

NextGen Triggers Project Overview

Alberto Di Meglio
Project Coordinator

On behalf of the NextGen Project Management Committee



NextGen
Next Generation Triggers

A LITTLE BACKGROUND STORY

2022

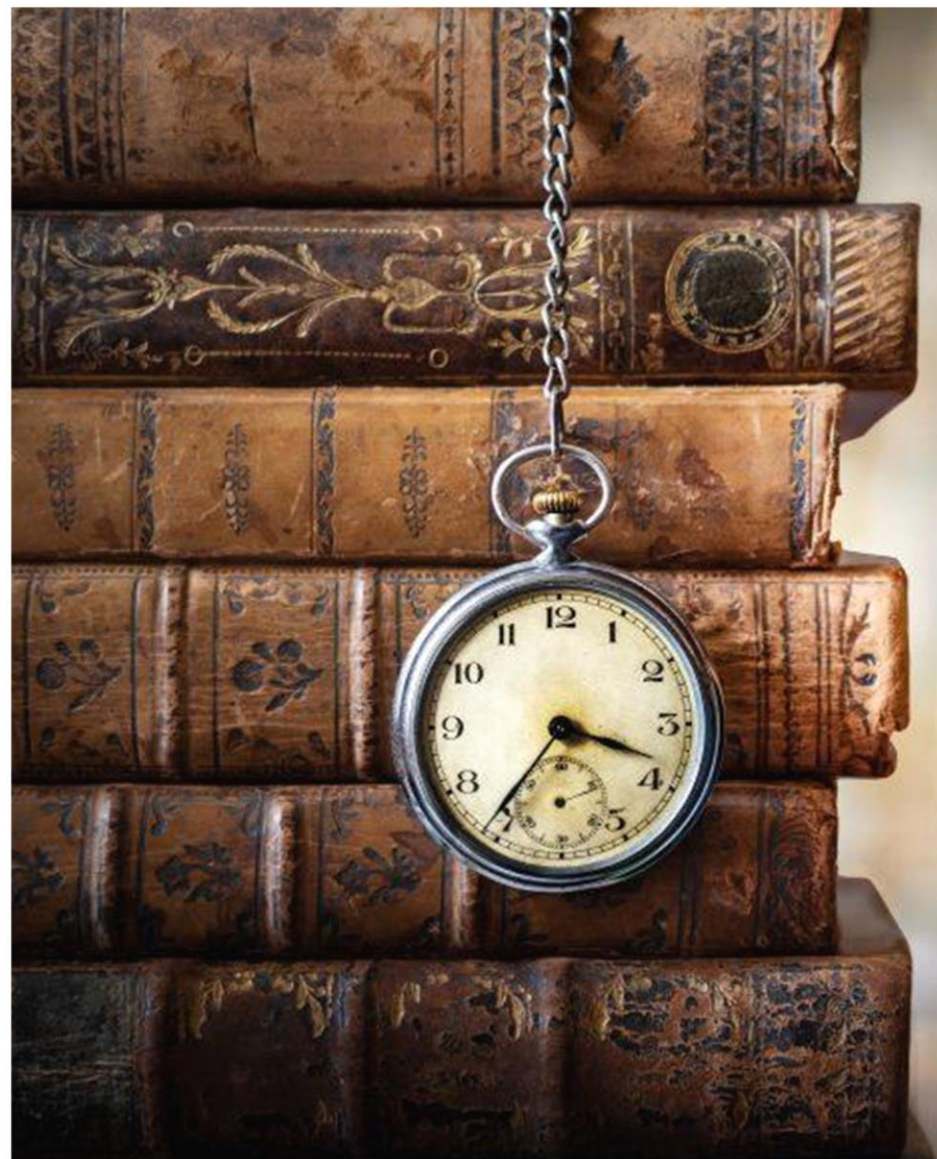
A group of private donors, visits CERN to know more about its missions and programmes.

