

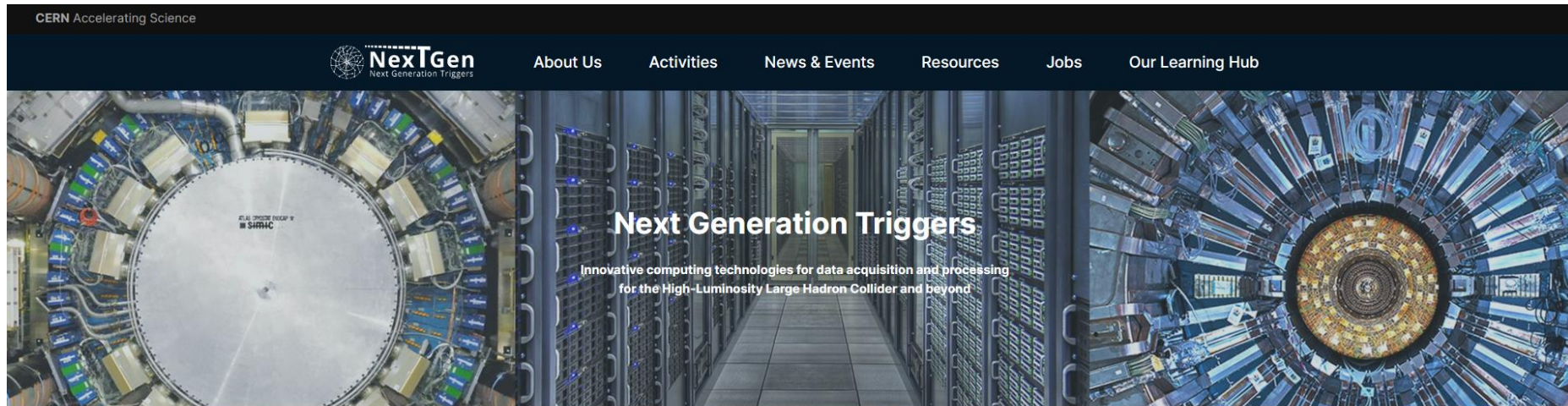
# NextGen Triggers Outreach and Communication

Alex Lasa Lamarca  
NGT Outreach and Communication Officer

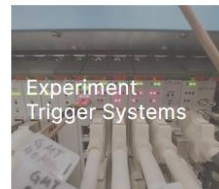


**NexTGen**  
Next Generation Triggers

# Main channel



### Our research



Experiment  
Trigger Systems

ATLAS and CMS experts in NextGen develop new workflows and data processing techniques to increase the sensitivity of future particle physics triggers



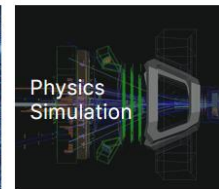
Heterogeneous  
Computing

NextGen develops and benchmarks software and techniques to exploit accelerated computing architectures keeping in mind cost and energy efficiency



Artificial  
Intelligence

NextGen investigates the use of AI technologies to improve the experiments' physics impact leveraging massive data throughput pipelines and large-scale models



Physics  
Simulation

Theoretical physicists and software engineers in NextGen look at new event generators techniques to improve simulation and detection of exotic signatures



Education and  
Training

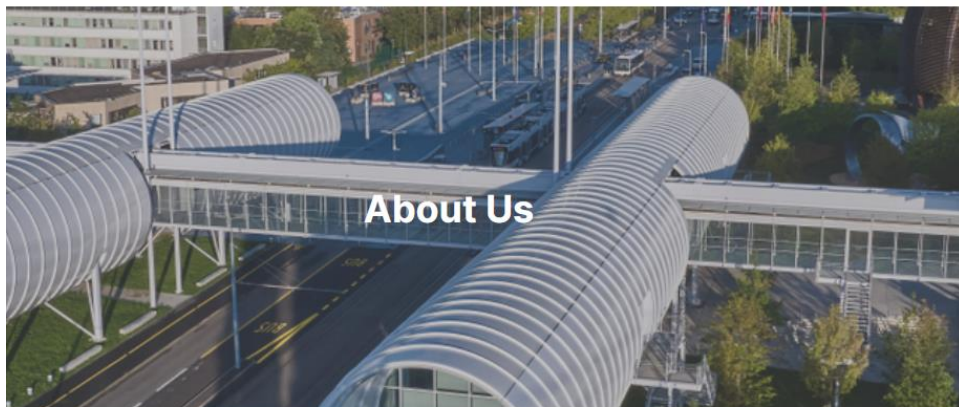
NextGen works with the High-Energy Physics community and computer science experts to provide new generations of scientists with the right skills for tomorrow's challenges

