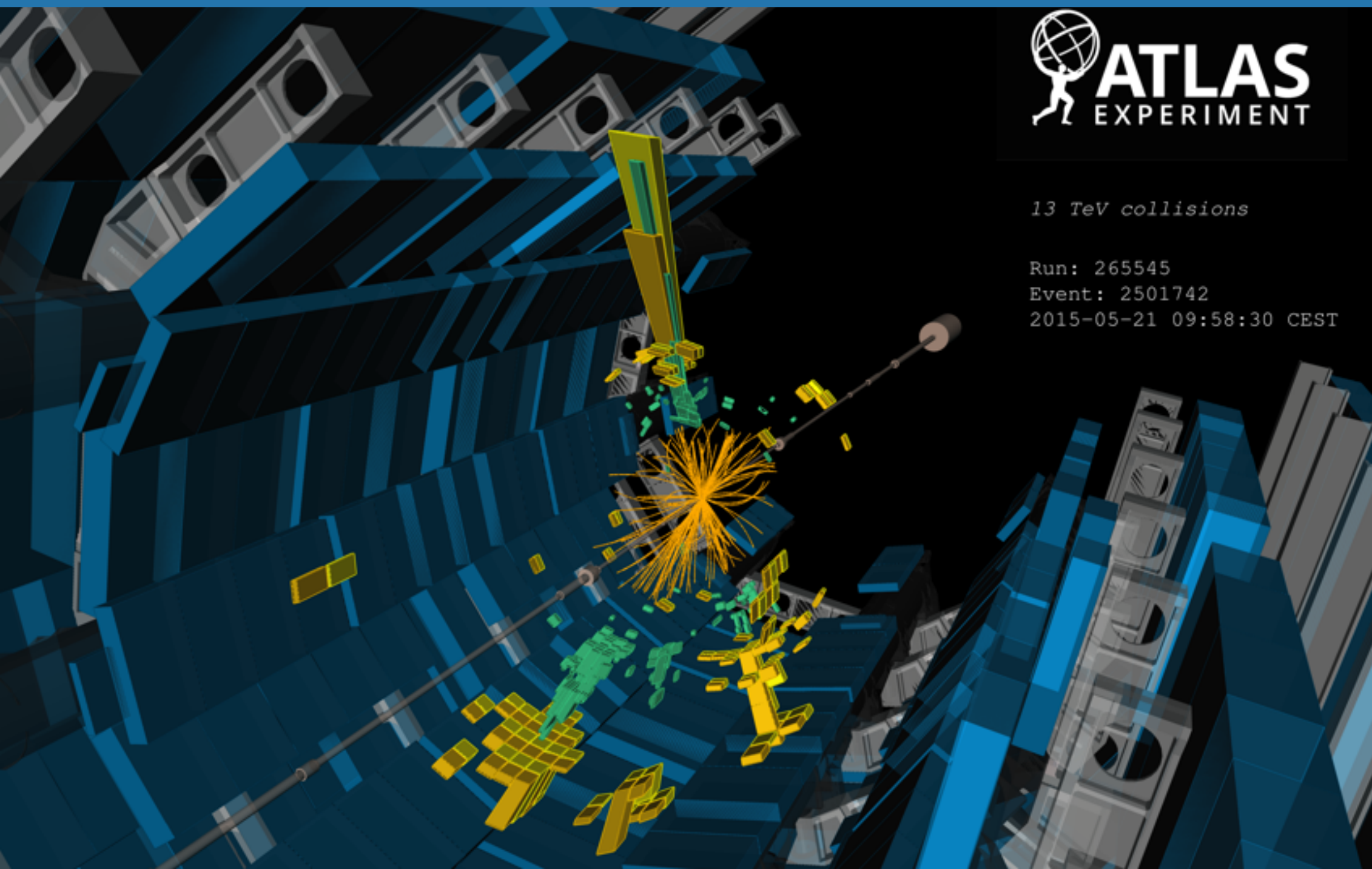


# ATLAS Computing Status

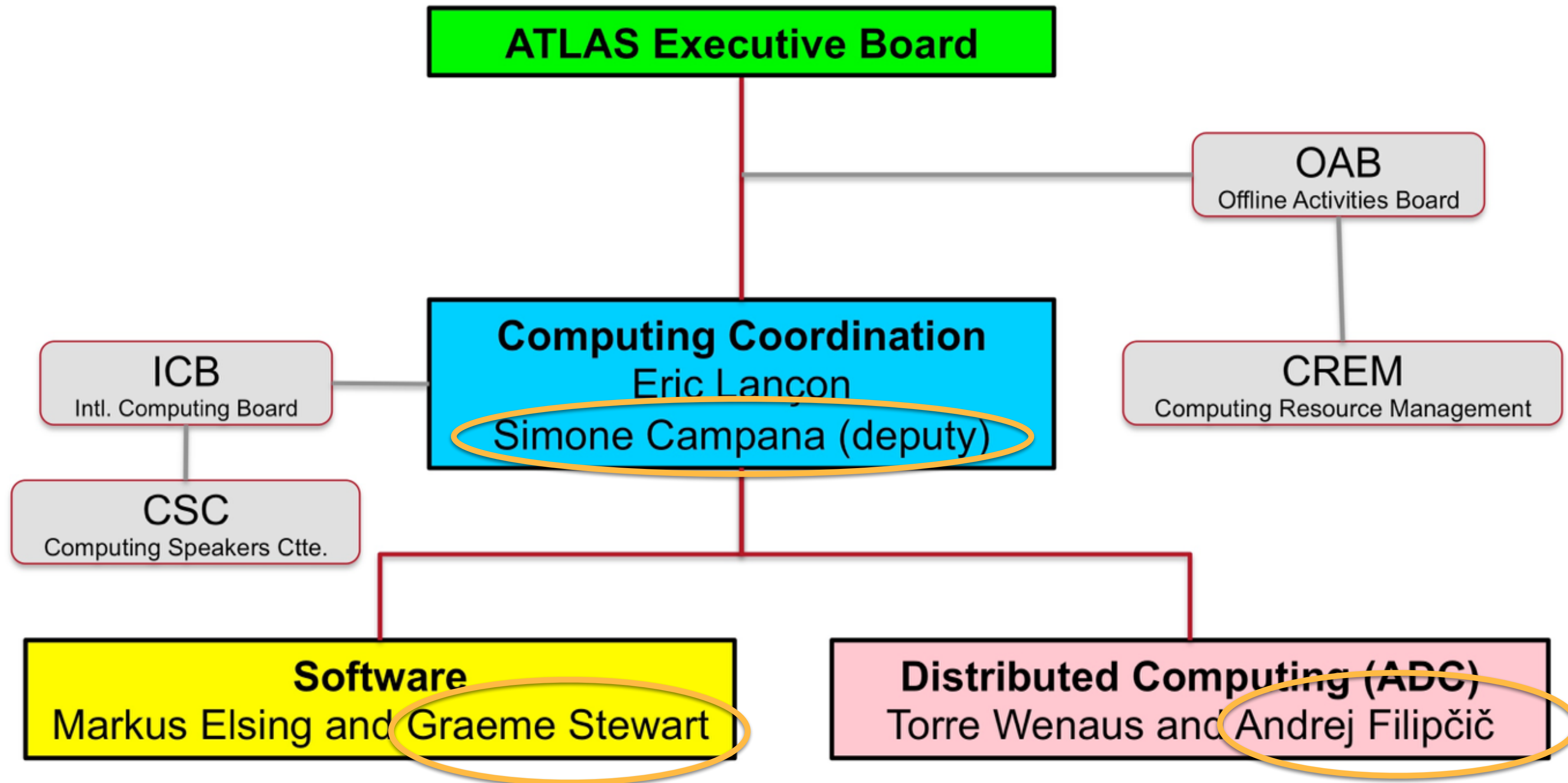


**LHCC June 2, 2015**  
Eric Lançon & Simone Campana

# Content

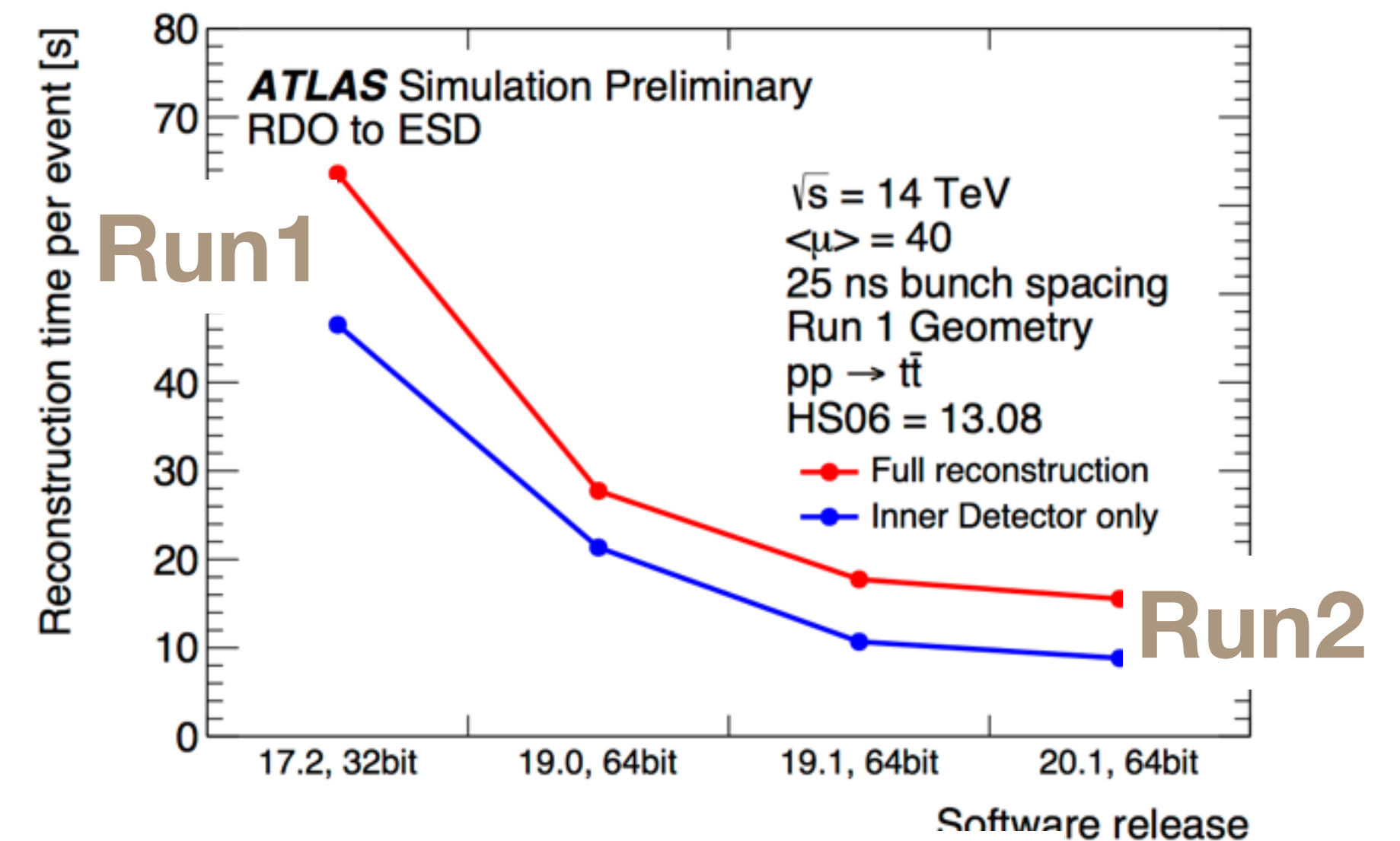
- ▶ What happened since last LHCC (March 3)
- ▶ Readiness for data taking
- ▶ Planing for the next months

