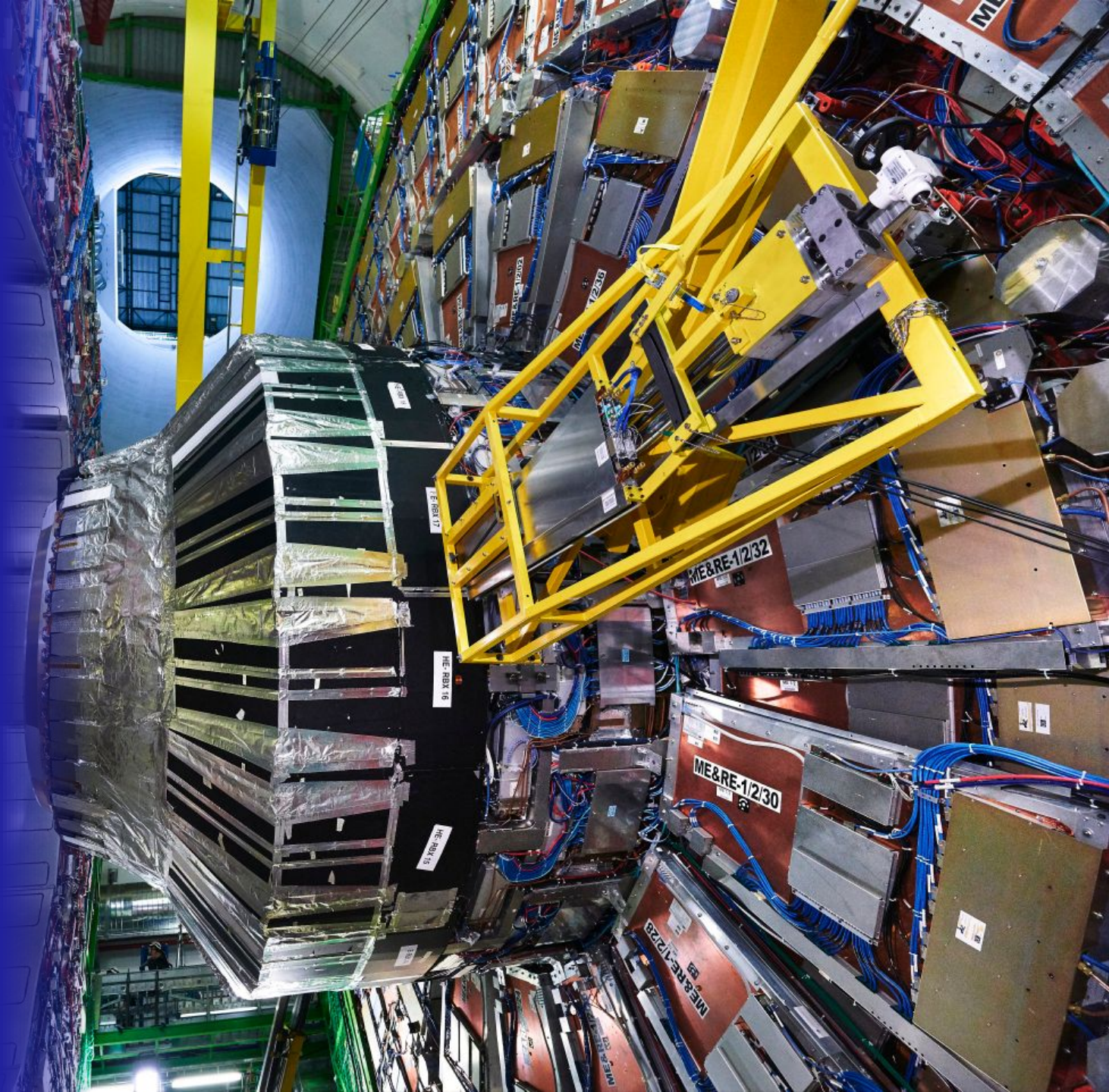


CMS Update

M. Klute (MIT), D. Piparo (CERN)

WLCG LHCC Meeting - Feb 18th, 2020

Update on O&C Activities



Production Update since Nov LHCC

■ Concluded

- Final re-reconstruction of 2017 data
- B-Parking reconstruction: 10^{10} B decays

