NextGen Triggers Project Overview

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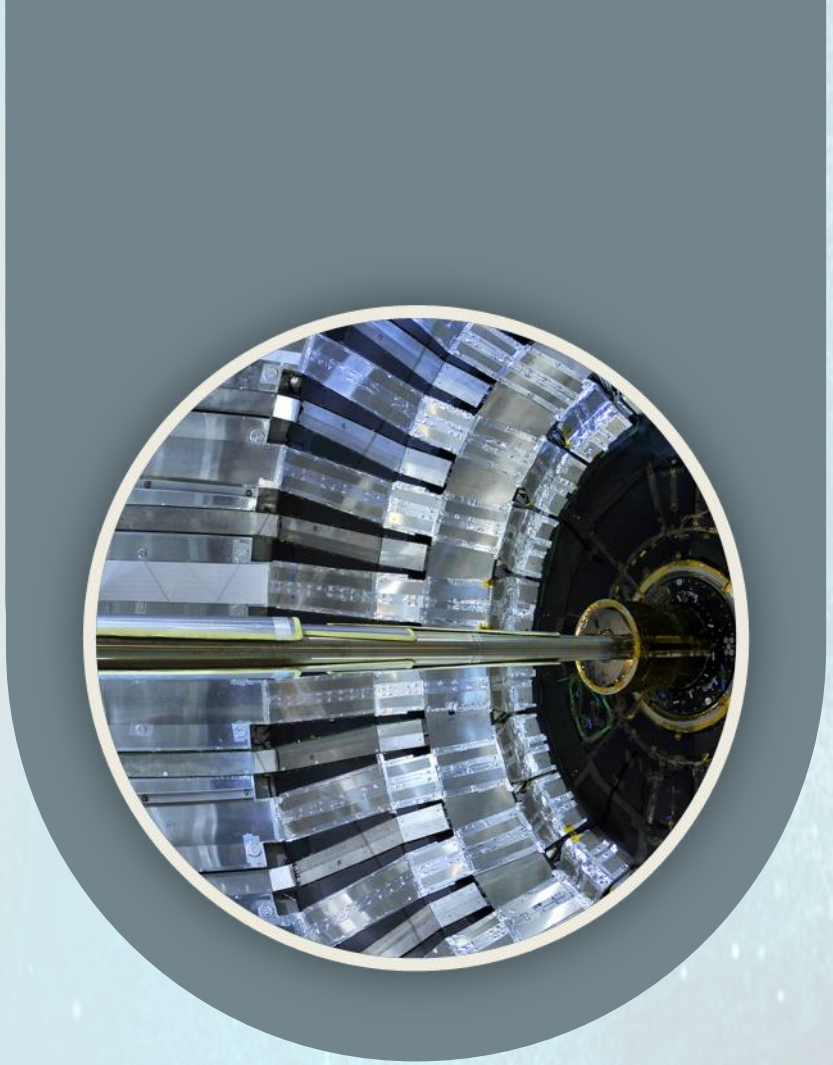
CERN | NexTGen Next Generation Triggers

WHAT IS
NEXT GENERATION TRIGGERS?

The Next Generation Triggers project, or NextGen, started in January 2024 as a collaboration between CERN (the Experimental Physics, Theoretical Physics and Information Technology Departments) and the ATLAS and CMS experiments.

The key objective of the five-year NextGen project is to get more physics information out of the HL-LHC data. The hope is to uncover as-yet-unseen phenomena by more efficiently selecting interesting physics events while rejecting background noise



In just a few microseconds, the complex triggers system can determine whether the information about a given collision event is worth keeping or not, but today we still discard the vast majority of raw data. Is it possible to do better?