# Changes in ATLAS computing

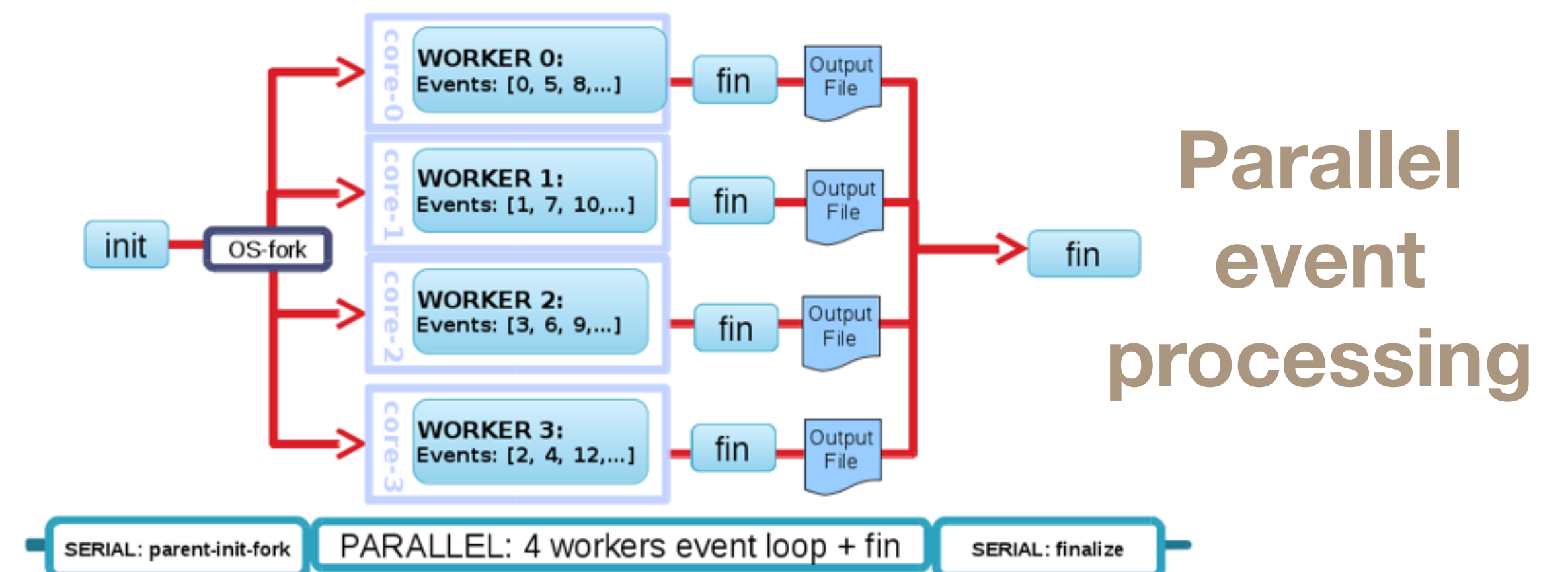


# Improvements during LS1

- ▶ Speedup of reconstruction: **factor 4**
- ▶ Simulation **20% faster**
- ▶ Software moved to **multi-core** (parallel event processing)
- ▶ New **data management** and **production** systems; deployed late 2014
- ▶ New **analysis model** : New *ROOT* readable data format with analysis outputs made using a train model
- ▶ + **Many others...**

