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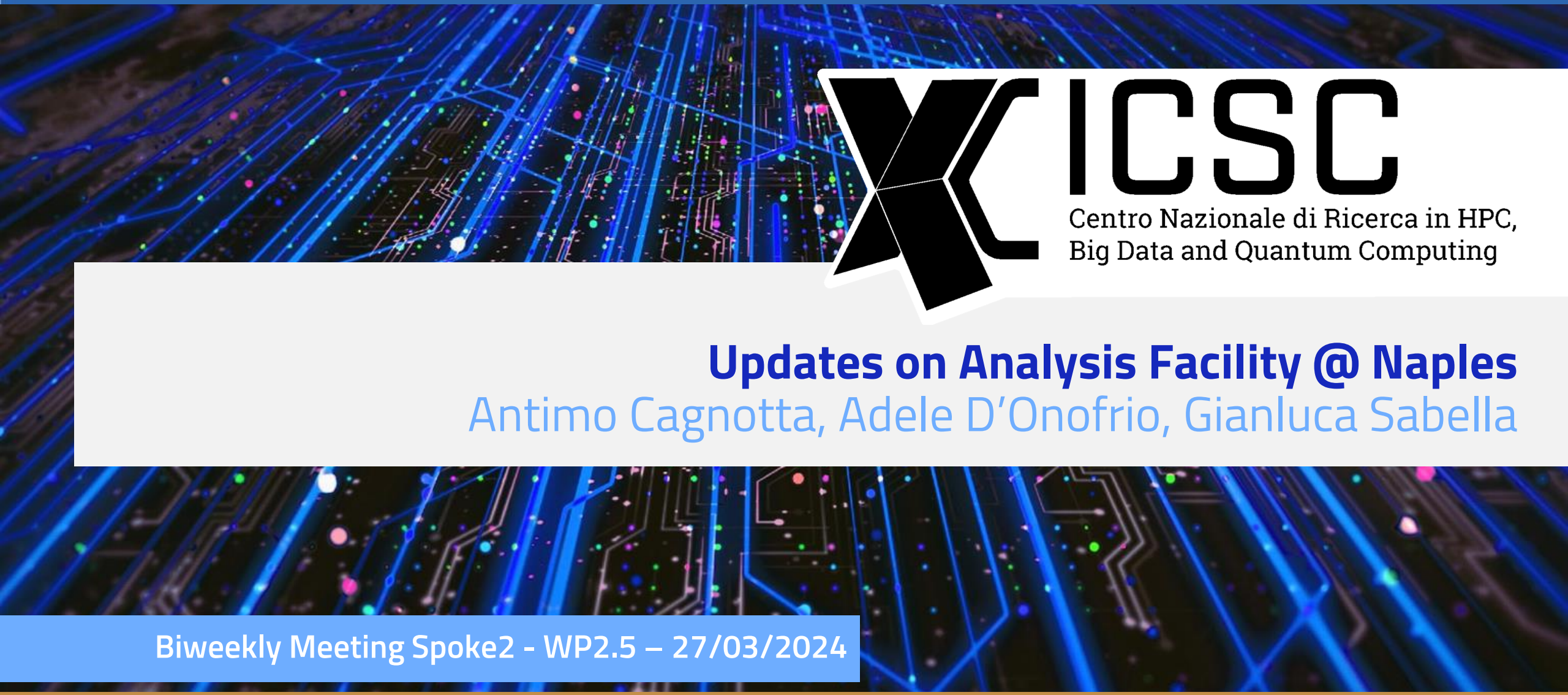
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing



