CERN: A UNIQUE ENVIRONMENT TO PUSH TECHNOLOGIES TO THEIR LIMITS
What is CERN?

European Organization for Nuclear Research

Founded in 1954 – 60th Anniversary Celebration!

22 Member States: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom, Romania

Associate Members in the Pre-Stage to Membership: Brazil, Cyprus, Pakistan, Serbia, Turkey, Ukraine

Applicant States: Slovenia

Observers to Council: India, Japan, Russia, United States of America, the European Commission and UNESCO
CERN Structure

Information Technology (IT)

Engineering (EN)

Technology (TE)

Physics (PH)

Beams (BE)

General Infrastructure

Services (GS)

Human Resources (HR)

Finance, Procurements

and Knowledge Transfer (FP)

http://home.web.cern.ch
http://home.web.cern.ch/about
http://information-technology.web.cern.ch/
IT Department Structure

- Computing Facilities
- Data & Storage Services
- Collaboration & Information Services
- Database Services
- Operating System & Infrastructure Services
- Platform & Engineering Services
- Support for Distributed Computing
- Communication Systems

Department Infrastructure
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/scientists
• Disseminate results and outreach to new audiences
The history of openlab

CERN openlab
Board of Sponsor 2013
Virtuous Cycle

CERN requirements push the limit

Apply new techniques and technologies

Joint development in rapid cycles

Test prototypes in CERN environment

Produce advanced products and services

A public-private partnership between the research community and industry
The Large Hadron Collider (LHC)
LHC Schedule

First run LS1 Second run LS2 Third run LS3 HL-LHC FCC?


LHC startup 900 GeV

Phase-0 Upgrade
Phase-1 Upgrade
Phase-2 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
Bunch spacing = 12.5 ns

LHC startup 900 GeV

7 TeV
L=6x10^{33} cm^{-2}s^{-2}
Bunch spacing = 50 ns

7 TeV
L=1x10^{34} cm^{-2}s^{-2}
Bunch spacing = 25 ns

14 TeV
L=2x10^{35} cm^{-2}s^{-2}
Spacing = 12.5 ns

50 PB/s out of the detectors
5 PB/day to be stored

2011 2010 2011 2019 2023 2024… 2030?
Information Technology Research Areas

- Data acquisition and filtering
- Computing platforms, data analysis, simulation
- Data storage and long-term data preservation
- Compute provisioning (cloud)
- Networks
- Data analytics
CERN openlab Structure

Board of Sponsors (all sponsors represented)

CERN Partner Contacts

Mgmt team (Head, CTO, Comms, Admin)

Project 1 (Project leader)

Project 2 (Project leader)

Project N (Project leader)

CERN/IT Mgmt. (DHO, IT-EC Project Office, etc.), Legal, KT

Head: Alberto di Meglio
CTO: Fons Rademakers
Administration: Kristina Gunne
Communications: Mélissa Gaillard
A Solid Educational Program

At CERN

- Regular workshops
- Special workshops
- Requirements workshops
- Training courses on hardware platforms
- Parallel programming, etc.

Outside the lab:

- CERN School of Computing in Portugal (August 2014)
- Thematic CSC in Split (June 2014)

- 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
Summer Student Program

Summer student program 2013
- 720+ applicants
- 22 selected candidates
- 13 lectures (including new lectures from external labs)
- A new lightning talks session
- 22 technical reports

Summer student program 2014
- 850+ applicants
- 23 selected candidates
- Lectures and visits program in collaboration with other Labs/Institutes and companies

Summer student program 2015
- 1500+ applicants
- 40 selected candidates
- Lectures and visits program in collaboration with other Labs/Institutes and companies
Started February 2013
Recruited 5 fellows

Model can be extended to other areas (e.g. data analytics)
Your CERN Experience

› 9 weeks
› A project to complete
› A report to be submitted
  ▪ Template provided (http://openlab.web.cern.ch/templates)
  ▪ Initial draft after 4 weeks (table of content, main sections)
  ▪ Final draft to your supervisor a week before leaving
› A 5-minute “lightning talk” to describe your project and its outcome (19/08)
› A series of lectures about IT, computing and data management applied to HEP and other scientific domains
  ▪ http://indico.cern.ch/category/6466/
› Visits to external companies and research institutes (Google, Open Systems and ETH)
Some of you will be required to sign a “confidentiality agreement”

Don’t be surprised, it is necessary in case you work with technologies from industrial partners still under NDA
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