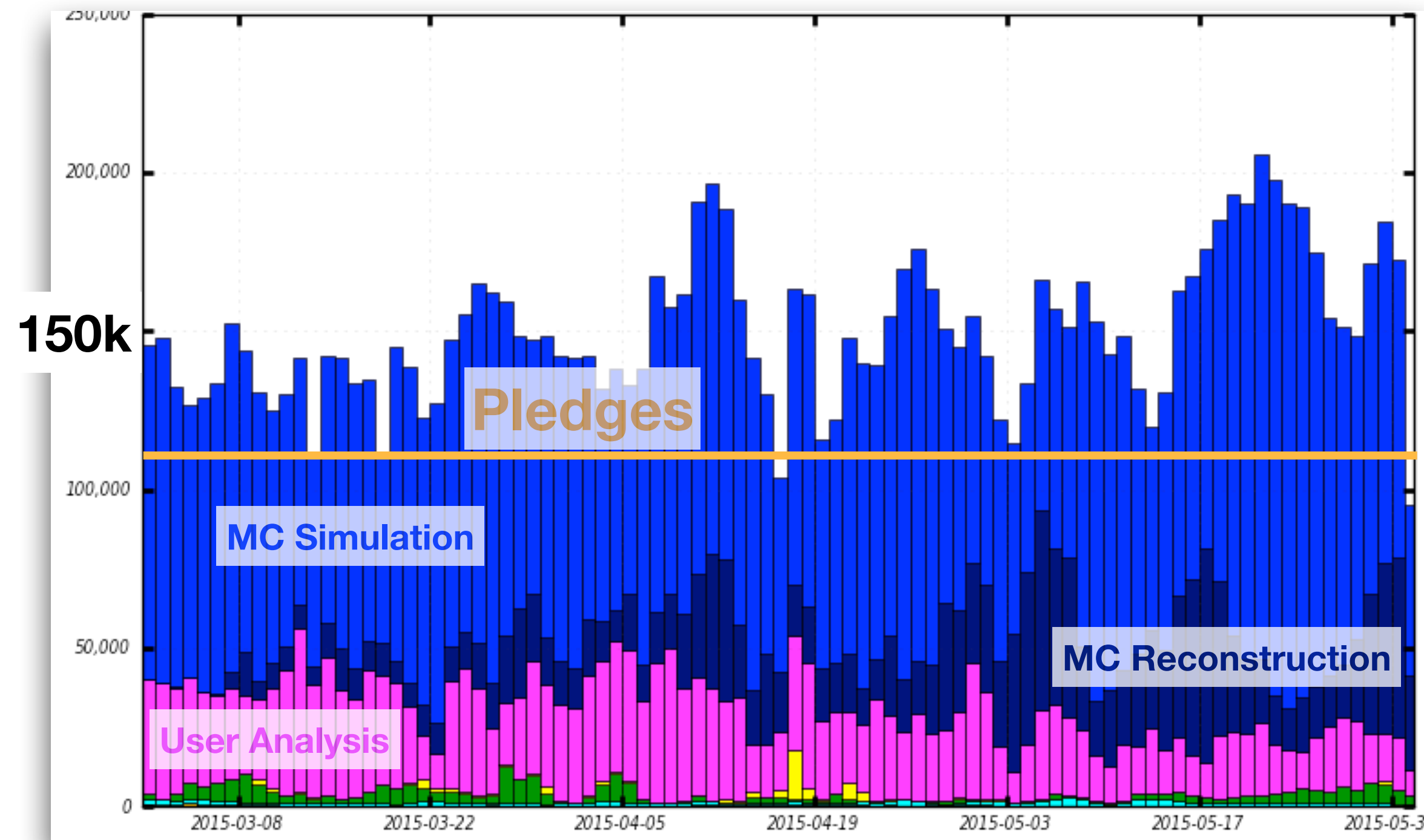


Schematic View of ATLAS AthenaMP

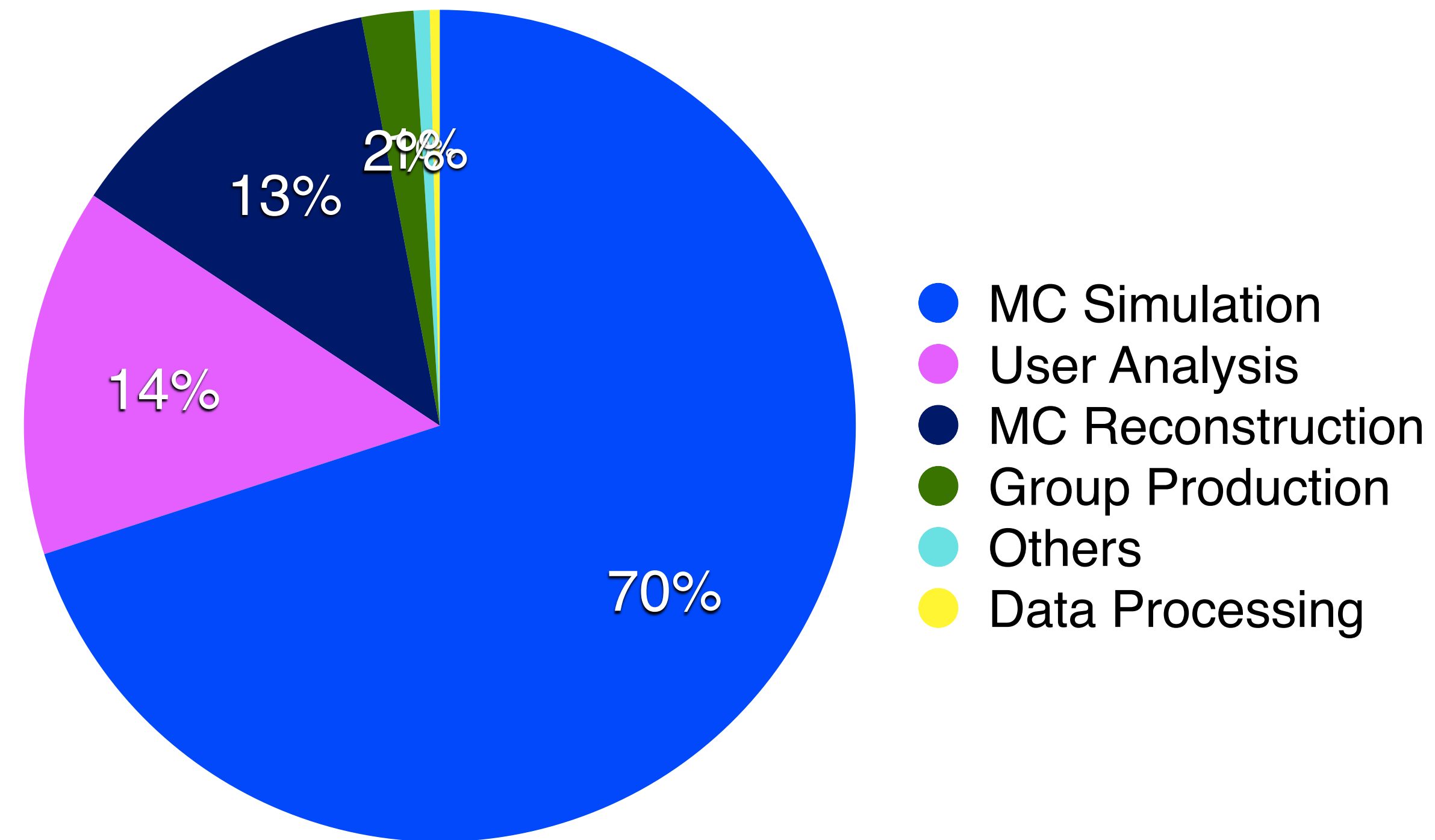


# Activities on the grid since March

Used cores

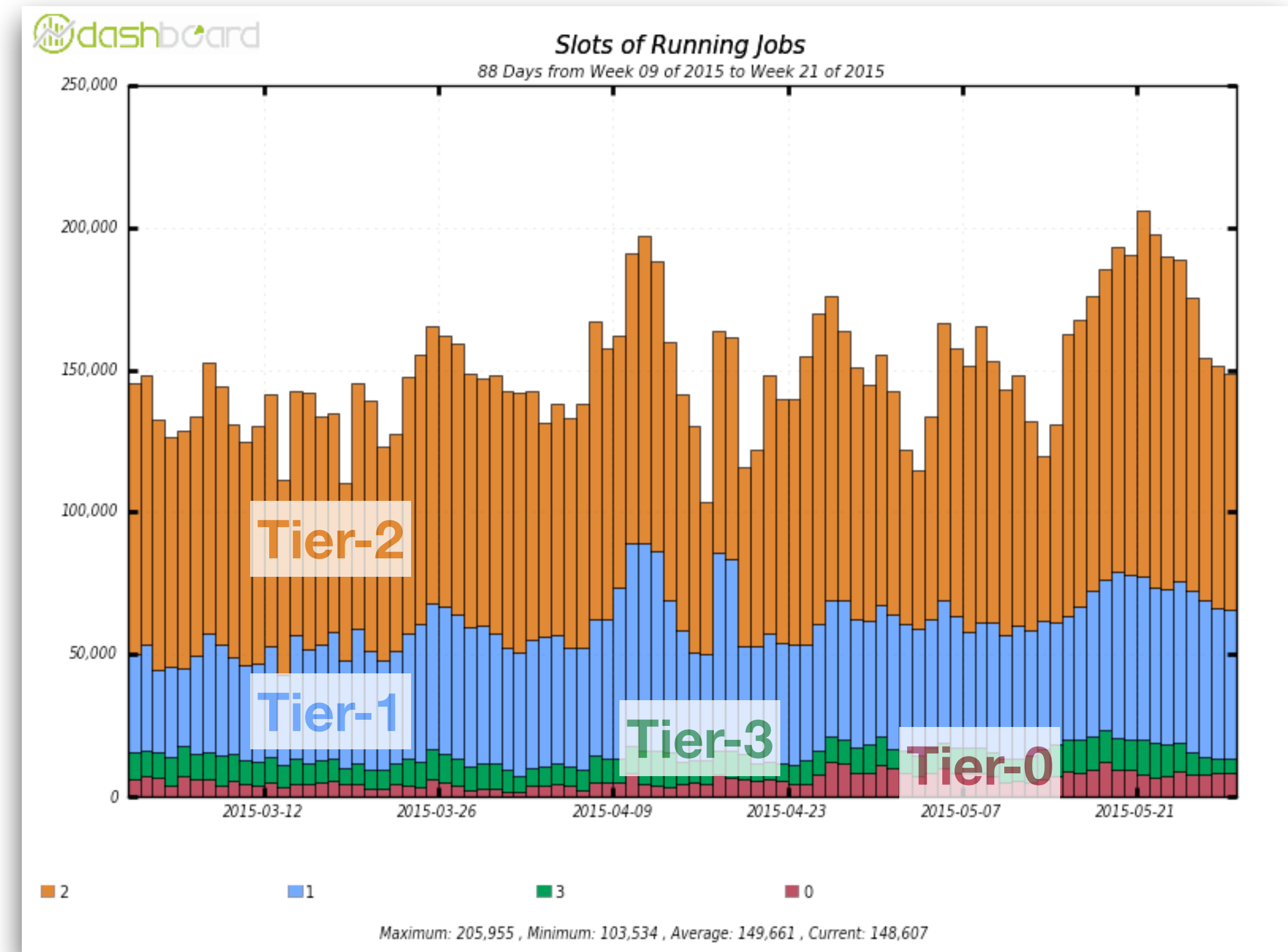


Wall Clock Consumption Good Jobs



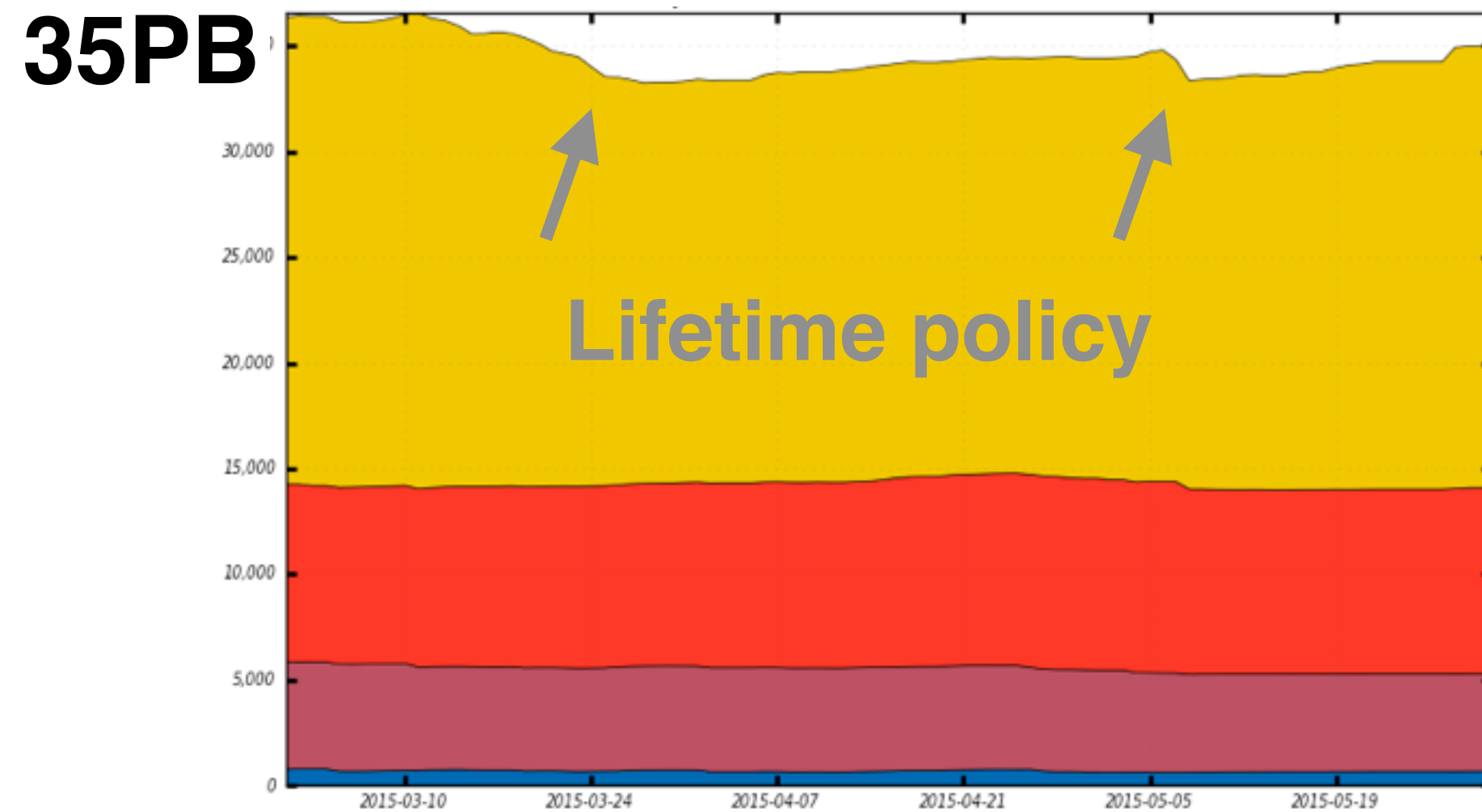
# Activity per Tier type

- ▶ Most of over-pledges resources provided by WLCG sites
- ▶ HPCs are listed as T3s or included in pledges of some T2 federations: ~5% of resources
  - New HPCs being put into production in the US and in China, ...
- ▶ Volunteer computing ~3% (including CPU efficiency)
- ▶ Accounting of non WLCG resources is an issue. No 'official' easy to use tool for accounting of CPU cycles delivered.