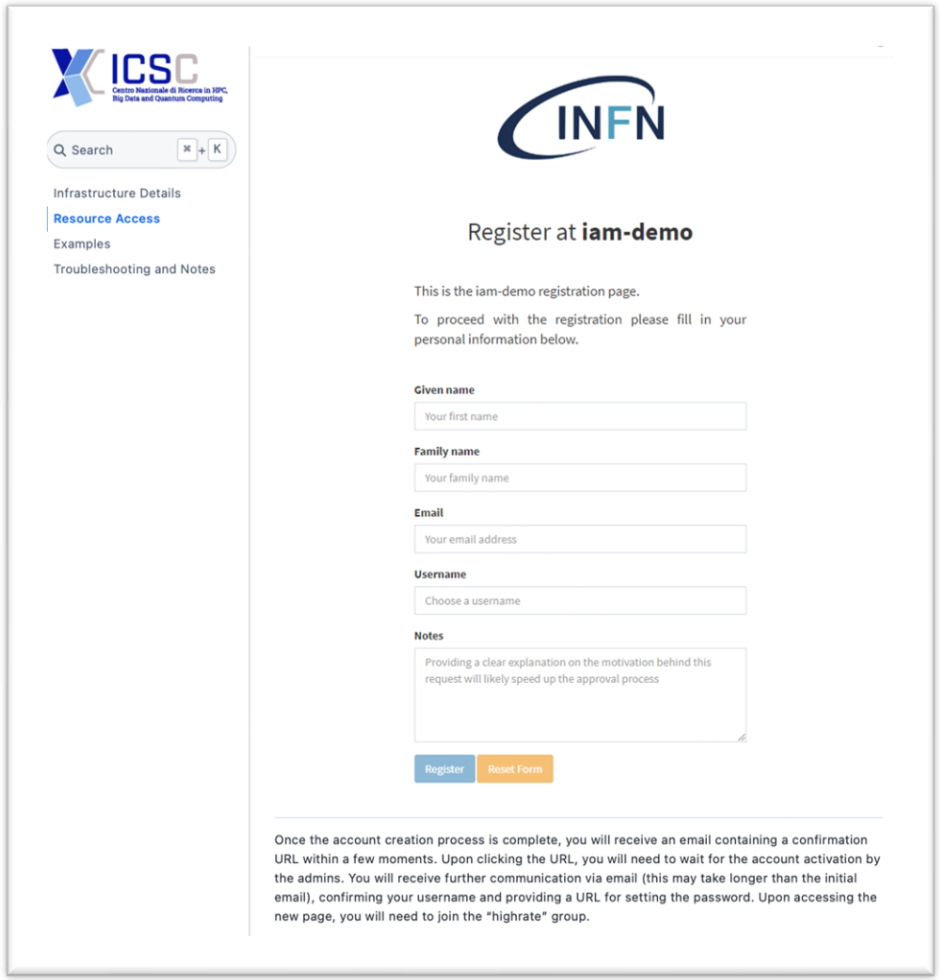
ICSC
Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