■ Finalizing

- Final re-reconstruction of 2018 data

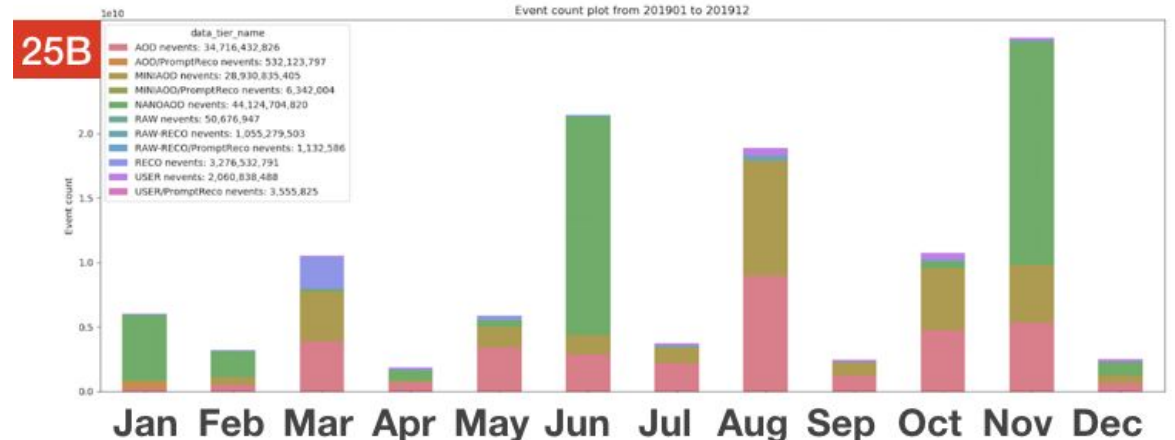
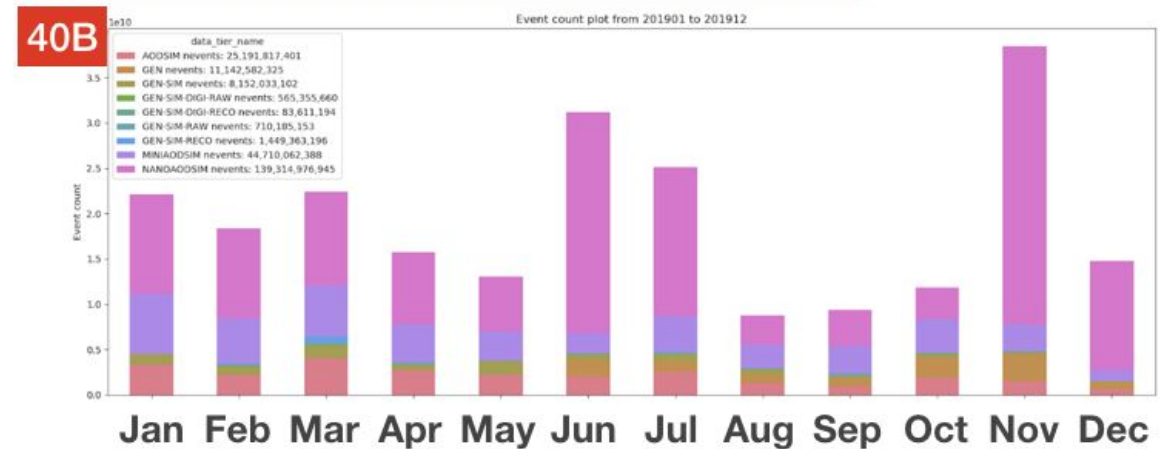
■ Ongoing

- Phase-2 HLT samples (digi)
- Run-3 trigger sample
- Final re-reconstruction of 2016 data
- Run-2 MC (default and legacy)