Discover more

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



# Main channel

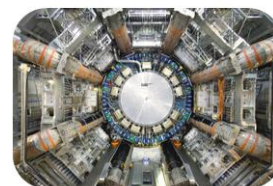
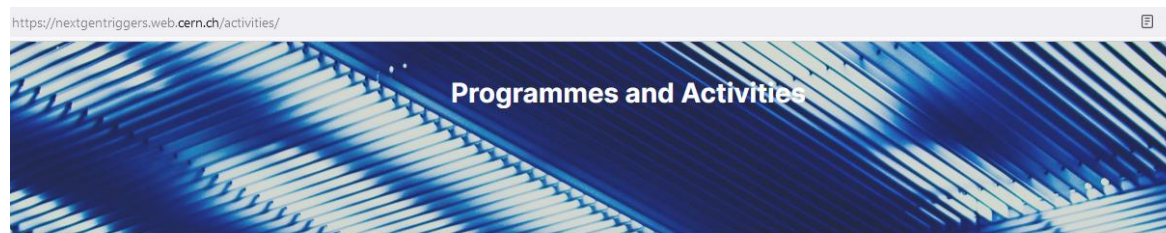


Innovative computing technologies for data acquisition and processing for the High-Luminosity Large Hadron Collider and beyond

2024 Started      24 Technical Units      >100 Researchers

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. Scientists will make use of neural network optimisation, quantum-inspired algorithms, high-performance computing and field-programmable gate array (FPGA) techniques to improve the theoretical modelling and optimise their tools in the search for ultra-rare events.

The foundations of the NextGen project were laid in 2022 when a group of private donors, including former Google CEO Eric Schmidt, visited CERN. This



## **WP2: Enhancing the ATLAS Trigger and Data Acquisition**

This work package focuses on an enhancement of the already ambitious upgrade of the ATLAS experiment's trigger and data acquisition system for the High Luminosity Phase of the LHC (HL-LHC) scheduled to start in 2029. Novel approaches to trigger event selection will extend the ATLAS physics potential, state-of-the-art Machine Learning techniques.



## **WP3: Rethinking the CMS Real-Time Data Processing**

This work package aims to rethink the CMS data acquisition system allowing the CMS physics program to operate over all the collisions produced by the LHC. This is achieved through the High-Level Trigger (HLT) Real-time Reconstruction Revolution (R<sup>3</sup>) and a novel L1-trigger scouting stream.