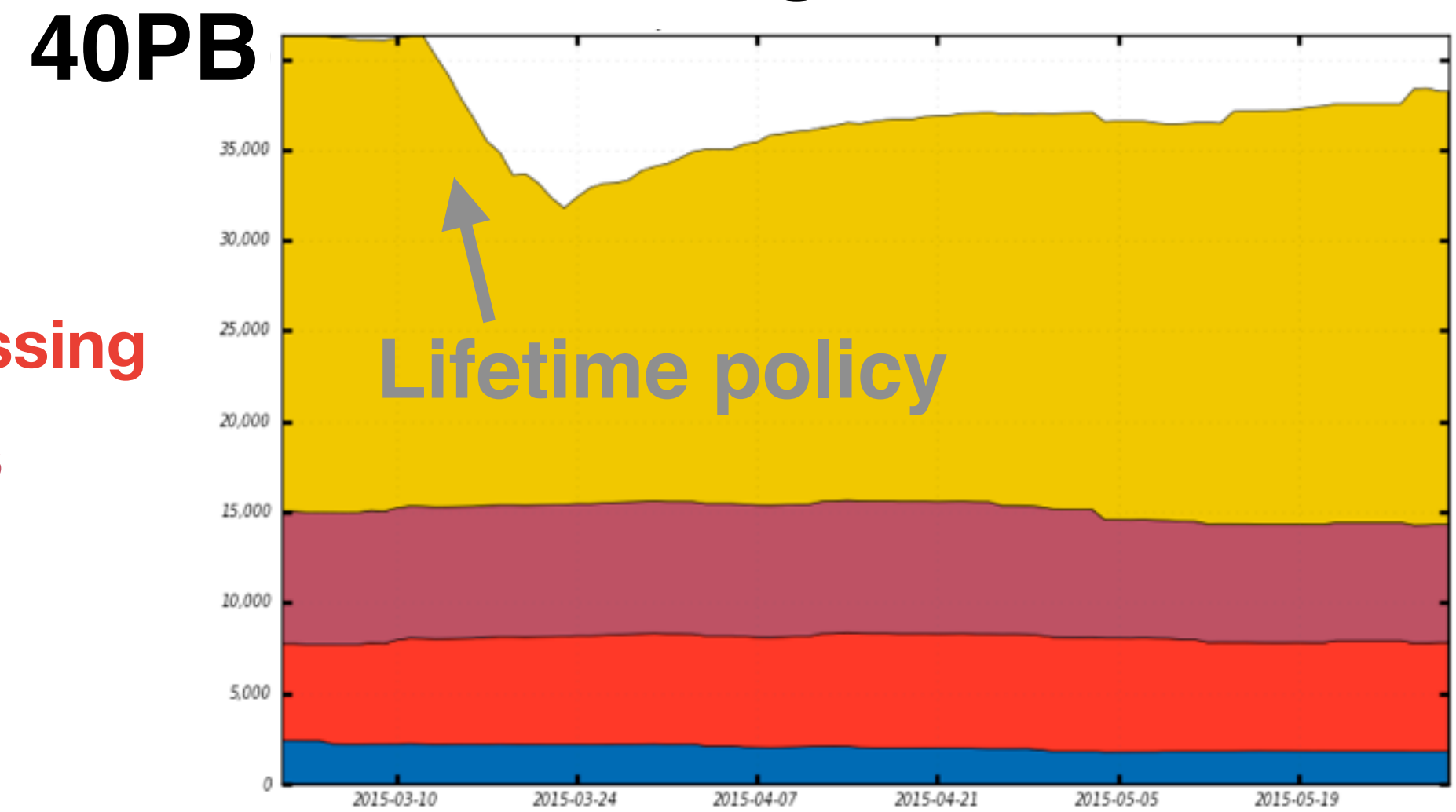


# Disk Space Usage

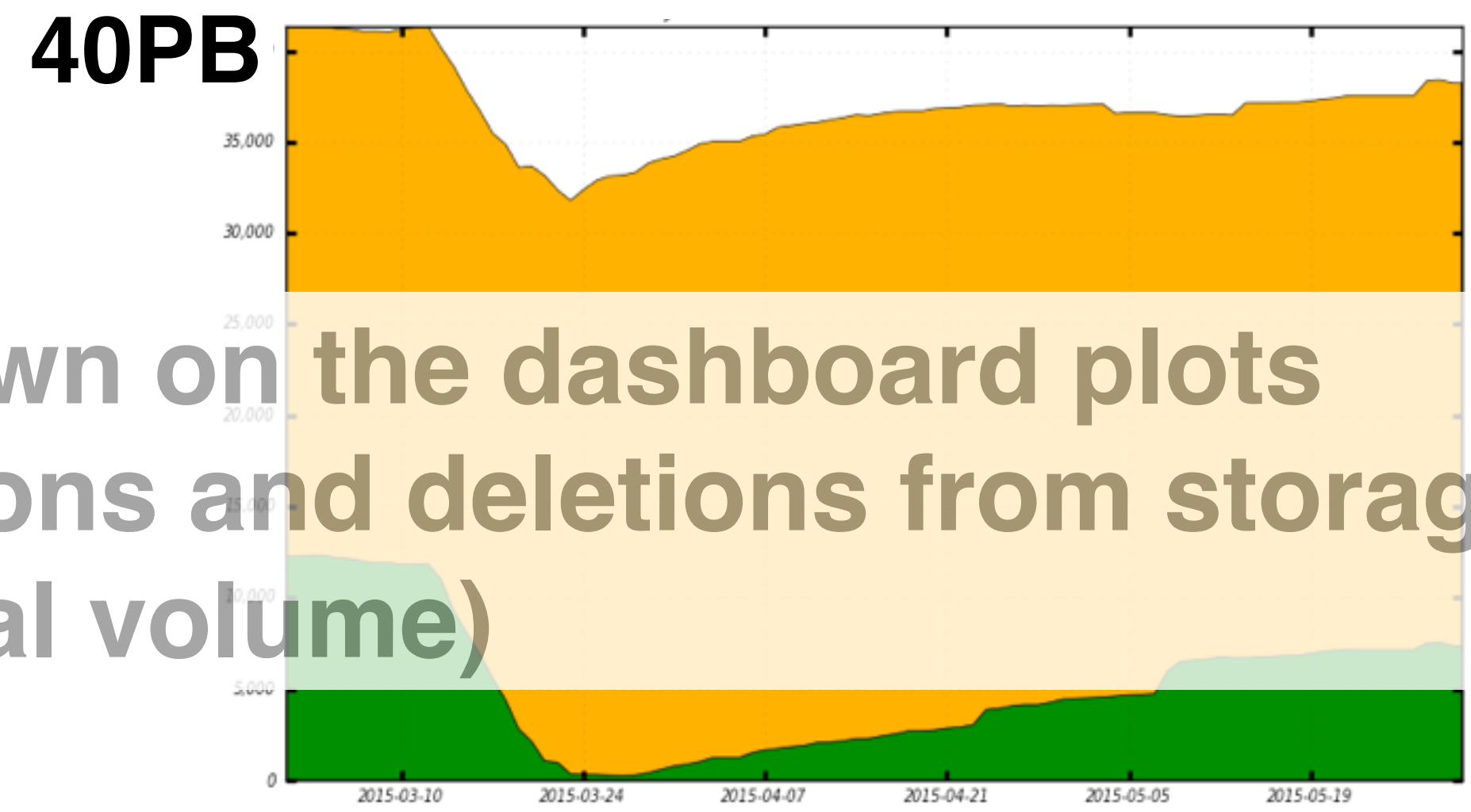
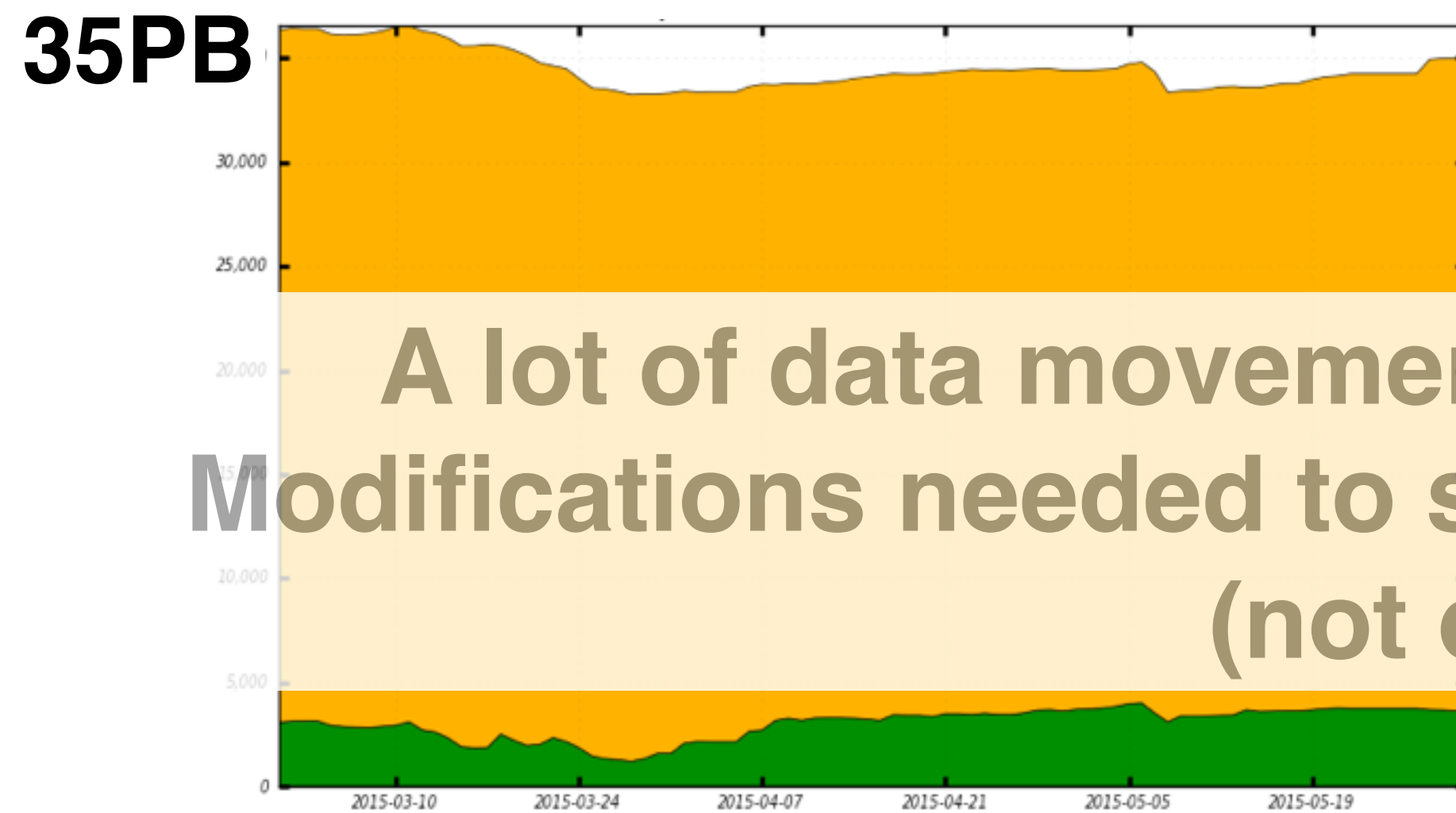
T1s