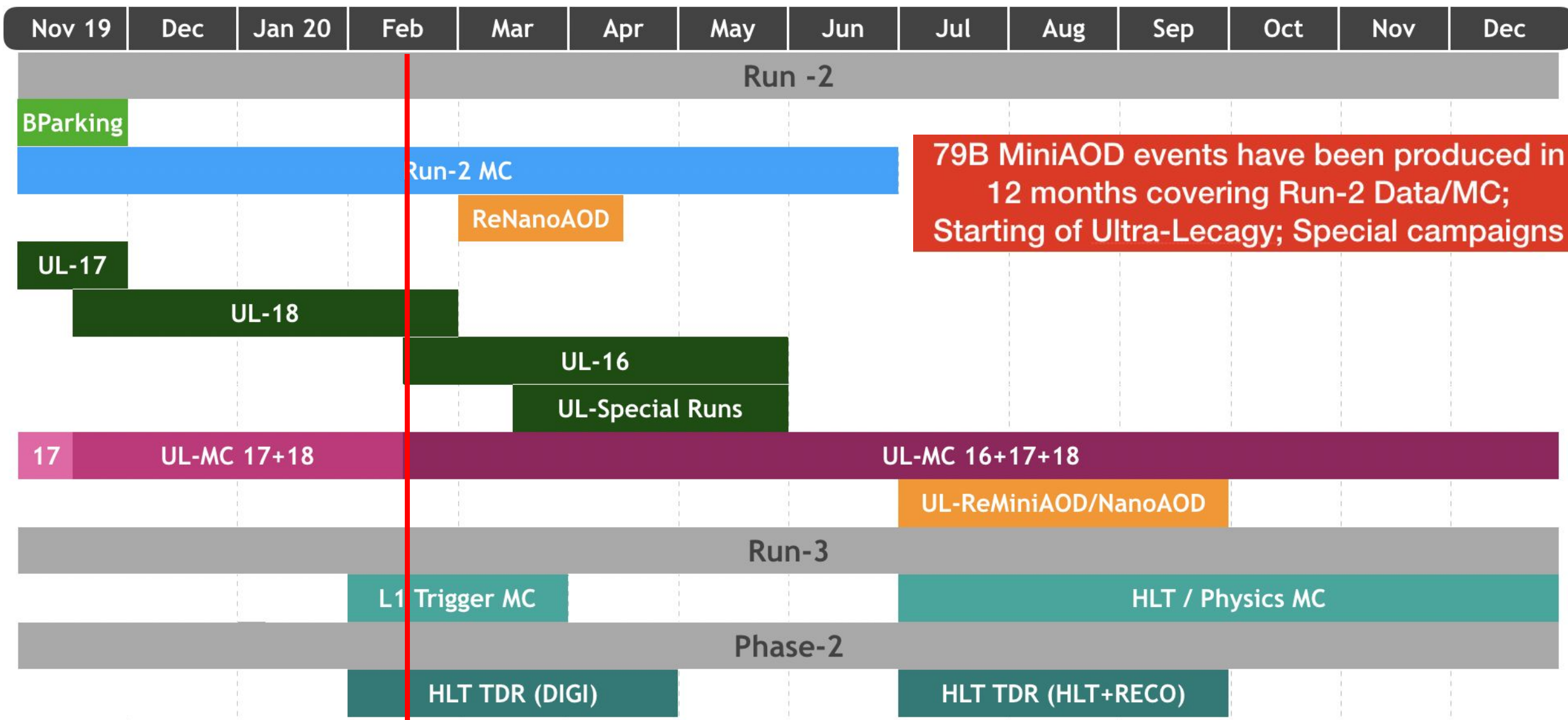
■ Preparing

- Phase-2 HLT samples (reco)
- Final re-reconstruction of Run-2 special runs
- Analysis data formats

Generate MC (Top) & Data
Reprocessing (Bottom) per month
By each datatier



Production update since Nov LHCC



79B MiniAOD events have been produced in 12 months covering Run-2 Data/MC; Starting of Ultra-Lecagy; Special campaigns