2023

This first visit eventually evolves 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 IS NEXT GENERATION TRIGGERS?



Five years: 2024-2028 supported by an external donation, combining

- ATLAS, CMS; limited participation of ALICE, LHCb
- CERN's Theory & IT departments
- CERN's Exp Physics Software group



Project goals ([proposal](#))

- opportunity for wider R&D
- improve LHC experiments in 2028+
- invest in community education and training



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?

HOW

Experiment-specific R&D

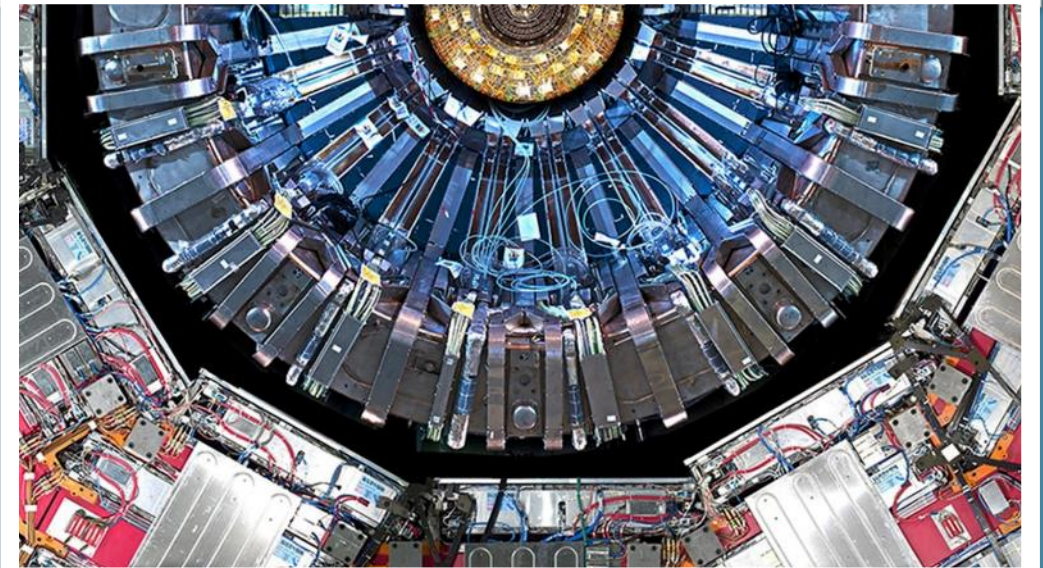
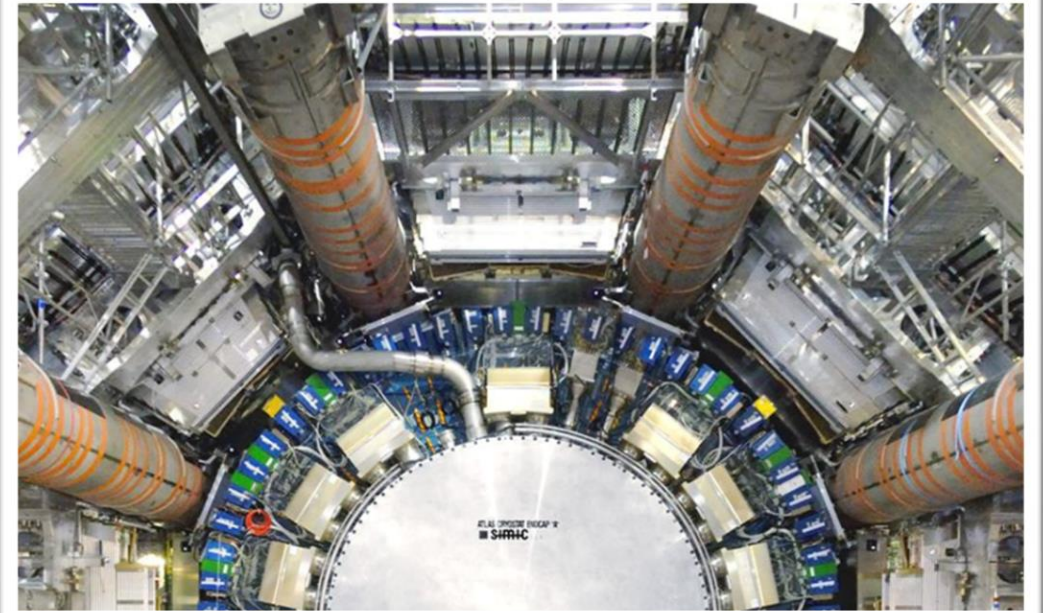
- ▶ ATLAS+CMS define their R&D requirements
- ▶ Benefitting from common R&D, training

