Centre de Calcul
de l'Institut National de Physique Nucléaire
et de Physique des Particules

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ATLAS Data Carousel 2021

By Aresh Vedaee

Outline

- A bit of history
- Current status
- Future steps

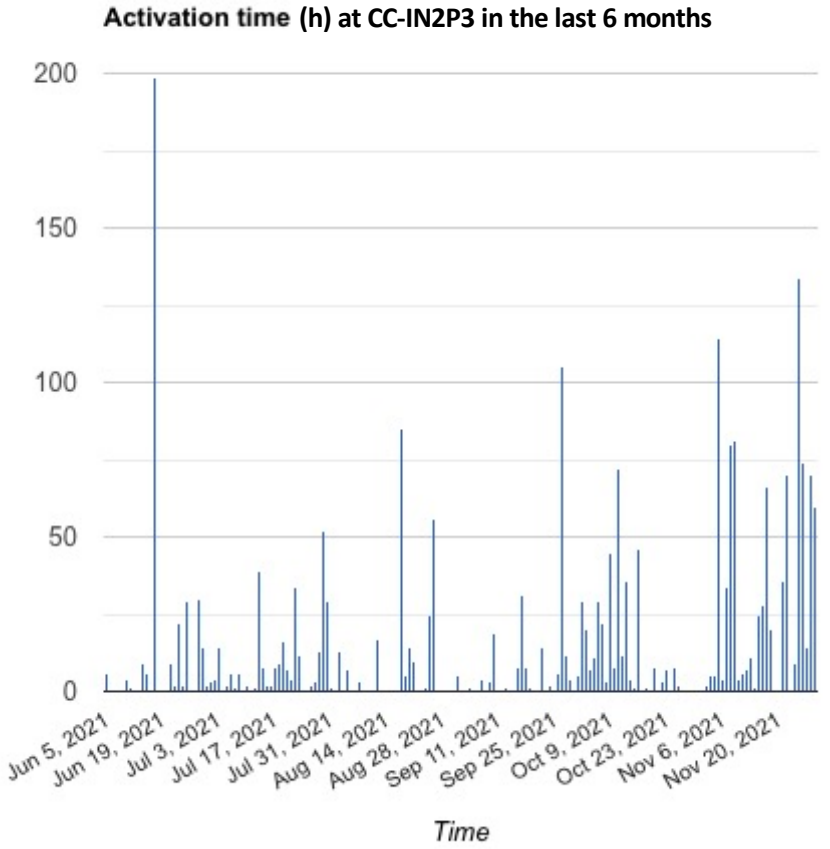
Data Carousel: a bit of history

- Objective:
  - Problem: The overarching common challenge for particle physics experiments is data handling for Run3 and especially Run4 (HL-LHC) => required volume of data for processing campaigns on disk > disk capacity
  - Solution: data carousel => definition: *By 'data carousel' ,we mean an orchestration between workflow management (WFMS), data management (DDM/Rucio) and tape services whereby a bulk production campaign with its inputs resident on tape, is executed by staging and promptly processing a sliding window of X% (5%?, 10%?) of inputs onto buffer disk, such that only ~ X% of inputs are pinned on disk at any one time*
    - No pre-set target on tape throughput: the goal is to efficiently use the available tape capacities

- R&D (2018-2020):
  - Phase I: Tape system performance evaluation at CERN and the WLCG Tier-1 centers
  - Phase II: integration between workflow management & data management systems , middleware services (e.g. FTS), and Grid sites
    - During Phase II identified missing distributed software components needed for an effective Data Carousel operation (it was mostly related to Rucio/ProdSys2 integration and a special service to release data processng before the whole data sample is staged in). => Intelligent Data Delivery Service (iDDS) has been developed for a better orchestration to optimize resource usage in various workflows and solve the issue with the delayed processing in bulk reprocessing campaigns
  - Phase III: Run Data Carousel at scale in production for the selected workflows with an ultimate goal to have it operational before LHC Run 3 in 2022

Data Carousel: current status (2021)

- All three R&D phases have now been completed.
- ADC ran the full LHC Run 2 data reprocessing and has been continuously running Monte-Carlo simulation in Data Carousel mode (+iDDS) since 2020
  - Monitoring tool: https://bigpanda.cern.ch/datacardash/
- Derivation production was tested at small scale during R&D, in full production in 2021
- Positive side effects: improvements from sites' tape systems e.g. at FZK and TRIUMF



Data Carousel: future steps

- During Run 3, major campaigns requesting data from tape are expected to run in Data Carouse mode
- Evaluate how end-user analysis can be run in Data Carousel mode
- Increase file sizes to tapes (5~10 GB files) to boost tape efficiency in Run 3
  - For the longer term, better file placement on tapes, achieved through more sophisticated writing mechanisms (smart writing)
- Continual improvement efforts tape recall efficiency and grow tape capacity towards the needs of the HL-LHC
  - Continued collaboration between tape facilities and the experiments (not only ATLAS, because Tier-0 and many Tier-1 sites support multiple experiments)
  - Several cross-experiment Data Carousel exercises are under discussion as well (e.g. large scale multi-VO reprocessing campaign)

Merci!