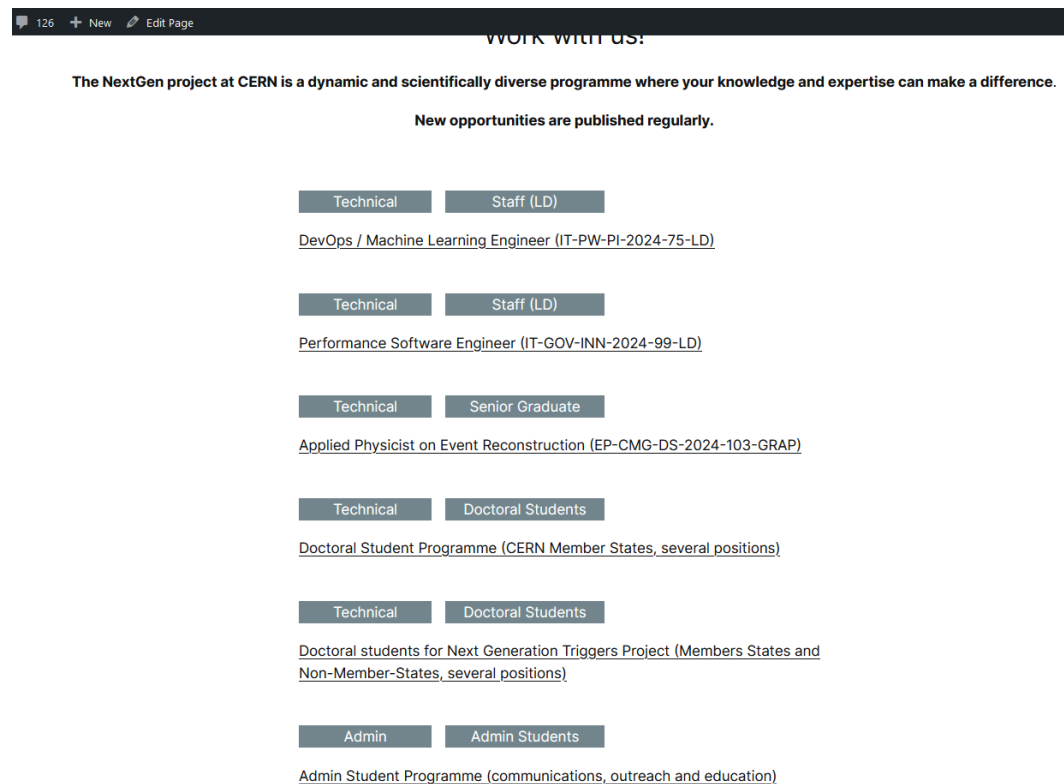
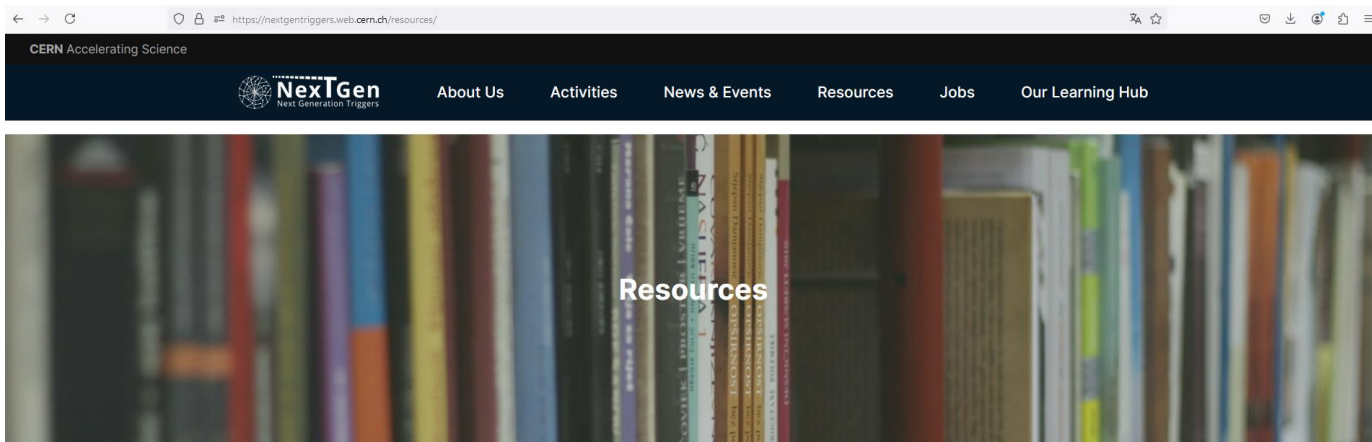
## **WP1: Infrastructure, Algorithms and Theory**



## **WP4: Education Programmes and Outreach**



# Main channel



## Public Proposal

Title	Date	File
NextGen Triggers Proposal	12/12/23	<a href="#">Download</a>

## Materials

Title	File
Logos	<a href="#">Download</a>
Presentation Templates	<a href="#">Download</a>



# Main channel

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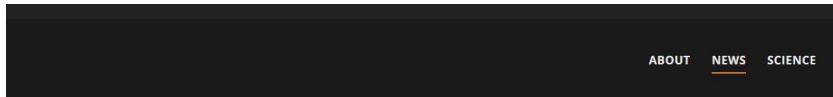
NextGen Triggers at ESC  
2024: A Journey into



INFN Efficient Scientific  
Computing School.