T2s



MC Production  
Data (re)processing  
Group Analysis  
User Analysis

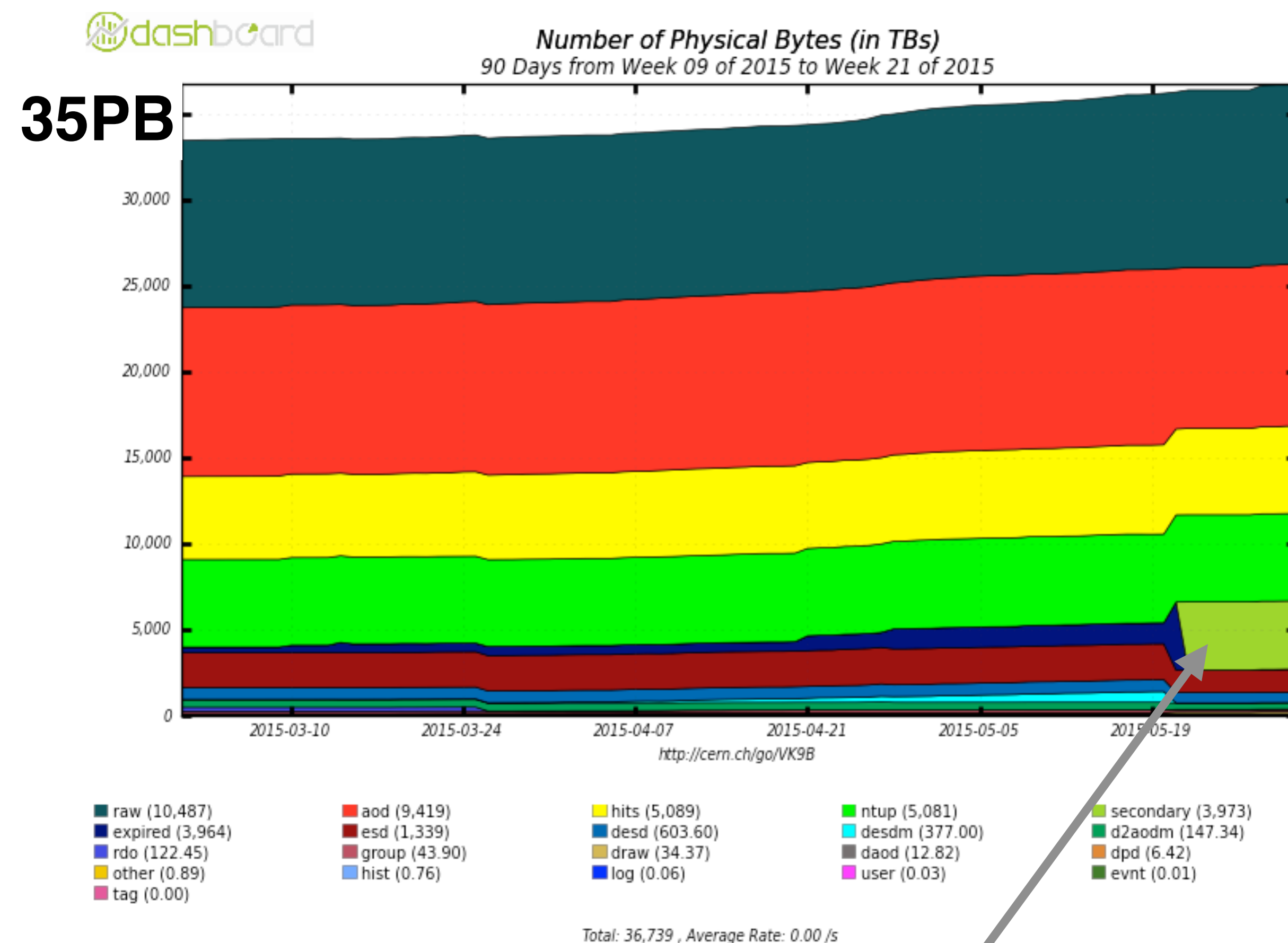


Primary  
Secondary

A lot of data movements not shown on the dashboard plots  
Modifications needed to show additions and deletions from storage  
(not only the total volume)

# Tape Usage at T1s

- ▶ Some of physics groups (SUSY, ...) archived to tape Run1 low level datasets (ntuples)
  - a few PB
  - more data to be archived but still ~100 Run1 physics papers to be published
- ▶ Lifetime model also applied to data on tape
  - space not immediately recoverable



Lifetime policy



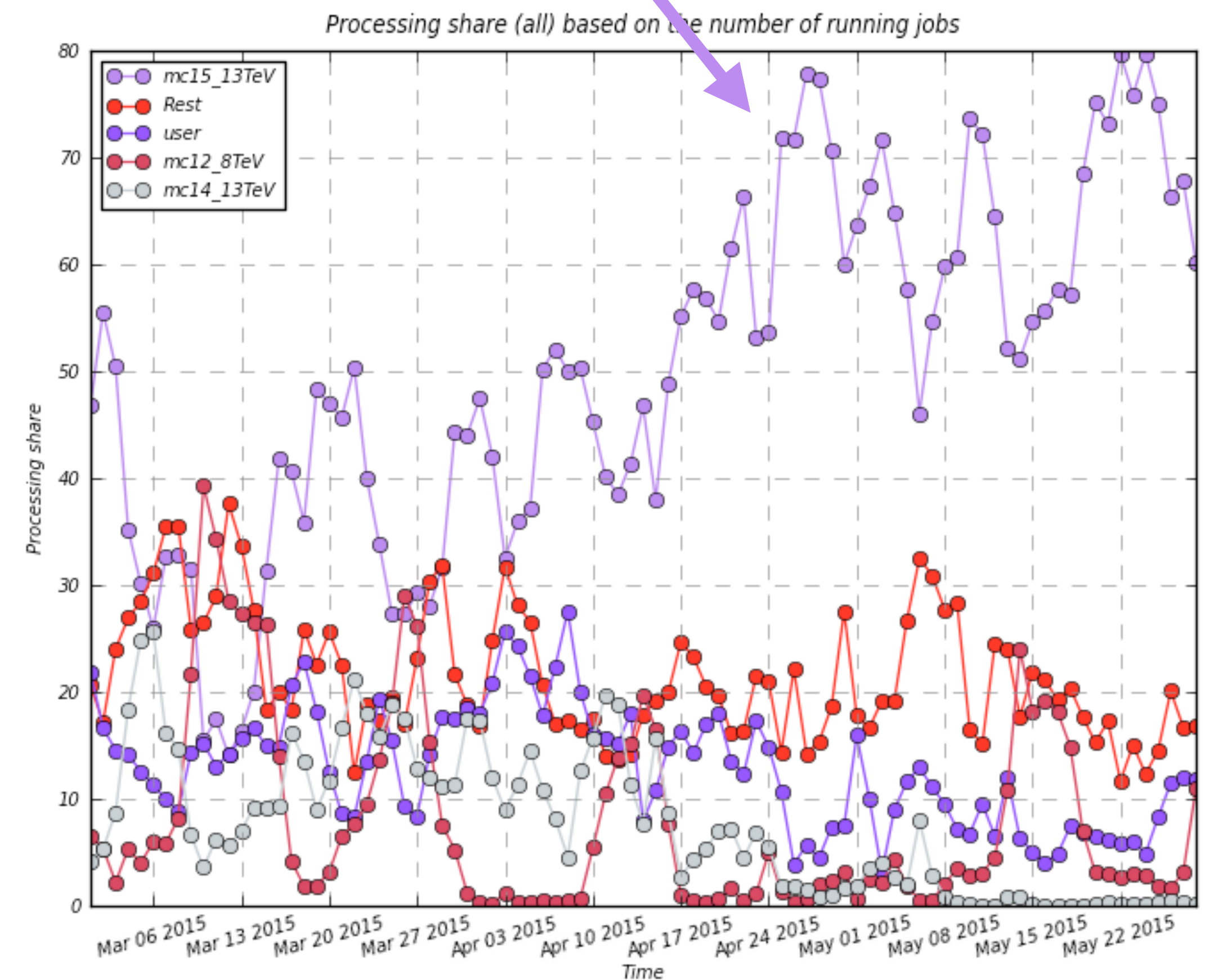
# Readiness for Data Taking

- ▶ Software and computing for Run2 exercised fall 2014/ winter 2015 (Data Challenge 2014)
- ▶ MC simulation with Run2 geometry running at full speed since March
- ▶ Reconstructed for 50 ns conditions (25 ns underway)
- ▶ Reconstruction software frozen at Tier-0 and on the grid
- ▶ New **analysis model** : New *ROOT readable* data format with analysis outputs DxAOD made using a train model