Common R&D + Training

- ▶ Combining all parties: 2 (+2) experiments, IT, theory, experimental physics software

Results are open

- ▶ Open access, open source, including training
- ▶ Embedded in experiments



THE KEY OBJECTIVES

More than technical work



Goals

- ▶ To get more physics information out of the HL-LHC data.
- ▶ To uncover as-yet-unseen phenomena by more efficiently selecting exotic and rare physics events thanks to better models and data processing techniques.



Technologies

- ▶ ML and classical algos: invent, optimize, benchmark
- ▶ Quantum-inspired algorithms and new physics simulations
- ▶ FPGAs, GPUs, high-performance computing, more efficient architectures



Community

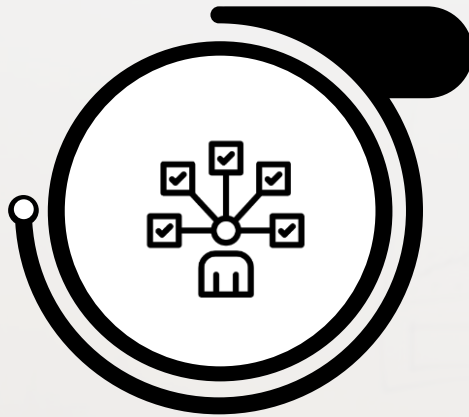
- ▶ Define common objectives across different experiments and Institutes
- ▶ Train future researchers on new computing techniques for real applications
- ▶ Promote Open Science principles and contribute to open source development of AI/ML technologies

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 education program for NextGen researchers is included.