A LITTLE

BACKGROUND STORY

2022

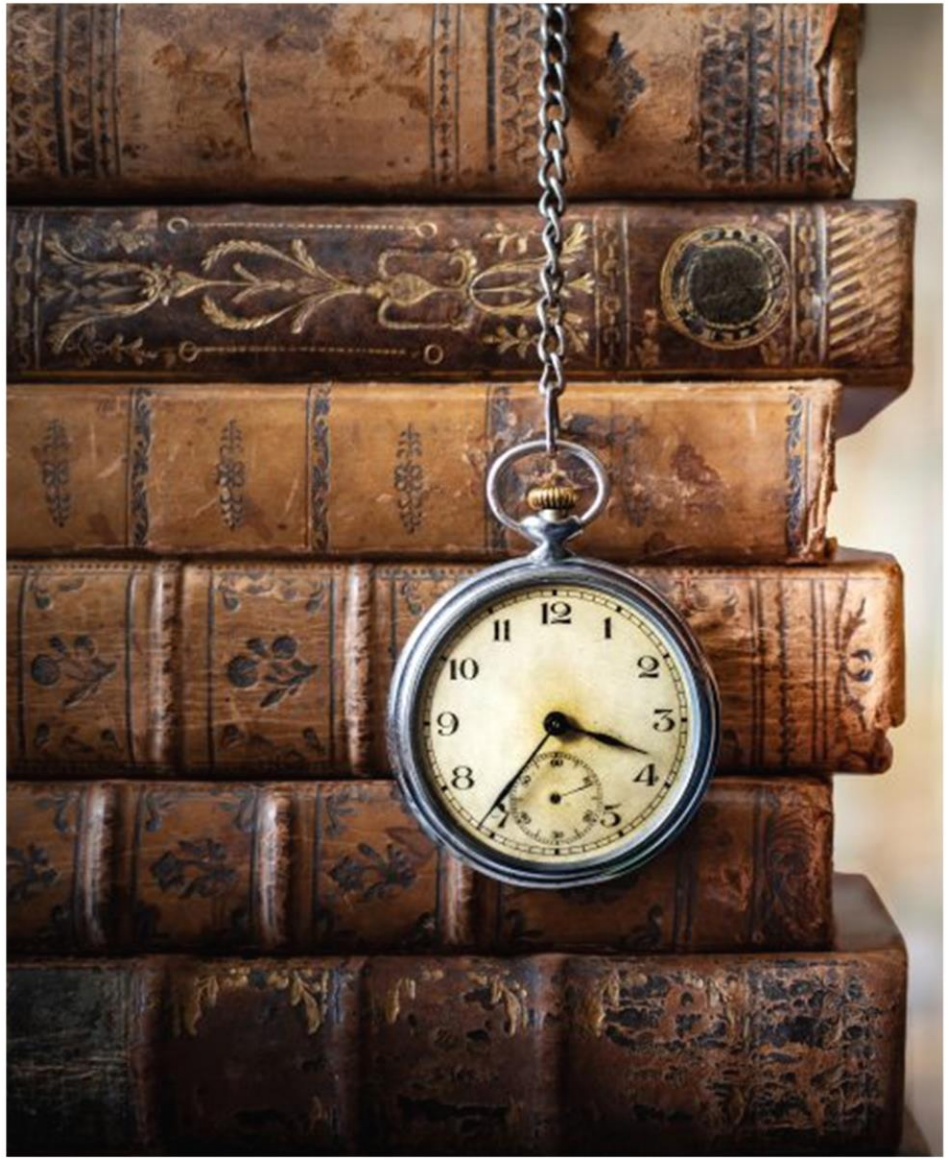
A group of private donors, including former Google CEO Eric Schmidt, visited CERN to know more about its missions and programmes.

2023

This first inspiring visit eventually evolved into an agreement with the Eric and Wendy Schmidt Fund for Strategic Innovation, approved by the CERN Council in October 2023, to fund a project to support advanced research for the future trigger systems at the HL-LHC and beyond.

2024

January kick-off. NextGen Triggers was born!



