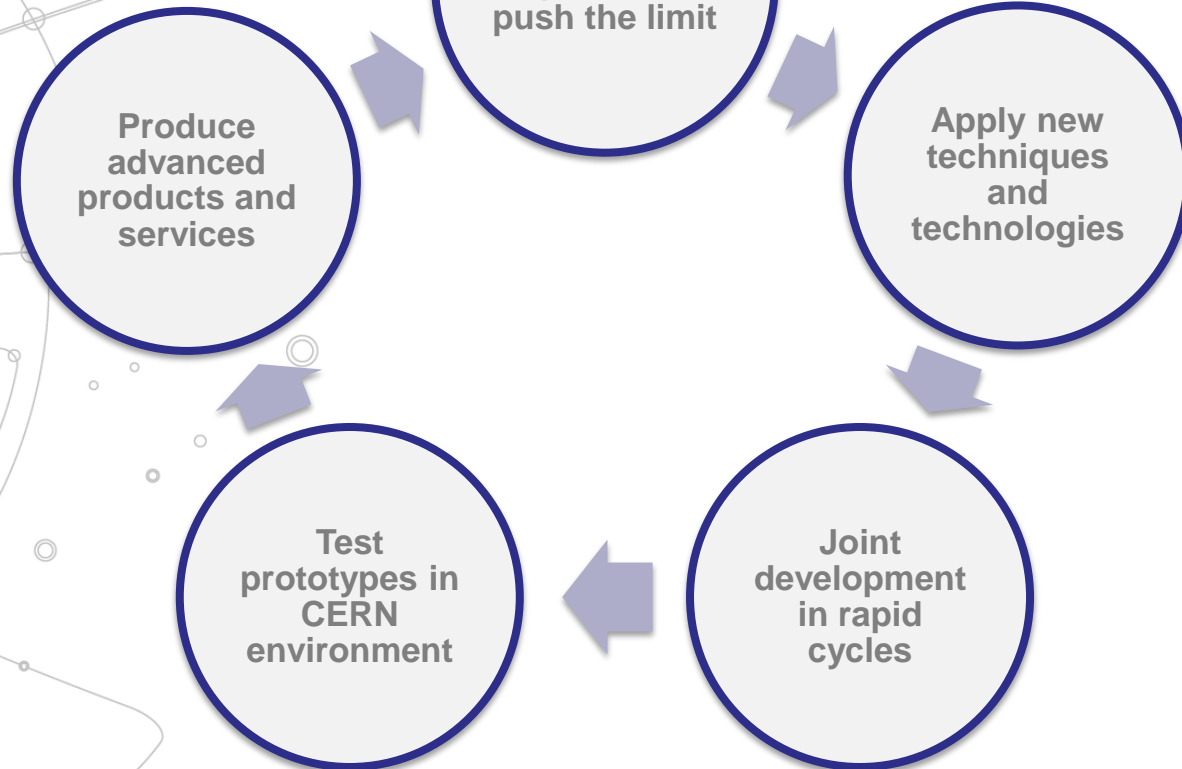
ASSOCIATE

Yandex

The history of openlab



Virtuous Cycle



A public-private partnership between the research community and industry

The Large Hadron Collider (LHC)



LHC Schedule

2009 2010 2011 2011 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 ... 2030?

First run

LS1

Second run

LS2

Third run

LS3

HL-LHC

FCC?

LHC startup
900 GeV

Phase-0 Upgrade

Phase-1 Upgrade

50 times more data than today in the next 10 years
50 PB/s out of the detectors
5 PB/day to be stored

Bunch spacing = 50 ns

Bunch spacing = 25 ns

Bunch spacing = 25 ns

TeV
 $35 \text{ cm}^{-2}\text{s}^{-2}$
Spacing = 12.5 ns

Phase V Preparation

IT Challenges Whitepaper

- Workshops, discussions, presentations
- Published in May 2014

Internal discussions, workshops, initial use cases definitions

Now defining specific openlab V projects



Who we have involved so far



Information Technology Research Areas



Data acquisition and filtering



Computing platforms, data analysis, simulation



Data storage and long-term data preservation



Compute provisioning (cloud)



Networks

Medical applications



Data analytics

Collaborative Projects



**High-Throughput TDAQ
for LHC Experiment
Detectors**

**Optimization of
Radiation Transport
Simulation Software**

**Cloud Federations
Support in OpenStack**

**In-Database Physics
Analysis at Exascale**

**Control Systems for the
LHC**

**Predictive Data
Analytics for Monitoring
and Data Transfers
Optimization**

New professional profiles

Multicore CPU programming, graphical processors (GPU), multithreaded software

Software & Computing Engineers

Data analysis platforms, statistics, mathematics, data visualization, monitoring, security, etc.

Data Scientists

Applications of physics to medical research (hadron therapy, etc.), simulation software

Multidisciplinary applications

A Solid Educational Program

At CERN

- Regular workshops
- Special workshops and lectures
- Requirements workshops
- Training courses on hardware platforms, parallel programming, etc.

Outside the lab:

- CERN School of Computing
- Thematic School of Computing
- Speakers at conferences and events

ISEF Winners Program

Summer student program

The ICE-DIP project



Programs is highly structured, with different tiers and specializations – students, young researchers, professional researchers and experts - including summer student lectures as well as numerous invited talks at CERN

An incubator for innovation

- Promote collaboration across scientific domains
- Give young researchers opportunities to develop ideas and share experiences
- Explore business and exploitation strategies in collaboration with industry leaders



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