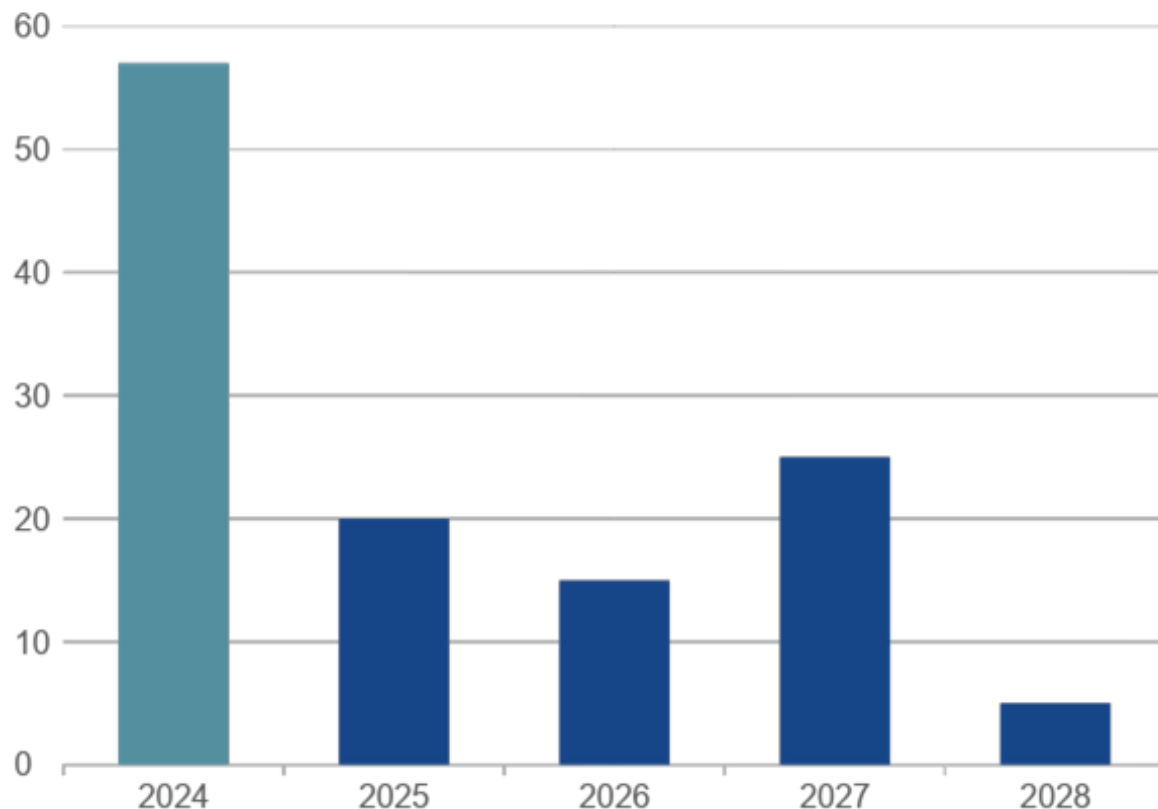


Targeted events and conferences for the wider scientific community will be organized.



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.

First action? Hire the Experts!



Target effort

- ▶ **~280 FTEs** planned in total across 5 years
- ▶ **57 new hires** for 2024
- ▶ Mixed profiles: master, PhD, post-doc, staff

THE NEXT GENERATION TRIGGERS

PROJECT IS BROKEN DOWN INTO FOUR WORK PACKAGES:

WP1

Infrastructure,
Algorithms and Theory

01

WP4:

Education Programmes
and Outreach

04



WP2:

Enhancing the ATLAS Trigger
and Data Acquisition

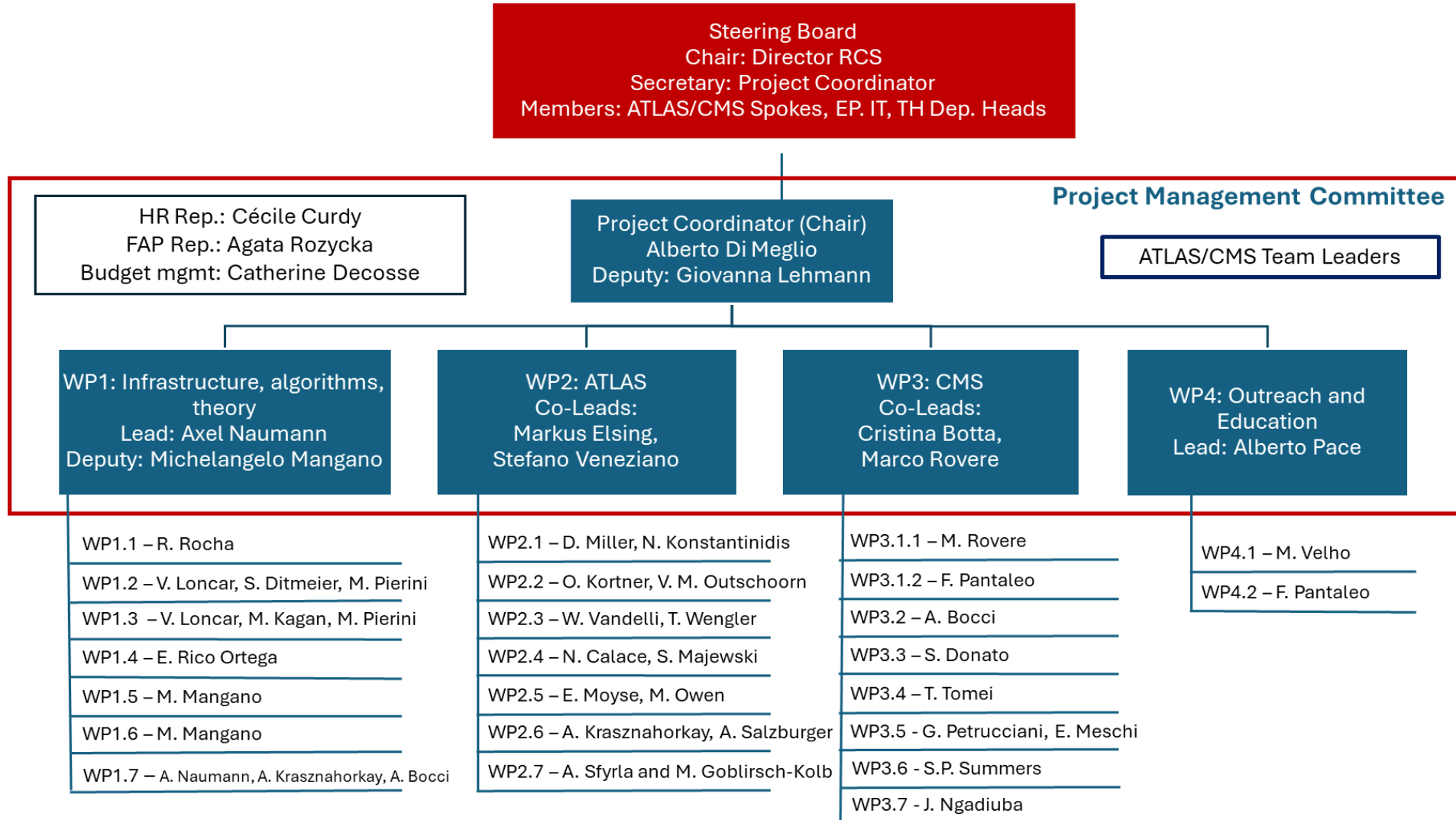
02

WP3:

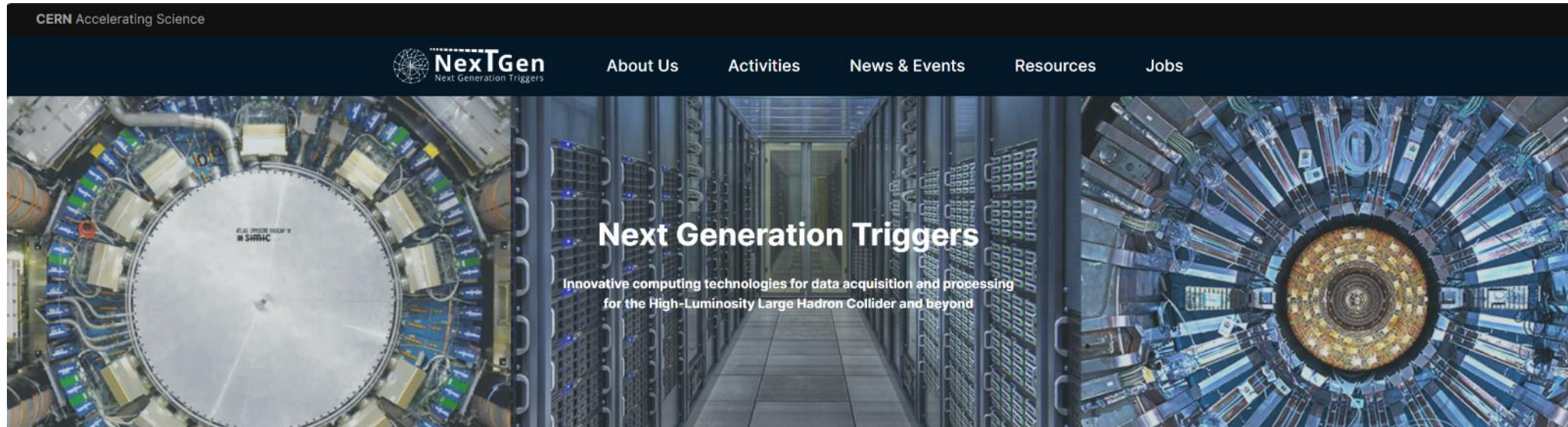
Rethinking the CMS Real
Time Data Processing