[News & Events](#)

# Secondary, but still strong channels



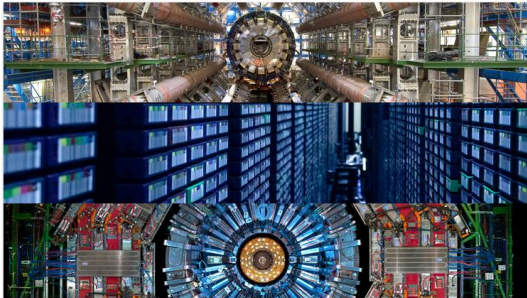
News · News · Topic: Computing

Voir en français

## The next-generation triggers for CERN detectors

The recently launched Next-Generation Triggers project is set to remarkably increase the efficiency, sensitivity and modelling of CERN experiments

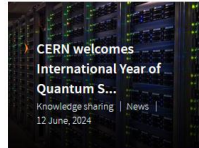
11 APRIL, 2024 | By Antonella Del Rosso



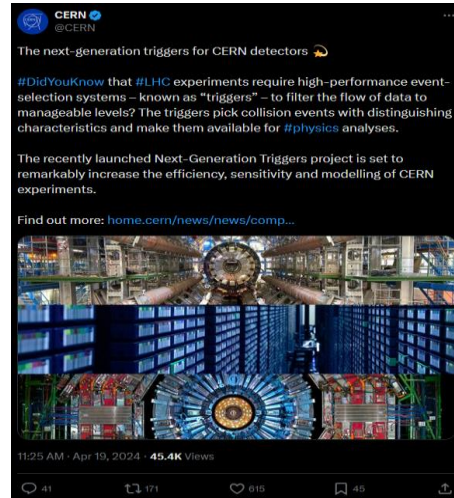
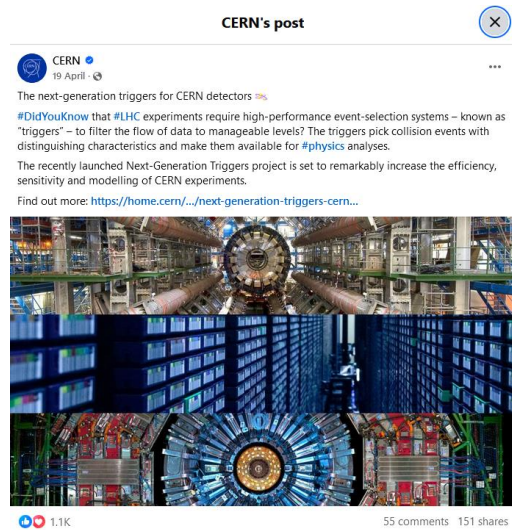
From top to bottom: ATLAS, CERN Data Centre and CMS (Image: CERN)

The experiments at the Large Hadron Collider (LHC) require high-performance event-selection systems – known as “triggers” in particle physics – to filter the flow of data to manageable levels. The triggers pick events with distinguishing characteristics, such as interactions or collisions of particles recorded in particle detectors, and make them available for physics analyses. In just a few seconds, the complex system can determine whether the information about a given collision event is worth keeping or not.

### Related Articles



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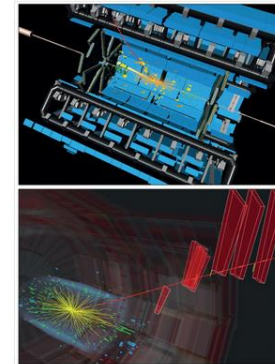
CERN MAIN WEBPAGE ARTICLE



COMPUTING | NEWS

## Next-generation triggers for HL-LHC and beyond

3 May 2024



On your marks ATLAS (top) and CMS (above) events recorded at a collision energy of 13.6 TeV on 5 April, marking the beginning of physics data-taking for 2024. Credit: ATLAS-PHOTO-2024-012-1/CMS-PHO-EVENTS-2024-019-3

The LHC experiments have surpassed expectations in their ability to squeeze the most out of their large datasets, also demonstrating the wealth of scientific understanding to be gained from improvements to data-acquisition pipelines. Colliding proton bunches at a rate of 40 MHz, the LHC produces a huge quantity of data that must be filtered in real-time to levels that are manageable for offline computing and ensuing physics analysis. When the High-Luminosity LHC (HL-LHC) enters operation from 2029, the data rates and event complexity will further increase significantly.