Updates on Analysis Facility @ Naples

Antimo Cagnotta, Adele D'Onofrio, Gianluca Sabella

Biweekly Meeting Spoke2 - WP2.5 – 27/03/2024

Documentation efforts on GitHub

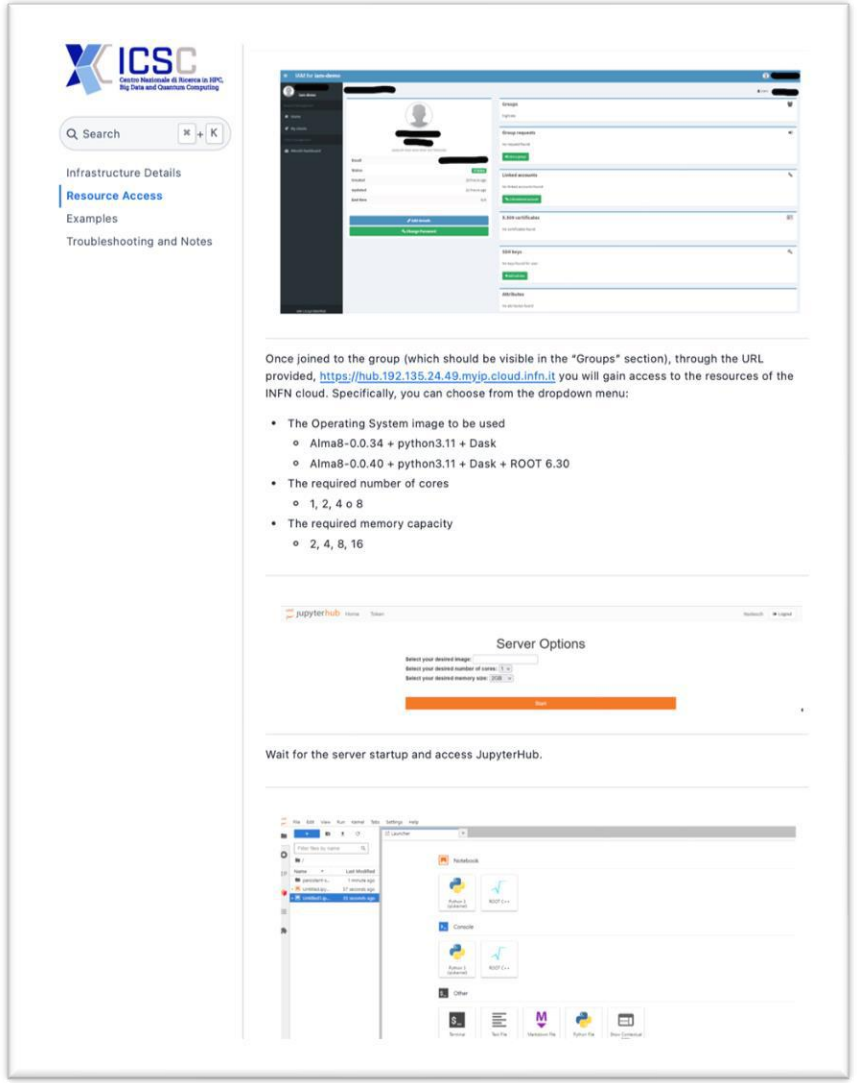


- We have developed a detailed step-by-step guide to enable users, who have access to the national Cloud, to configure their own infrastructure using the INFN Cloud interface.

Documentation efforts on GitHub

- To ensure ease of editing and accessibility, the documentation was written using the markup language: "Markdown“