03

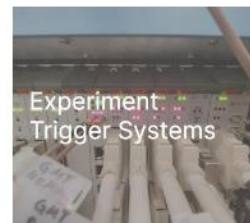
THE PROJECT GOVERNANCE



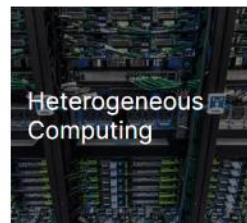
THE WEB SITE



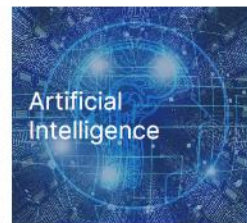
Our research



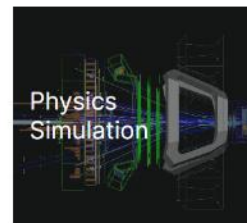
ATLAS and CMS experts in NextGen develop new



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/>

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 in **January 2025** as a public report.

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

THE YEARLY NEXTGEN WORKSHOP

The yearly NextGen Workshop is the main technical event (see WP4 presentation for more on exchange and outreach plans).

Open to any interested person in the community to be informed on activities and progress, exchange ideas, ask questions, make suggestions

Technical presentation from all Tasks

Help us to shape the programme for the next years!

Next Generation Triggers 1st Technical Workshop

NOVEMBER 25-27, 2024

25-27 Nov 2024
CERN
Europe/Zurich timezone

Enter your search term

Next Generation Triggers
1st Technical Workshop
November 25-27, 2024
CERN 774/R-013
REGISTER NOW!
contact nextgen-info@cern.ch

Join us for the highly anticipated 1st Technical Workshop of the Next Generation Triggers Project!

From November 25th to 27th, 2024, we will be hosting a three-afternoon event at CERN, where we will introduce the groundbreaking work we're embarking on to revolutionize data analysis at the HL-LHC.

Agenda

Overview

Timetable

Registration

Videoconference

Privacy Information

How to get here

Contact

✉ nextgen-info@cern.ch

Timetable

< Mon 25/11 Tue 26/11 Wed 27/11 All days >

Print PDF Full screen Detailed view Filter

13:00

Introduction

Alberto Di Meglio

774/R-013, CERN

13:30 - 14:00

14:00

Work Package 1: Infrastructure, Algorithms and Theory

15:00

774/R-013, CERN

14:00 - 15:40

Coffee break

16:00

774/R-013, CERN

15:40 - 16:10

Work Package 1

774/R-013, CERN

16:10 - 16:50

17:00

Work Package 4: Education Programmes and Outreach

774/R-013, CERN

16:50 - 17:30

Networking cocktail

18:00

774/R-013, CERN

17:30 - 18:30

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13:00

Work Package 2: Enhancing the ATLAS Trigger and Data Acquisition

14:00

774/R-013, CERN

13:30 - 14:30

Coffee break

774/R-013, CERN

14:30 - 15:00

15:00

Work package 3: Rethinking the CMS Real-Time Data Processing

774/R-013, CERN

15:00 - 16:00

16:00

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774/R-013, CERN

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17:00

Closing remarks

774/R-013, CERN

17:00 - 17:20

Thanks and enjoy!



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