To meet this challenge, the general-purpose LHC experiments ATLAS and CMS are preparing significant detector upgrades, which include improvements in the online filtering or trigger-selection processes. In view of the importance of this step, the collaborations seek to further enhance their trigger and analysis capabilities, and thus their scientific potential, beyond their

CERN COURIER ARTICLE



# Example

## NextGen Triggers at ESC 2024: A Journey into Advanced Scientific Computing

Nov 5, 2024 — in News & Events  
Alex Lasa Lamarca



Eight of our NGT colleagues at the ESC in Bertinoro. In order, from left to right: Jessica Prendi, Benjamin Huth, Felice Pantaleo (lecturer), Jan Schulz, Pierfrancesco Butti, Luca Ferragina, Mateusz Zarucki and Daniele Massaro. Photo: Felice Pantaleo.

As part of our commitment to continuous learning and development, [T4.2, the STEAM Programme](#), plays a crucial role in equipping our team members with the advanced skills in cutting-edge computing and data science. This commitment to education prepared seven of our colleagues to pack their bags, laptops, and curiosity to join the [15th ESC International School](#) in Bertinoro, Italy, celebrated from October 14th to October 24th. Organized by [INFN](#) and with Next Generation Triggers being one of the collaborators, this year's school promised an immersive journey into "Architectures, Tools, and Methodologies for Large-Scale Scientific Computing Applications." For our

[NextGen webpage article](#)



**CERN Computing**  
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1w • Edited •

Designing the AI-based algorithms for the next generation triggers that will help reserachers in their quest for new particle signatures is no easy task. This is why, one of the four pillars of the NextGen Triggers programme (#NGT) is ...more

Miriam Cordero Muriel and 110 others  
1 comment · 5 reposts

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**ESC - Efficient Scientific Computing School - INFN**  
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Thank you! It has been a real honour to have such talented students at this edition of the ESC - Efficient Scientific Computing School !

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# IT README

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NOVEMBER 7, 2024 BY ALASALAM  
NextGen Triggers goes to school

From October 14th to October 24th, eight of our colleagues working on the #NextGenTriggers project participated in the XV International School on Efficient Scientific Computing in Bertinoro, Italy.



[IT Readme blog post](#)

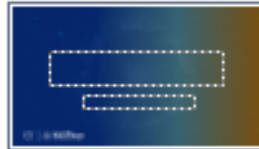


# Templates, presentations etc.

## Office Theme



Cover page



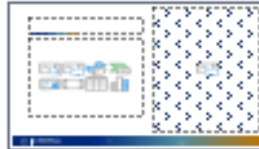
1\_Title slide



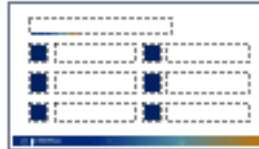
Full Content slide



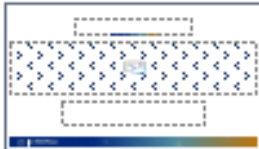
Title only slide



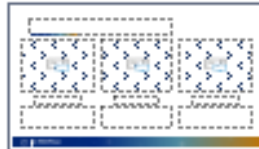
left image + right content slide



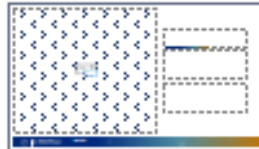
6 points slide



Half Rectangular image slide



3 image slide



Left image + right content



Full Image slide



Closing slide



<https://nextgentrigger.web.cern.ch/resources>





# Templates, presentations etc.

## Office Theme



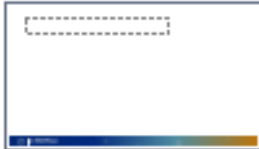
Cover page



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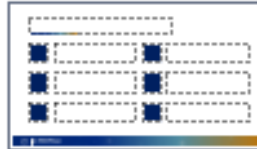
Full Content slide