WHAT

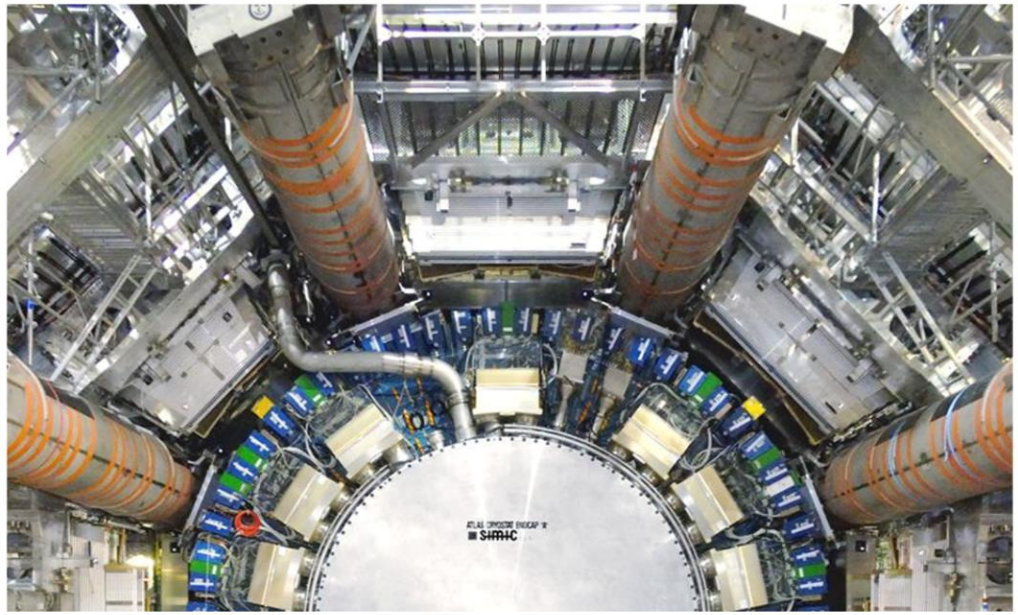
In Preparation For The High-luminosity LHC (HL-LHC):

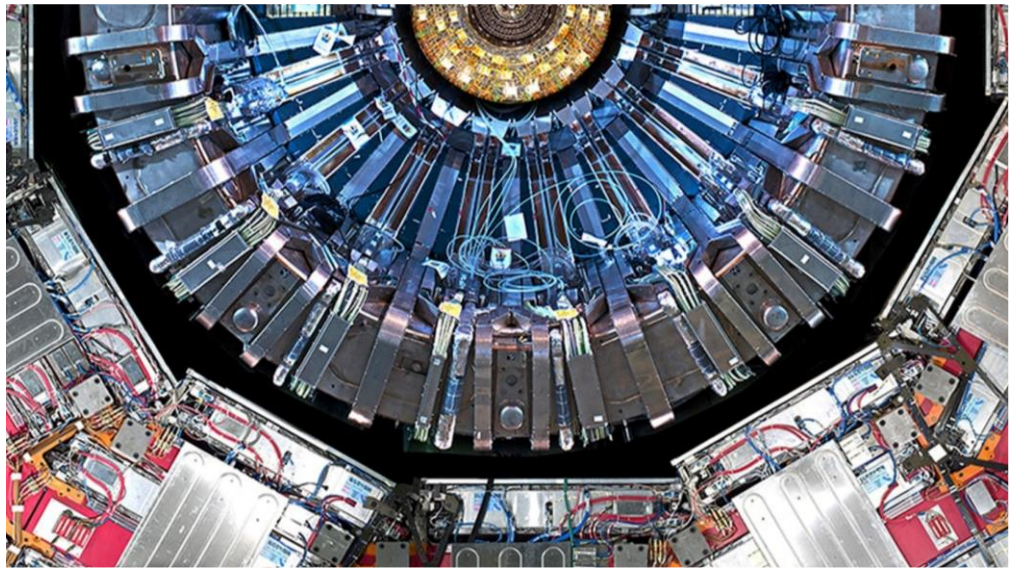
- The ATLAS and CMS detectors are being upgraded.
- Upgrades include finer spatial and timing granularity.
- These upgrades will result in more data for each collision

WHY

To prepare for the increase of raw data generation expected when the LHC enters the High-Luminosity phase:

- Need to develop new strategies for more sophisticated event processing and selection.
- That is where the NGT comes into play.





THE KEY SCIENTIFIC OBJECTIVES

Of The Five-Year NextGen Triggers Project

Goals

- To get more physics information out of the HL-LHC data.
- To uncover as-yet-unseen phenomena by more efficiently selecting interesting physics events while rejecting background noise.

Methods

- Neural networks, data formats and algorithms optimisation
- Quantum-inspired algorithms and new physics scenarios
- High-performance computing and more efficient architectures

THE SUPPORTING STRATEGY

Of The Five-Year NextGen Triggers Projects

NextGen will collaborate with experts in academia and industry.