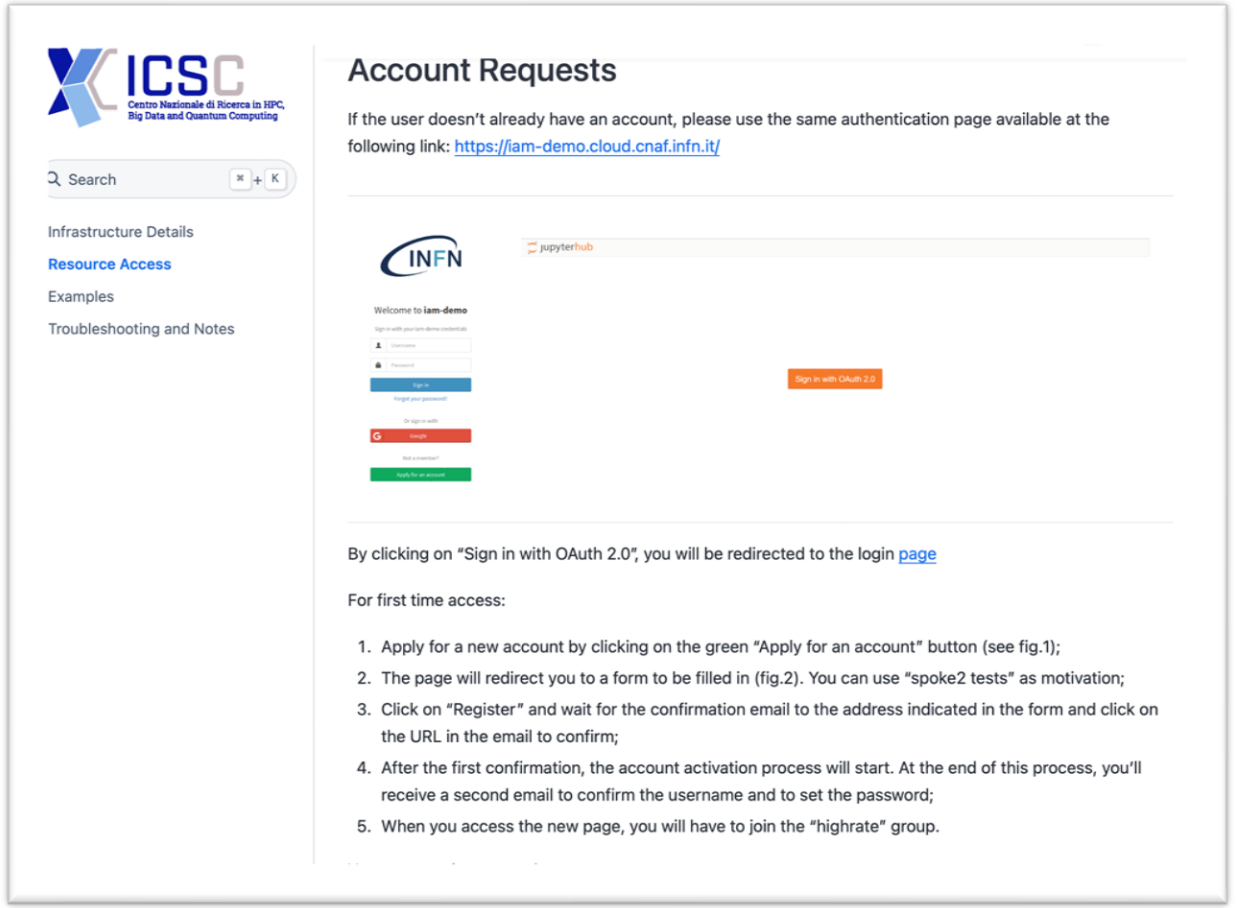
  - We integrated the .md files, provided by F. Gravili, with more detailed instructions on the steps to follow, including the addition of explanatory images



Documentation efforts on GitHub

- Due to complications with fork/push operations for ".md files", the documentation was initially developed locally

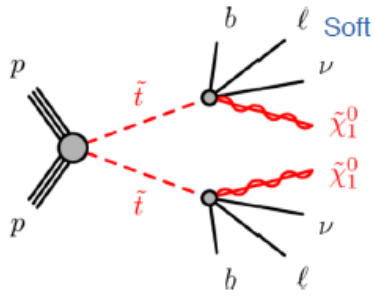
- The next step involves uploading the documentation to the wiki of our official repository on GitHub, making it easily accessible and editable for everyone.



ATLAS use-case I

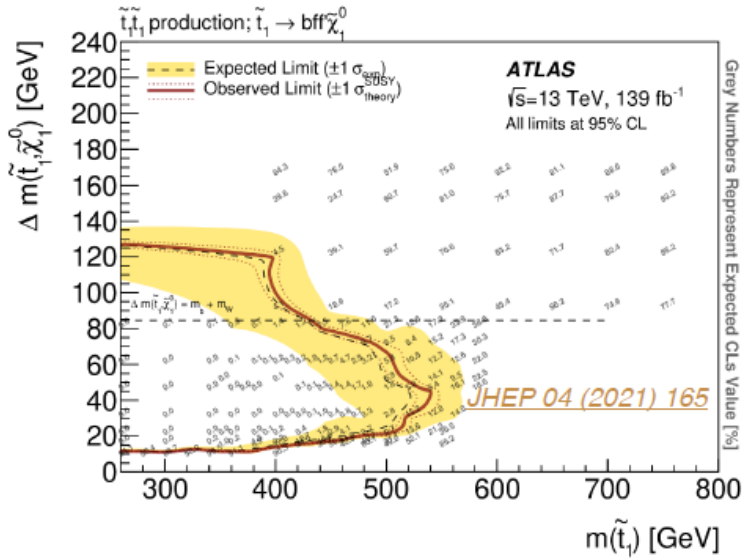
SUperSYmmetry: Beyond Standard Model theory