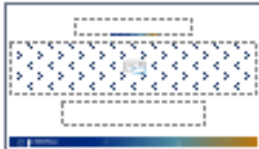
Title only slide



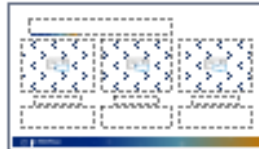
left image + right content slide



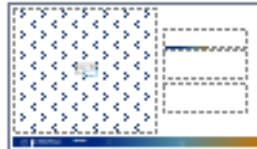
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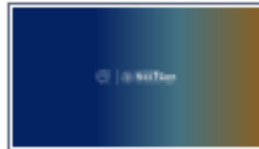
3 image slide




Left image + right content



Full Image slide



Closing slide



**NEXT GENERATION TRIGGERS**

**WP1:**  
INFRASTRUCTURE, ALGORITHMS AND THEORY




**NEXT GENERATION TRIGGERS**

**WP2:**  
ENHANCING THE ATLAS TRIGGER AND DATA ACQUISITION



**NEXT GENERATION TRIGGERS**

**WP3:**  
RETHINKING THE CMS REAL-TIME DATA PROCESSING



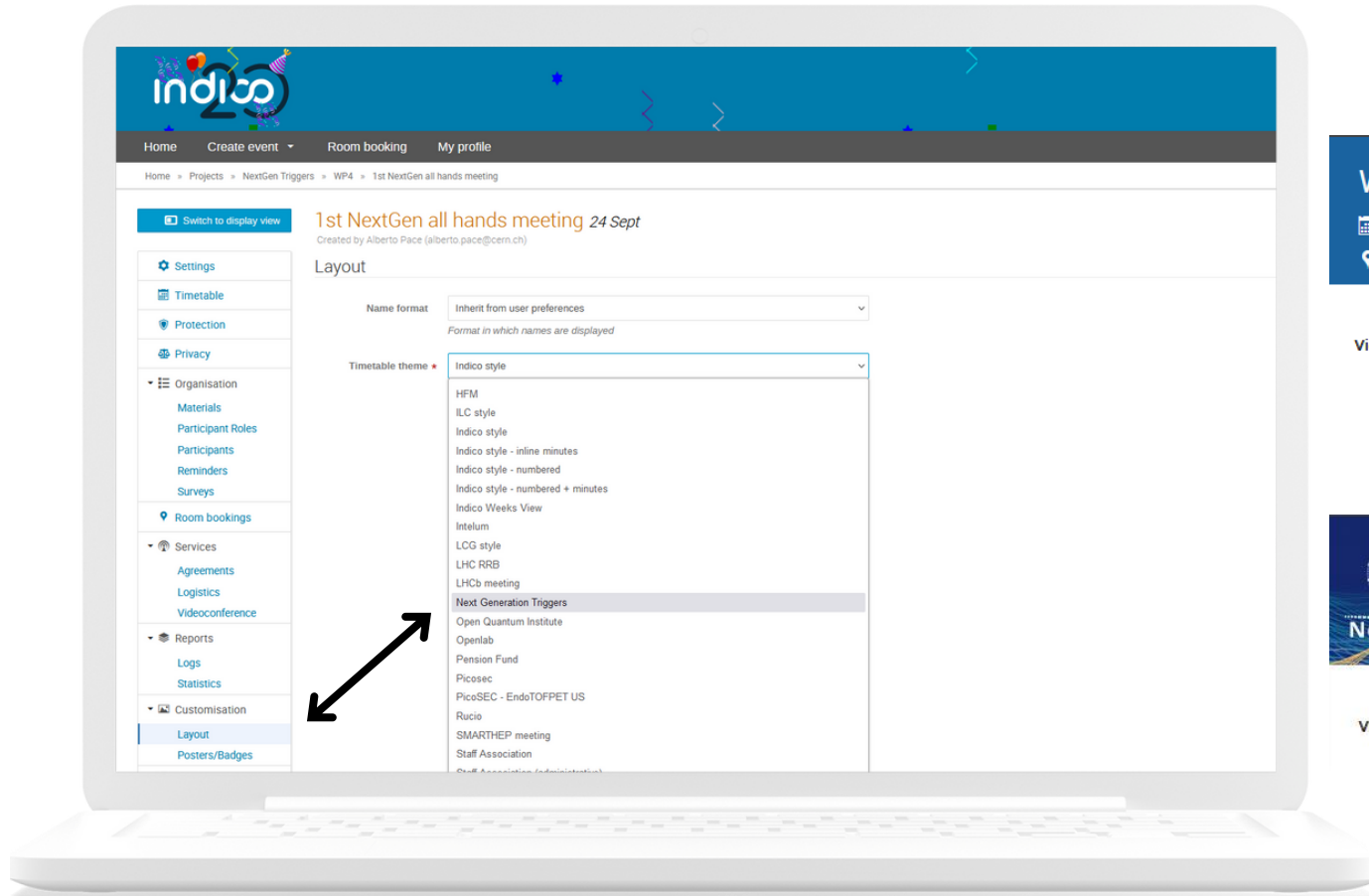
**NEXT GENERATION TRIGGERS**

**WP4:**  
EDUCATION PROGRAMS & OUTREACH

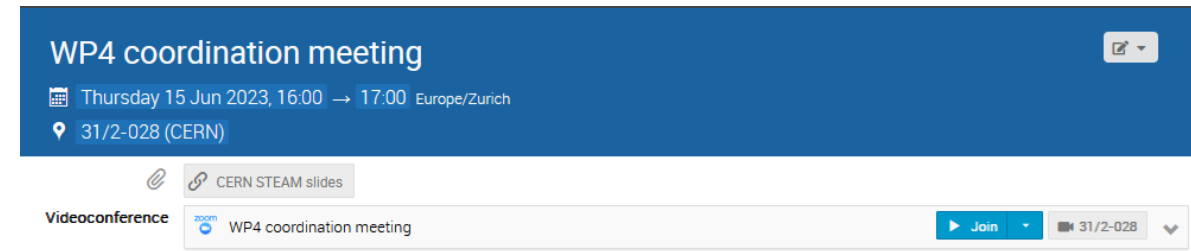
<https://nextgentriggers.web.cern.ch/resources>



# New Indico banner!



**BEFORE**



**AFTER**



# Yearly event

## And what's to come next year?

**1st NextGen all hands meeting**

Tuesday 24 Sept 2024, 14:00 → 18:00 Europe/Zurich

4/3-006 - TH Conference Room (CERN)

Description



Contact [nextgen-info@cern.ch](mailto:nextgen-info@cern.ch)

zoom 1st NextGen all hands meeting [Join](#) 4/3-006

- 14:00** → 14:30 **Introduction to the project** (30m)  