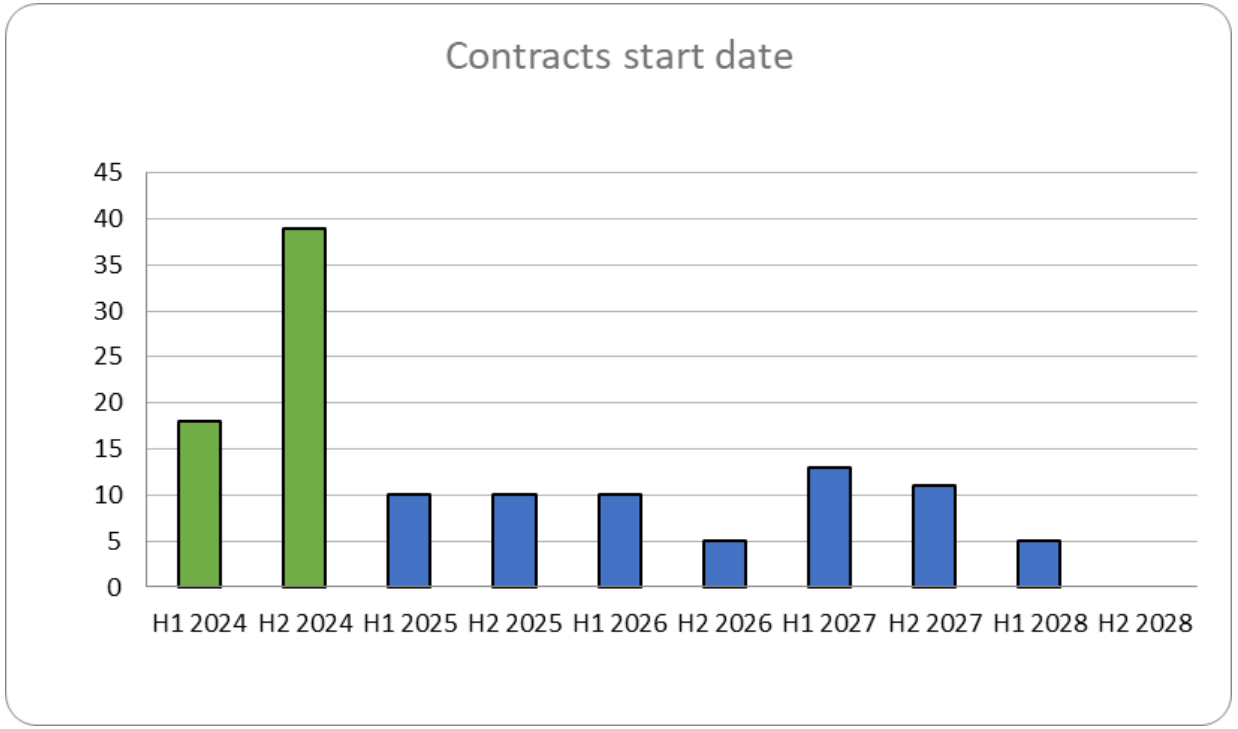
The work builds on CERN's open-science and knowledge-sharing principles.

A unique multidisciplinary training program for NextGen researchers is included.

Targeted events and conferences for the wider scientific community will be organized.

Intellectual property from the NextGen Triggers project, owned by CERN, will be released and shared under open licenses, in compliance with the CERN Open Science Policy.