Ongoing Migrations

- Several ambitious code migrations ongoing
- Aim is to finalize all during LS2



Migration to Geant4 10.6



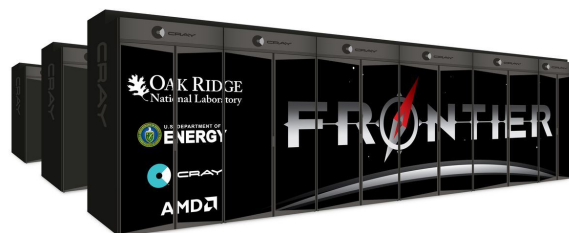
kubernetes



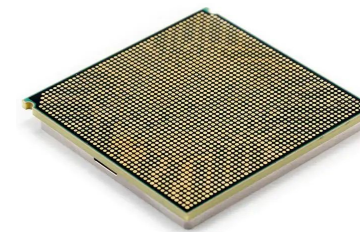
Heterogeneous Platforms

Enable the shift towards heterogeneous architectures, in its multiple aspects

- Online at HLT and offline, on the Grid and on non-WLCG centers
- CMSSW architecture and ecosystem of packages
- Integration of new software contributions, build and validation
- Benchmarking and profiling
- Workflows description, handling, submission (both central and user driven)
- Data caches
- Coordination with sites representatives and technical experts
- Collaboration and communication with other experiments, software providers whenever it is beneficial
- **Published CMS HPC documents:**



- <https://cds.cern.ch/record/2707936?ln=en>
- <https://cds.cern.ch/record/2707937?ln=en>