Speakers: Alberto Di Meglio (CERN), Giovanna Lehmann Miotto (CERN)  
NGT Presentation\_1...
- 14:30** → 14:40 **Questions and Answers** (10m)
- 14:40** → 15:00 **WP1: Infrastructure, Algorithms and Theory** (20m)  
Speakers: Axel Naumann (CERN), Michelangelo Mangano (CERN)  
NGT WS 2024 WP1...

**Next Generation Triggers 1st Technical Workshop**

**NOVEMBER 25-27, 2024**

25-27 Nov 2024  
CERN  
Europe/Zurich timezone

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- Timetable
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November 25-27, 2024

CERN 774/R-013

**REGISTER NOW!**

Contact [nextgen-info@cern.ch](mailto:nextgen-info@cern.ch)

# WHY AND HOW TO REACH US



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](mailto:cern-nextgen-communications@cern.ch)

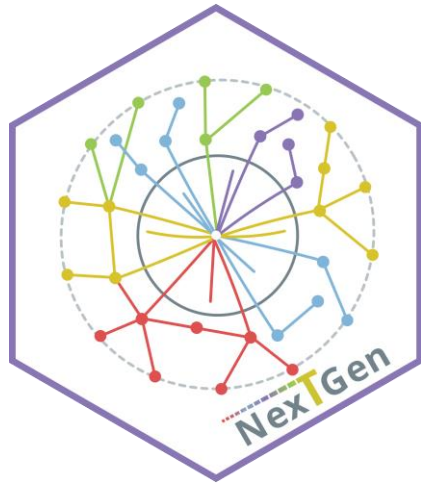


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To give them visibility and to ensure that this section remains comprehensive and up-to-date, all papers, presentations, etc. will be uploaded to their corresponding category in the “Resources” section of the web page. **Again, please do reach us!**

# FRESH STICKERS OUT OF THE OVEN!



**Thanks!**  
**Questions?**



**NextGen**  
Next Generation Triggers