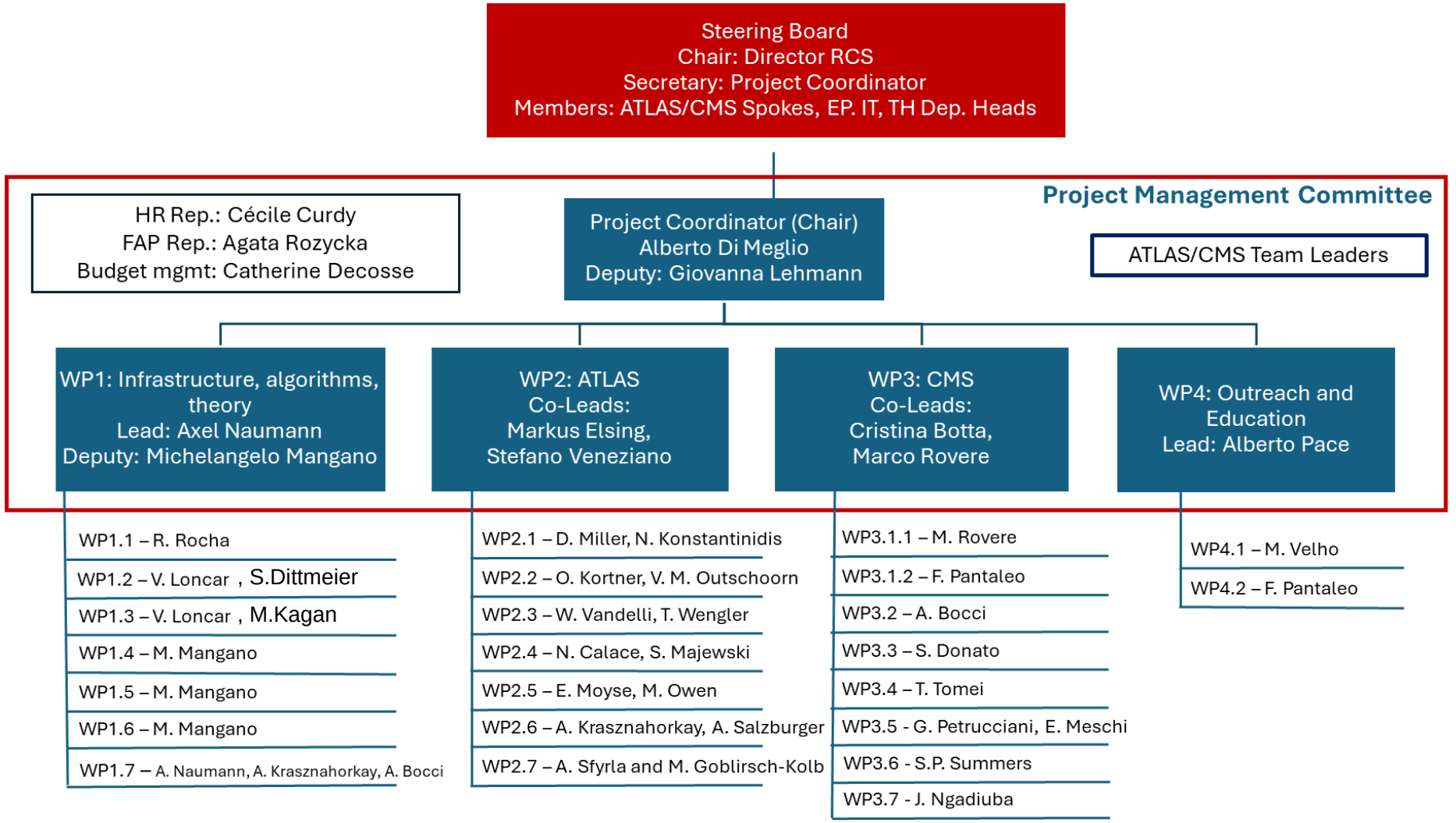
THE PROJECT WORKFORCE



Target effort

- **121 FTEs** planned in total across 5 years
- Mixed profiles: TECH/ADMIN, DOCT, GRAD, STAFF
- **57 new hires** planned just in 2024, on target to complete by end of the year

THE PROJECT GOVERNANCE



THE NEXT GENERATION TRIGGERS

PROJECT IS BROKEN DOWN INTO FOUR WORK PACKAGES:

WP1

Infrastructure, Algorithms and Theory

01

02

WP2:

Enhancing the ATLAS Trigger and Data Acquisition

WP4:

Education Programmes and Outreach

04

03

WP3:

Rethinking the CMS Real Time Data Processing

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Project Management Team

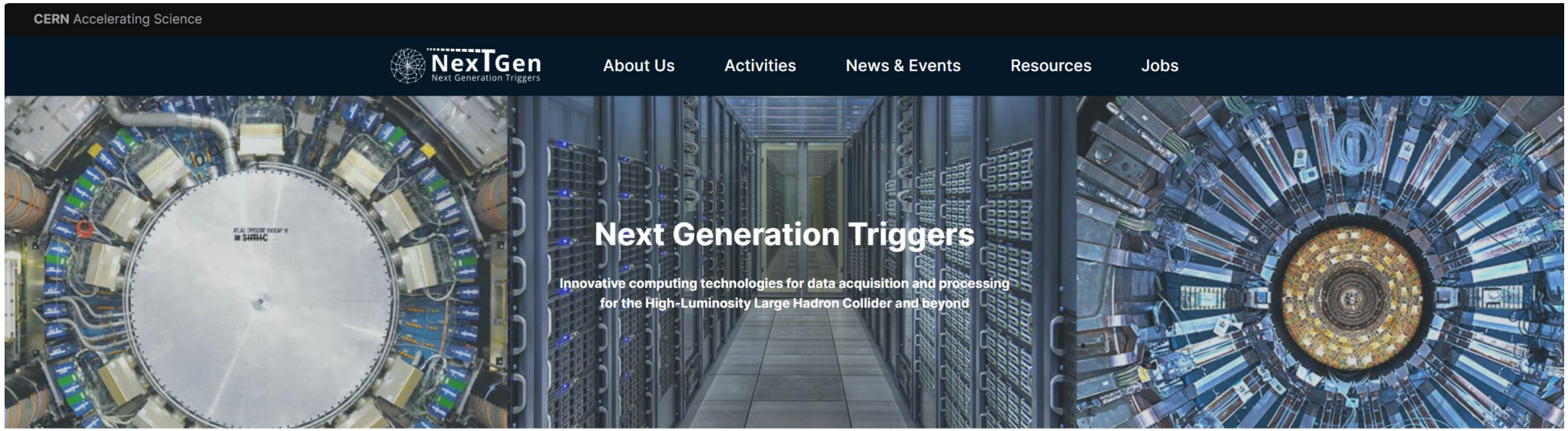
Jana Fišerová

Project Management

Alex Lasa Lamarca

Project Communications

THE WEB SITE



Our research

ATLAS and CMS experts in NextGen develop new

NextGen develops and benchmarks software and

NextGen investigates the use of AI technologies to improve

Theoretical physicists and software engineers in

NextGen works with the High-Energy Physics community

https://nextgentriggers.web.cern.ch/

INTERNAL
COMMUNICATIONS

- ***cern-nextgen-all@cern.ch – Everybody in the project, open to members, used to exchange high-level information and announcements***
- ***Every WP has dedicated coordinators and membership mailing lists, please contact the WP leads for more information***
- ***Additional mailing list for specific tasks, activities, etc. as necessary***

- ***A CERNBox Project has been created to host all project files***
  - ***A public folder is available at***

    https://cernbox.cern.ch/files/spaces/eos/project/n/nextgen/public

    with public files such as the high-level project proposals, templates, logos, and public versions of all deliverables as appropriate

EXTERNAL COMMUNICATIONS

Are you attending a conference and giving a talk about your project related to NextGen Triggers? Or maybe you are releasing a technical document? Whatever is the case, **please do reach us!**

cern-nextgen-communications@cern.ch

To give them visibility and to ensure that this section remains comprehensive and up-to-date, all papers, presentations, etc. will be uploaded to their corresponding category in the "Resources" section of the web page. **Again, please do reach us!**

DELIVERABLES, MILESTONES AND PLANS

Formal deliverables

- The Grant Agreement requires the submission of a number of formal deliverables every year
- There are in total 70 deliverables, 14 per year
- Each deliverable has an associated “proof of evidence”

The yearly **ER** (Evaluation Report, including the Financial Report) and all **“proofs of evidence”** for the previous year must be submitted by January 30th of the following year.

For 2024 we are starting now to collect technical information and financial (use of resources) information. The final version of all material must be ready at the latest by **Dec 20th**.