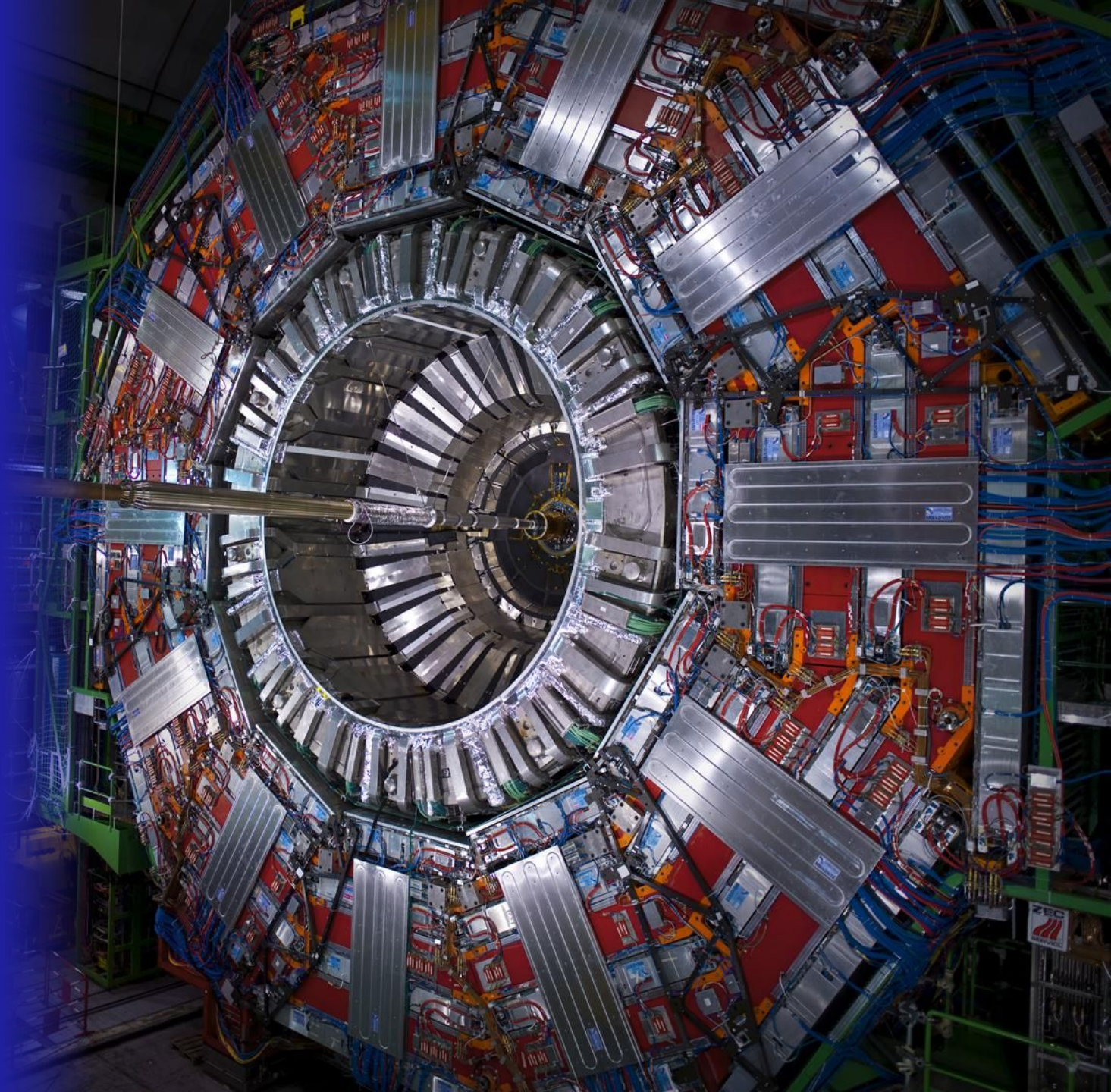


Run 3 is the target,
a test for HL-LHC

O&C Upgrade Structure

- **Evolution of the computing model (ECOM2X) concluded**
 - Was active for ~18 months
 - Internal report in final draft
 - Baseline for HL-LHC review
- **Strengthened upgrade group, dynamic resource usage group, and computing resource board**
- **Established working group for code modernisation and performance**
 - Subgroup of O&C upgrade group. Led by Daniel Elvira and David Sperka
 - Tasks include: computing performance, data structures, tools to measure and monitor, etc.
 - Prerequisite for efficient use of heterogeneous computing resources

**2019 Utilization
And
Request for 2021**





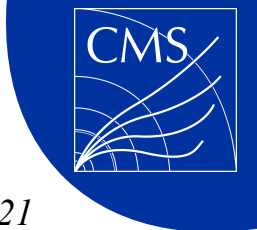
C-RSG Resource Utilization and Requests for 2021

■ First version of the request was discussed in September. Changes since then

- Implemented feedback on tape overhead, i.e. removed 15%
- Update LHC expectation to
 - 20fb⁻¹ max integrated luminosity (was 42fb⁻¹)
 - 2018 pileup scenario with average of 35 (was 45)
 - 3*10⁶ second pp operation (was 5*10⁶)
 - 1.2 10⁶ seconds heavy ion
- Implemented requests for physics program
 - 1.3kHz HLT rate (was 1kHz)
 - Additional rate to commission new trigger strategies and detectors

■ Due date is Feb 20th

Activity	Q1	Q2	Q3	Q4
Run 2 / 3 analysis	█			
Run 3 detector/physics objects commissioning	█	█	█	█
Validation sample production	█			
Commissioning T0 operations	█			
Proton - Proton T0 operations		█	█	
Mid-year re-reconstruction		█		
End-year re-reconstruction				█
Heavy ions T0 operations			█	
Heavy ions re-reconstruction				█
2021 Monte Carlo production	█			
Run 2 Monte Carlo production	█			
HI-LHC Monte Carlo production	█			
2021 re-MiniAOD				█