# Run2 MC Simulation

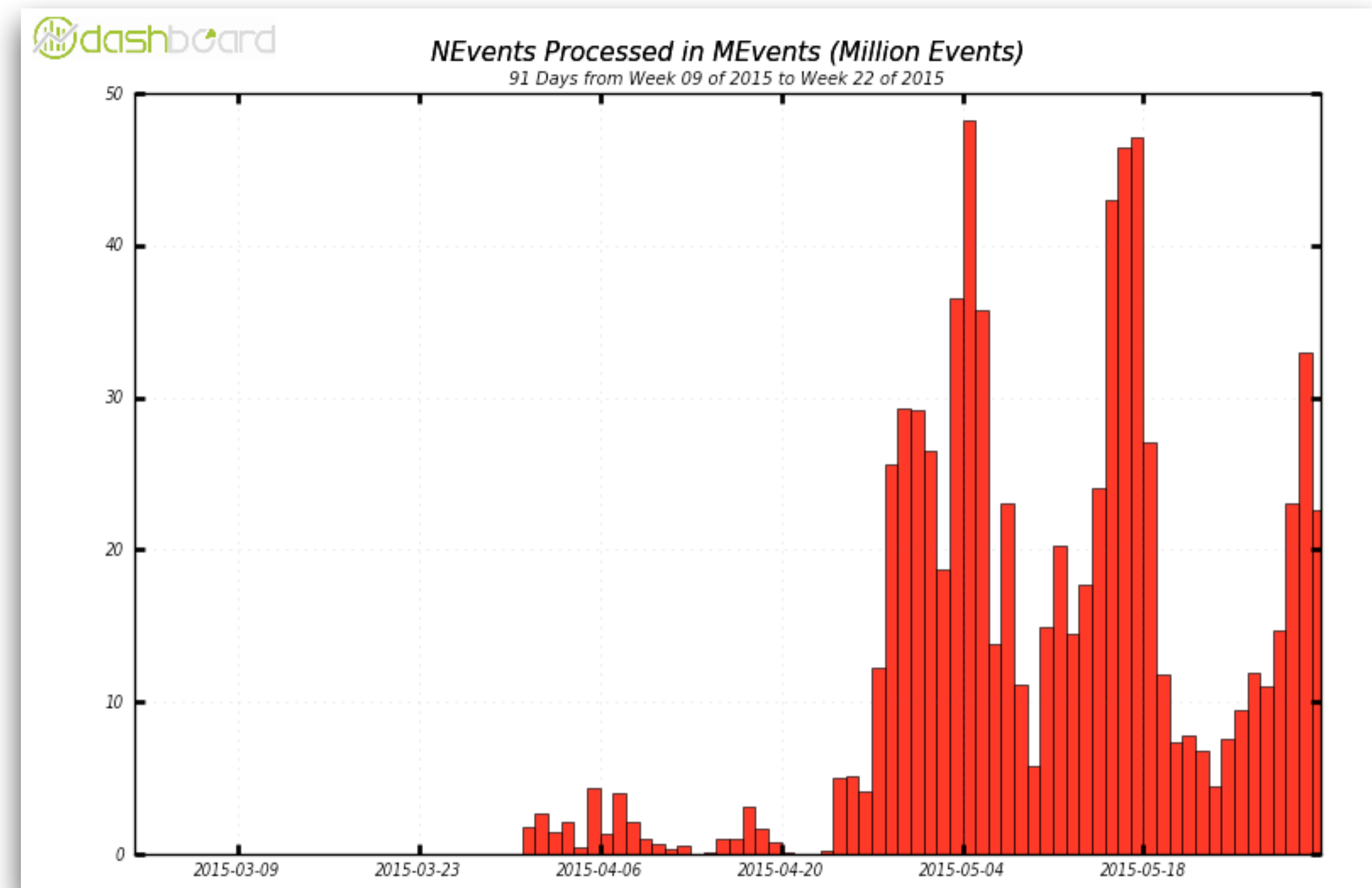
- ▶ MC simulation with Run2 geometry running at full speed since March
- ▶ 900+ M simulated (fullsim) events produced (+ 160 M fastsim)
- ▶ Took some time to ramp up
  - Difficulties to get enough multi-core resources from sites

Run2 simulation (MC15)  
up to 80% of CPU cores



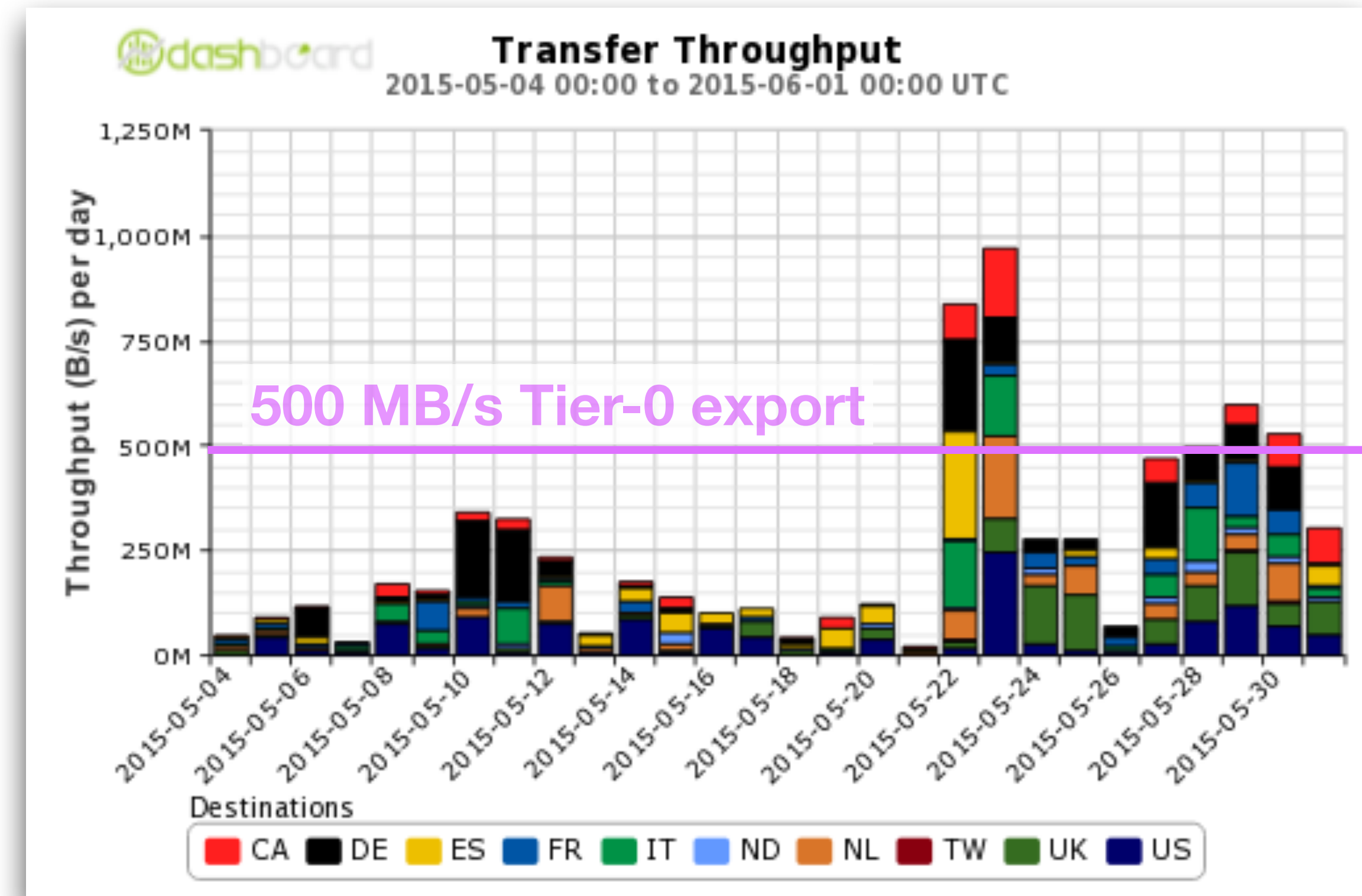
# MC15 digitisation + reconstruction

- ▶ Launched end of April
- ▶ 3 steps in one multi-core job
  - digitisation / trigger simulation / reconstruction
  - to save memory (2GB/core allocation)
- ▶ Up to 50M events/day
- ▶ 800+ M events reconstructed for 50 ns conditions (25 ns underway)