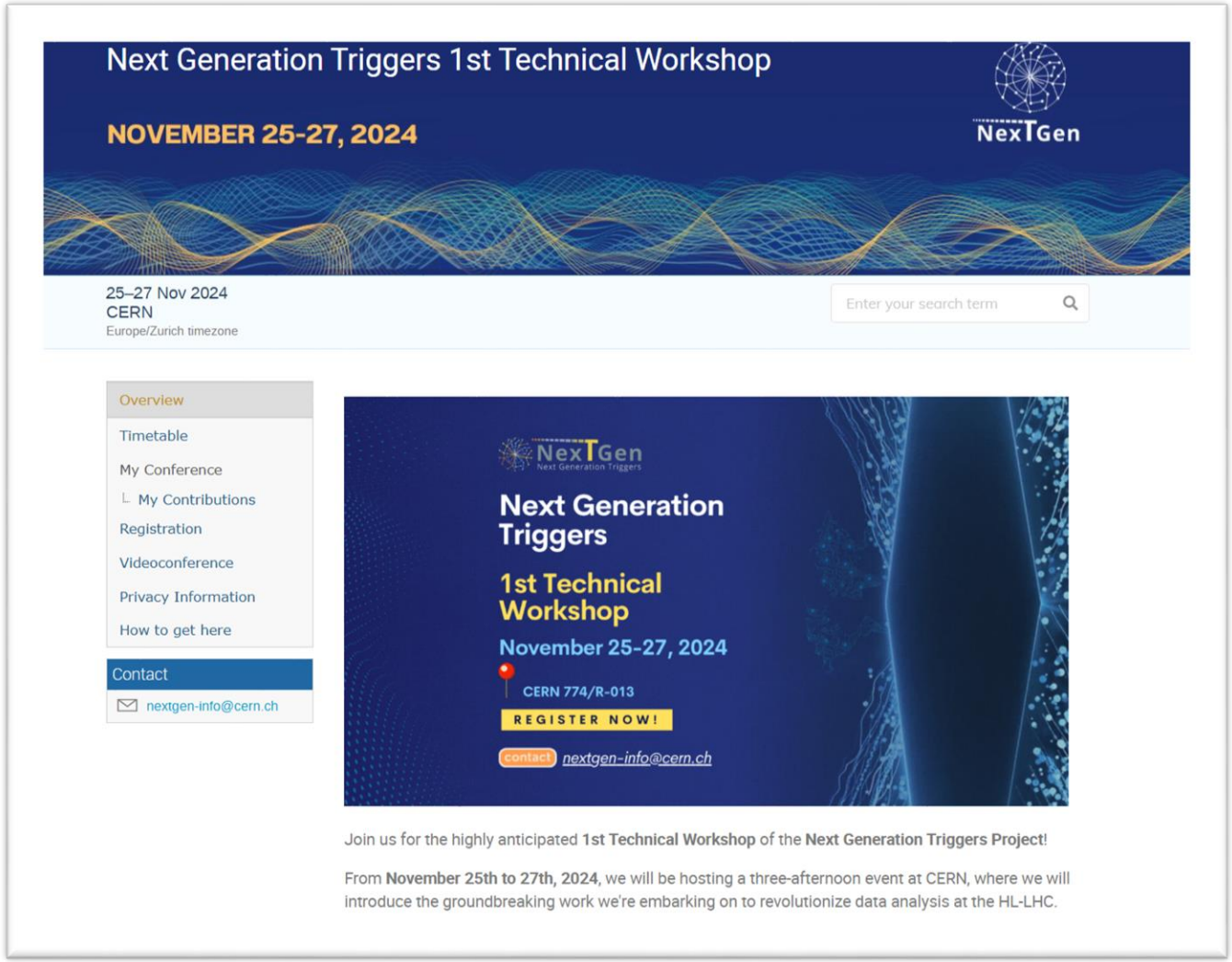
In addition to the “contractual” milestones listed in the proposal, we will define **intermediate milestones** (check-points) in June/July every year to assess progress and take any necessary corrective actions.

THE YEARLY NEXTGEN WORKSHOP

The yearly NextGen Workshop is the main Outreach event (see WP4 presentation for more on Exchange and Outreach plans).

It will be open to any interested person in the community and represent not only an effective way of sharing ideas and achievements **but also to collect information for the yearly technical Evaluation Report** ☺

So, see you all again on November 25th-27th!



... AND NOW QUESTIONS!