Request for 2021 in a Table

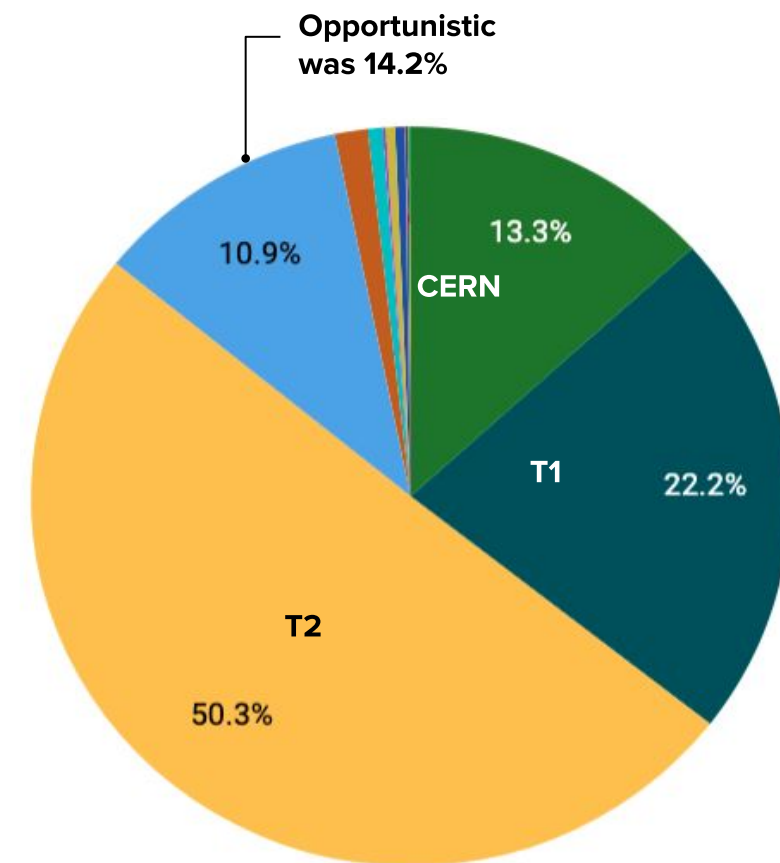
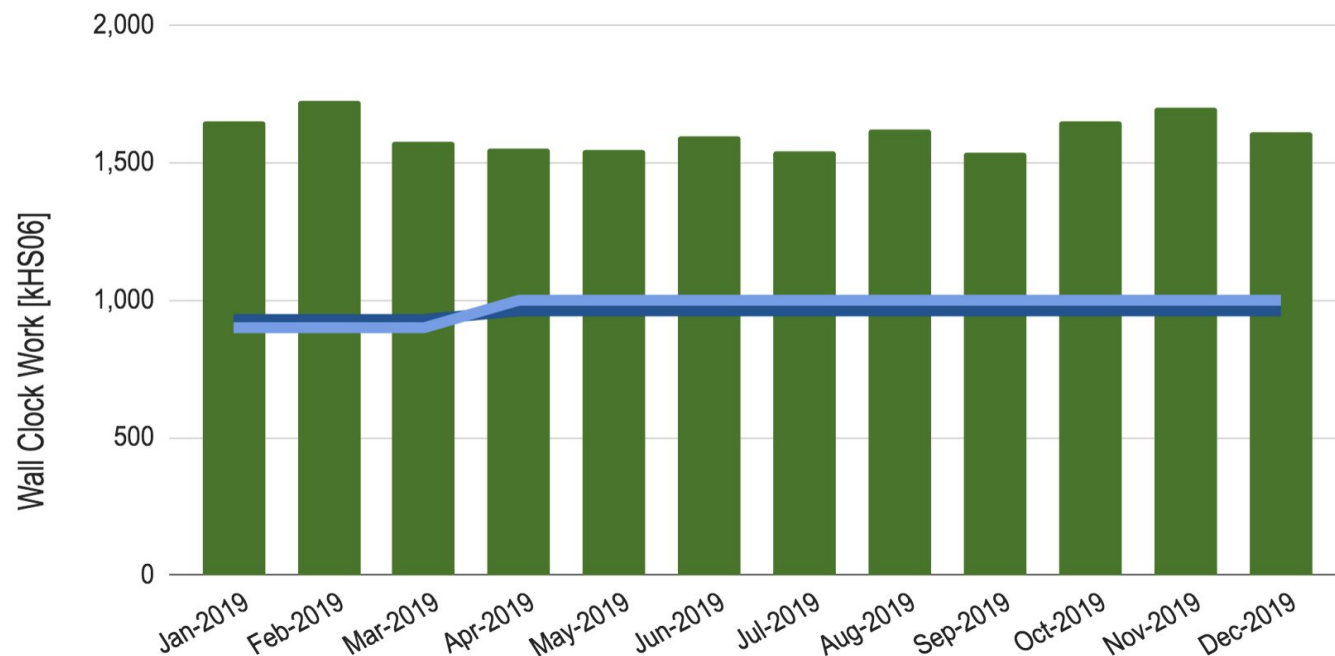
CMS resource request for 2021. The first column of numbers shows CRSG Spring '19 recommendations for 2020 resources, the second shows the 2021 CMS request, while the third shows the relative increase with respect to the 2020 CMS request.