- Three different analysis in the ***Run 2 paper***, already published, according to mass splitting between *stop* ($\tilde{t}_1$) and *neutralino* ($\tilde{\chi}^0_1$), allowing different decay modes:
  - 2 body → $\Delta m > m_t$
  - 3 body → $m_W + m_b < \Delta m < m_t$
  - 4 body, the one picked up → $\Delta m < m_W + m_b$
- Common final state signature: 2 OS leptons (electrons/muons), jets and missing transverse energy
- Cut & Count based approach
- Final, i.e. starting from flat ntuples, event selection done with *ROOT RDataFrame* and 3 helper classes, 100% python based:
  - List of cuts, in dictionaries
  - I/O, mainly to define and store output structures/yields
- Main workflow, to extract nominal yields and systematic variations, starting from single *TTree(s)* and/or *TChain(s)*



Soft leptons coming from a virtual W* boson decay

Compressed mass spectra:
$\Delta m < m_W + m_b$

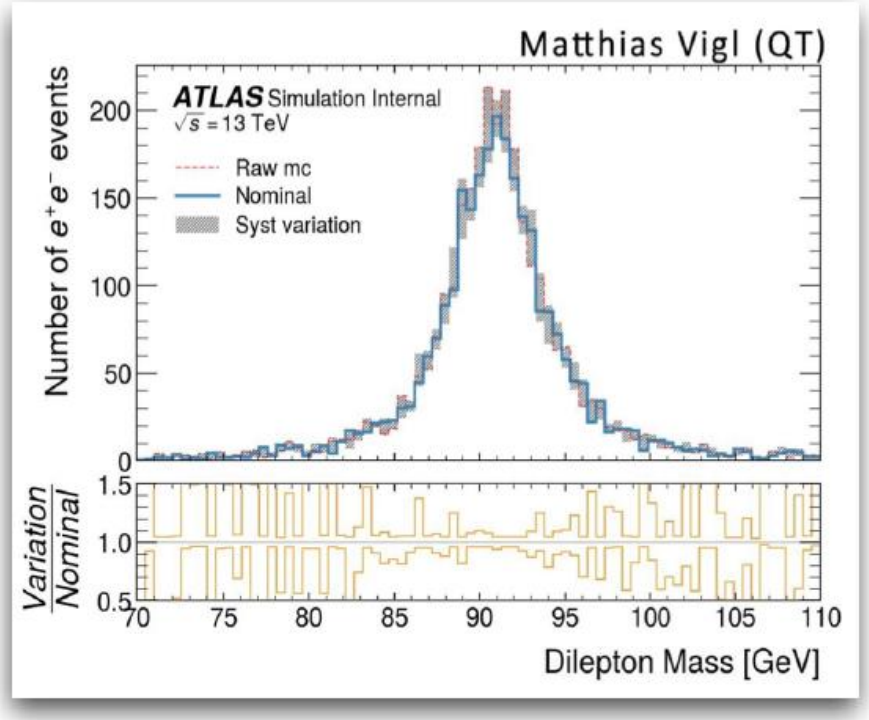


Working with INFN Lecce

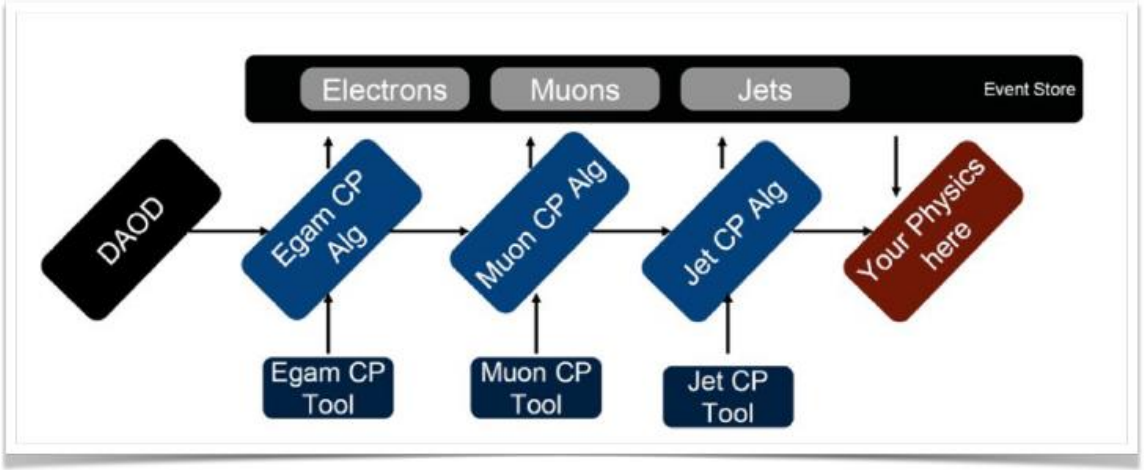
Preliminary results, using simulations and including systematic variations: evaluating execution time halved using the local Client and tests ongoing for the distributed client