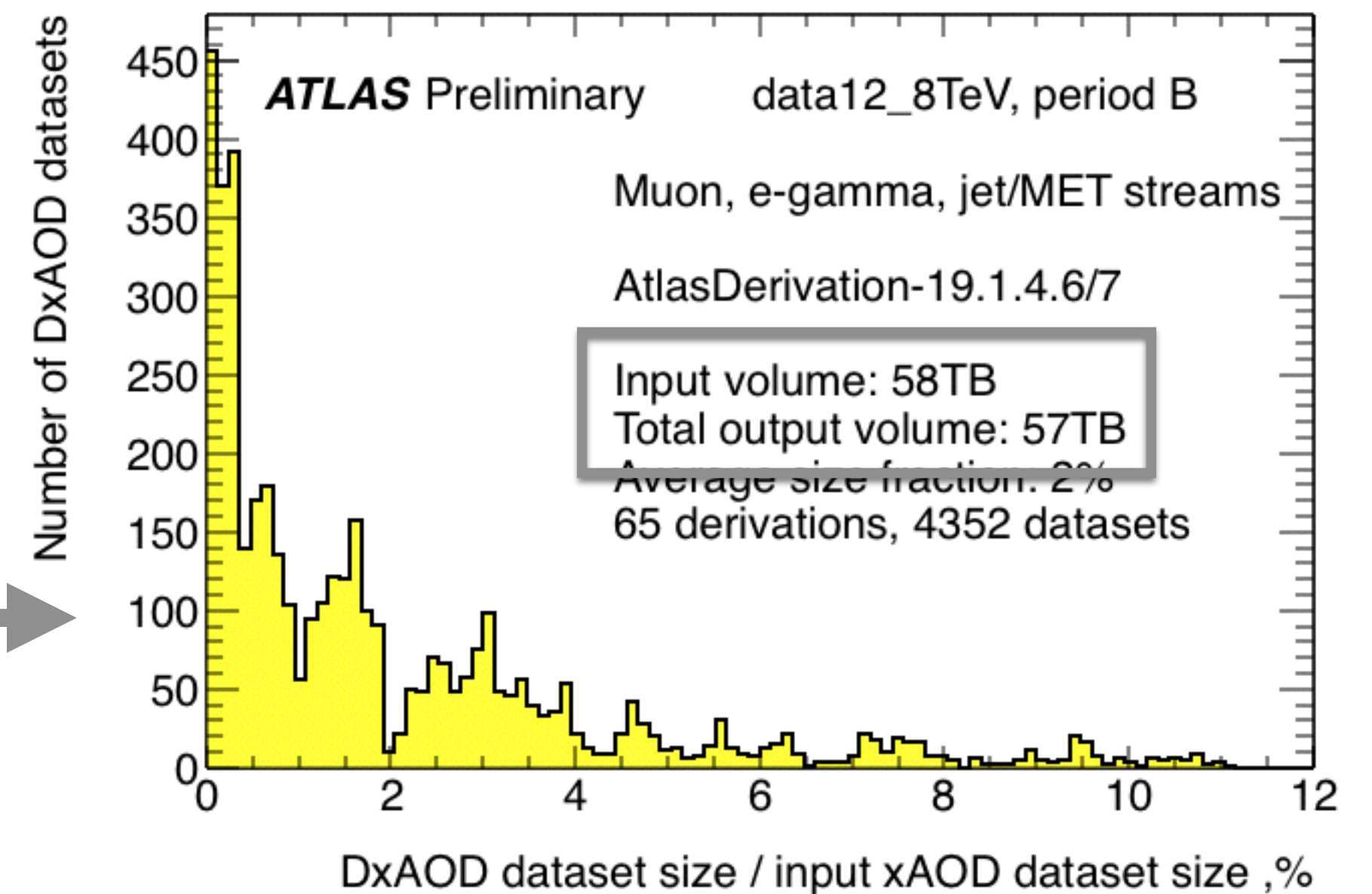
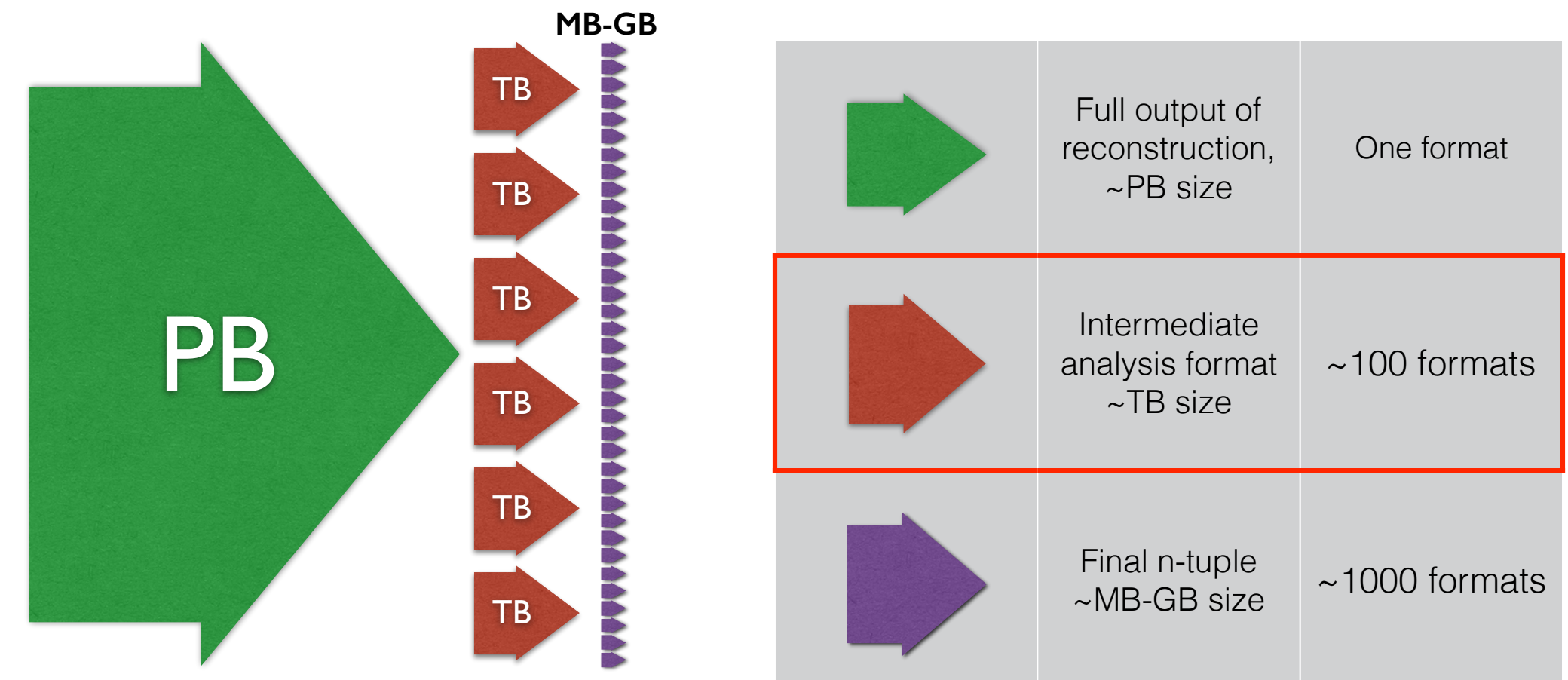
# Data distribution

- ▶ RAW data exported to tape at Tier-0 and Tier-1s as in Run1
- ▶ AODs produced on Tier-0 available on the grid 3-4 days after run finished
  - Spill-over from Tier-0 to Tier-1s tested but not used yet
- ▶ First level datasets (AOD, ...) exported from Tier-0 to Tier-1s **and** reliable and sizeable **Tier-2s** (Run1 : Tier-1s only)
- ▶ Derived data set production on the grid : new in Run2



# Derivation framework

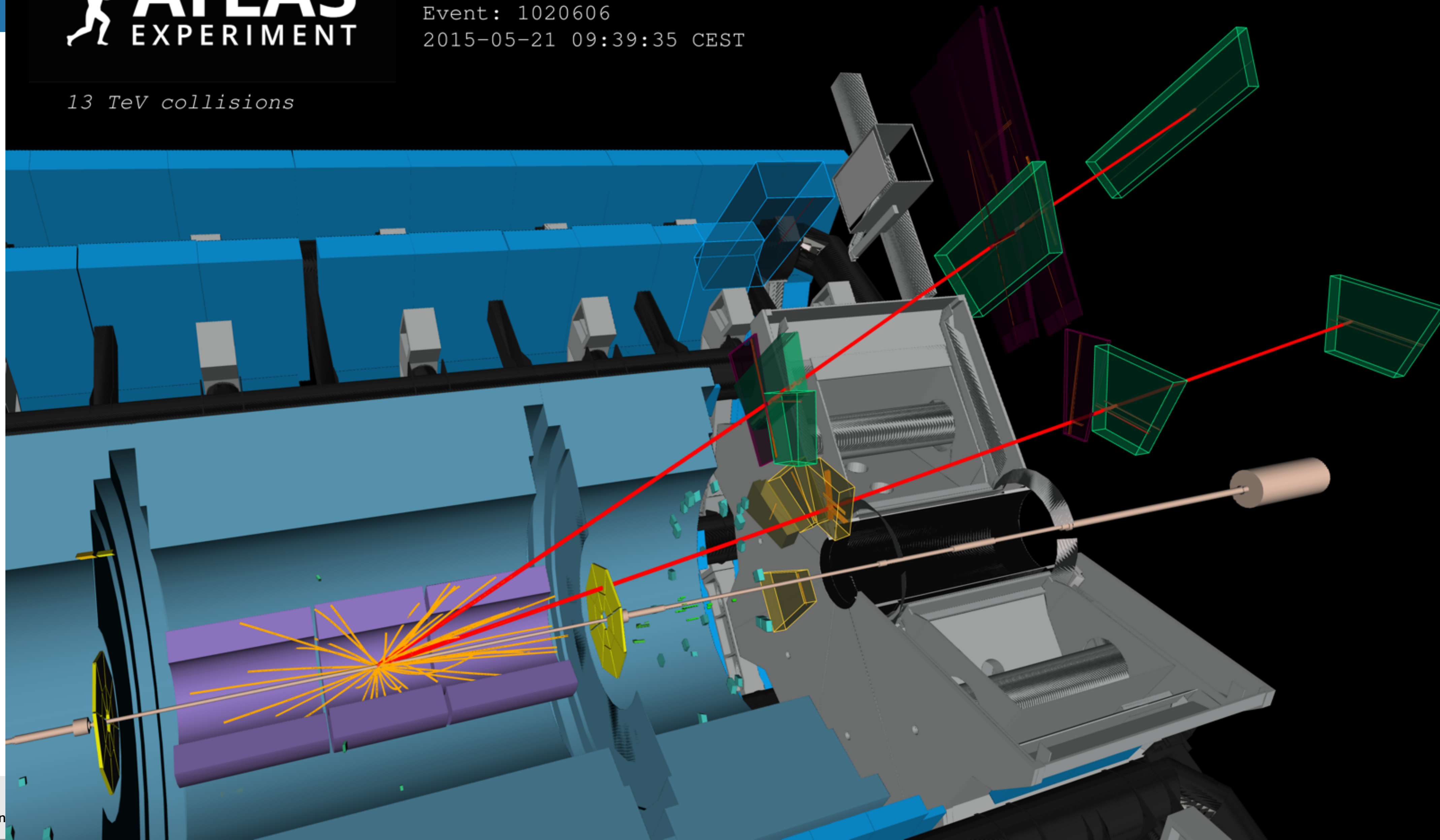
- ▶ New analysis model : New ROOT readable data format with analysis outputs **DxAOD** made using a train model
- ▶ Organised DxAOD production in trains
- ▶ Vital for quick turn around and robustness of analyses
- ▶ Size of all DxAODs must not exceed AOD size
- ▶ 90% of MC15 DxAOD samples produced



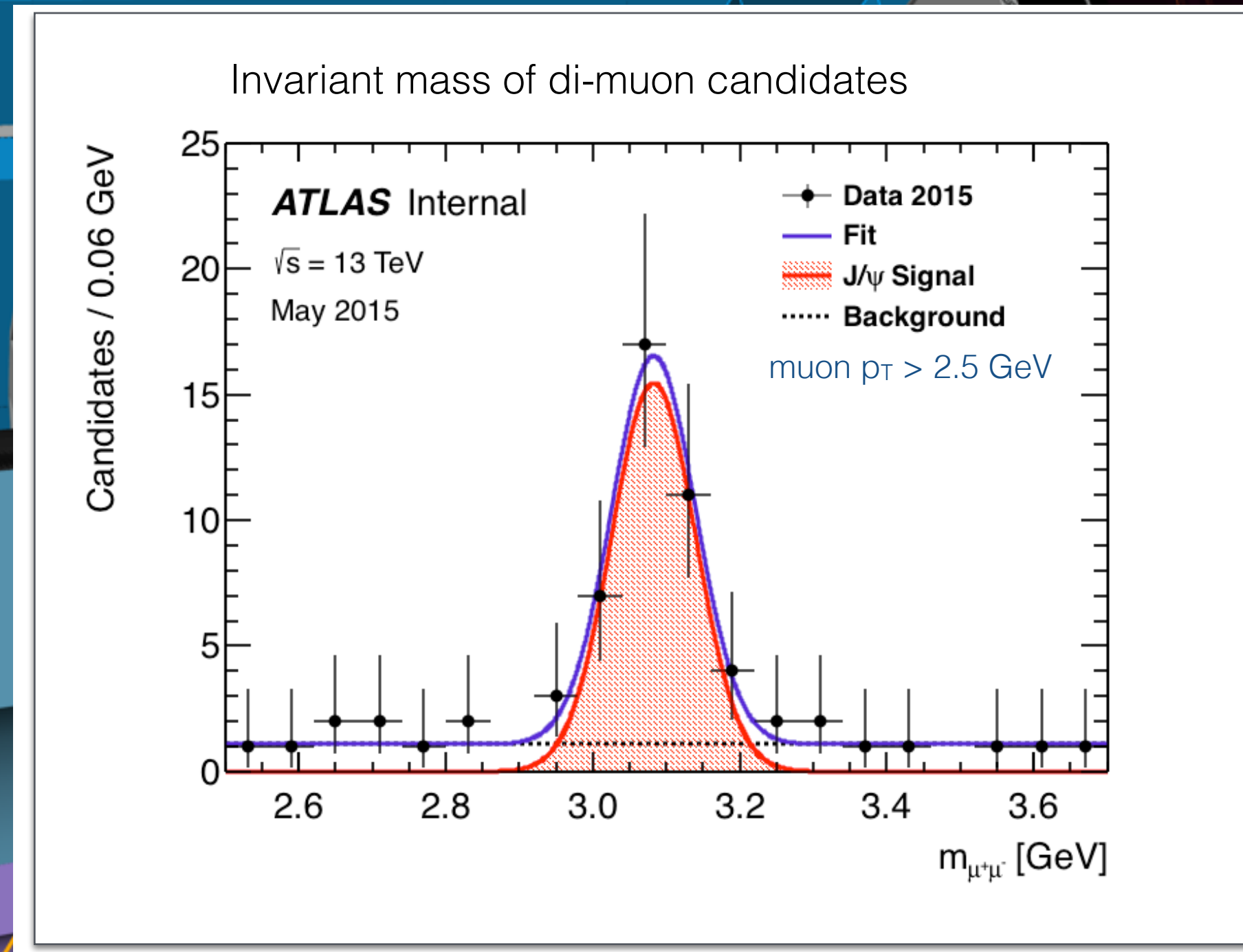
# Datasets for analysis

- ▶ Production of 80 DxAOD species on the grid (17 trains)
  - 48h after data reconstruction at Tier-0 (~6 days after end of run)
  - Working! and tested for 2015 data
- ▶ Access to DxAOD and to DxAOD content instrumented in analysis software, will allow to :
  - monitor grid AND non-grid dataset access
  - usage of variables within datasets to optimise DxAOD content

*13 TeV collisions*



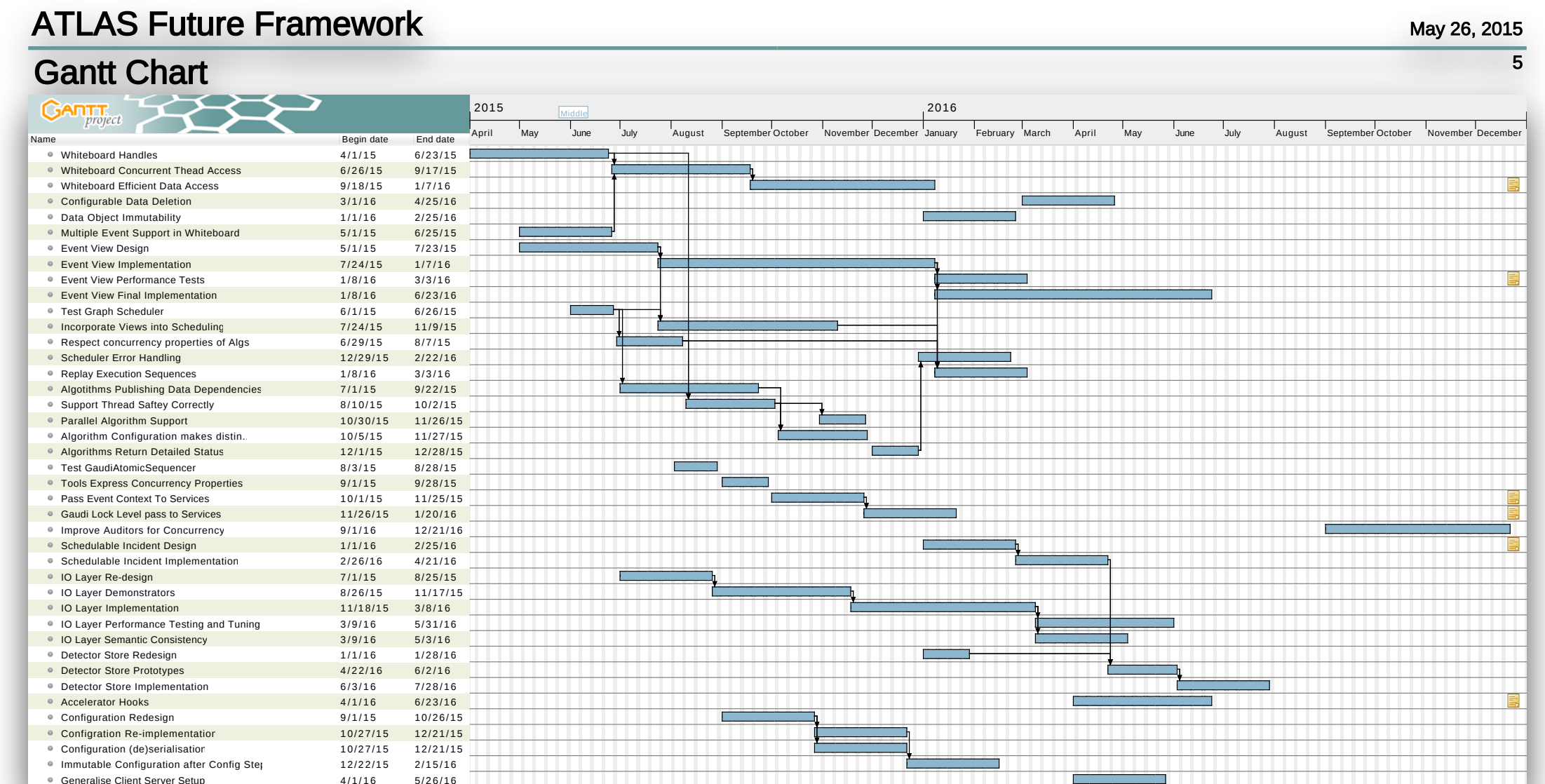
# Produced from DxAODs





# Software Future Framework

- ▶ aka GaudiHive
  - In collaboration with LHCb & PH-SFT
- ▶ Common project between ATLAS offline software & trigger
- ▶ Aiming for a prototype end 2017 to be tested on HLT farm in 2018
- ▶ Under approval process within ATLAS



# Planing for the future

## ▶ Major effort on software

- Run2 : ROOT6 (migration end of 2015), Geant4 v10, software configuration,...
- LS2 : change of software framework to multi-threading paradigm
- Collaborations with :
  - LHCb on software framework
  - CMS on multi-threading software techniques (starting)
  - CMS on conditions data Database and software (common paper at CHEP2015)

## ▶ Some paths towards a computing model for Run3

- More elastic model to leverage all possible kind of CPU resources (HPCs, clouds, volunteer computing), low granularity processing (Event service)
- Larger data-centres / Optimisation of network usage

# ATLAS is ready for Run 2