ATLAS use-case II

- Effort just started, based on other colleagues work
- Goal: evaluate computing performance on INFN clusters



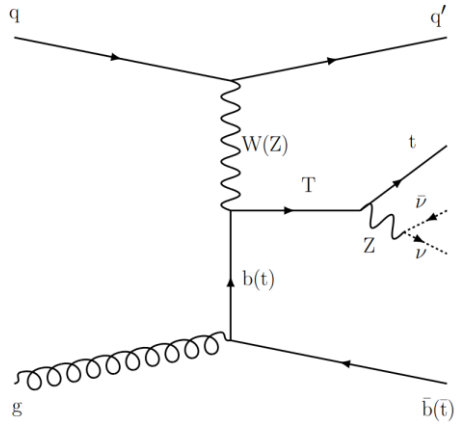
Columnar analysis implementation in CP tools

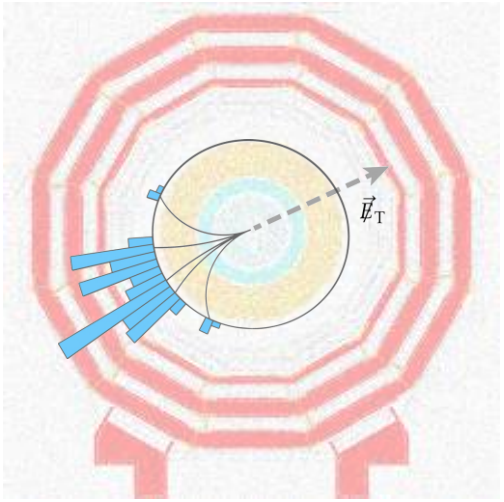


Example to implement and improve: Zee demonstrator

CMS use-case

- Early Run3 analysis (2022-2023 data taking)
- BSM searches : Vector-Like Quark T in $T \rightarrow tZ$ channel
- Final state: hadronic Top quark and Z $(\nu\nu)$
- Development of the already published full run2 analysis JHEP05(2022)093, with the idea to extend the results interpratation to more models predicting the same final state
- Dark Matter production in association with a Top quark





CMS use-case : goals and next steps

- Implement the analysis on the facility to evaluate the performance on INFN clusters

- Right now the code include the selection and the calculation for the final fit variables, we'd like to move part of the process from the preprocessing step to the one on the facility, among which ML prediction process and calculation of systematic variation (through correctionlib, optimized also for RDataFrame)