Resource	Site	2020 CMS Approved Request (Spring 19)	2021 CMS Request (Fall 19)	2021 CMS Request (Spring 20)	Increase from 2020 request
CPU (kHS06)	T0+CAF	423	517	500	18%
	T1	650	650	670	3%
	T2	1000	1200	1070	7%
	Total	2073	2367	2240	8%
Disk (PB)	T0+CAF	26.1	31	30	15%
	T1	68.0	77	77	13%
	T2	78.0	93	92	18%
	Total	172.1	201	199	15%
Tape (PB)	T0+CAF	99	144	120	21%
	T1	220	245	230	5%
	Total	319	389	350	10%

2019 Resource Utilization

- An **excellent year** for Monte Carlo and data processing
- Full utilisation of WLCG resources, even beyond the pledges
- CMS took advantage of several sources of opportunistic resources such as clouds, the HLT farm and HPCs.

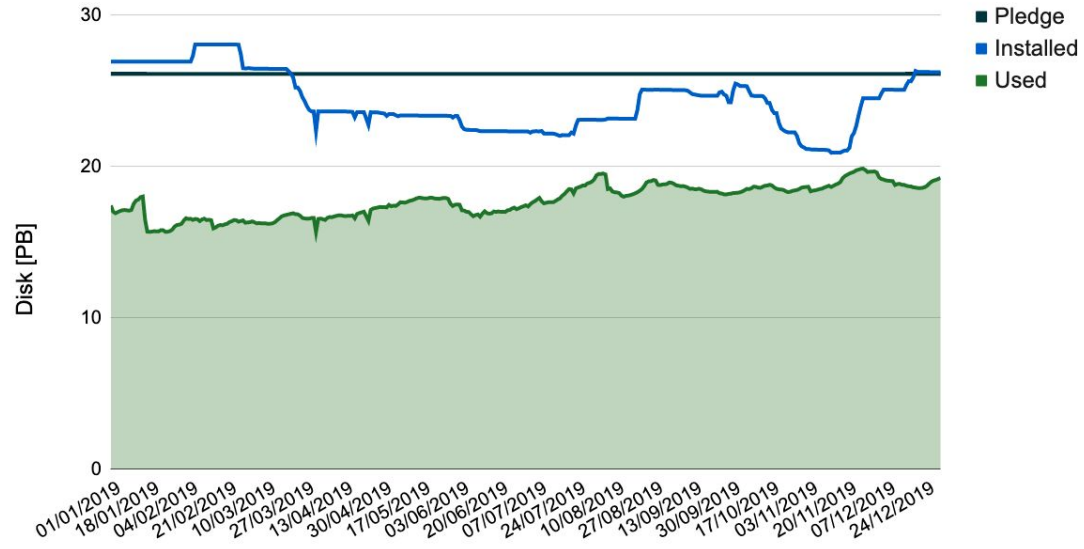
2019: T2 CPU usage



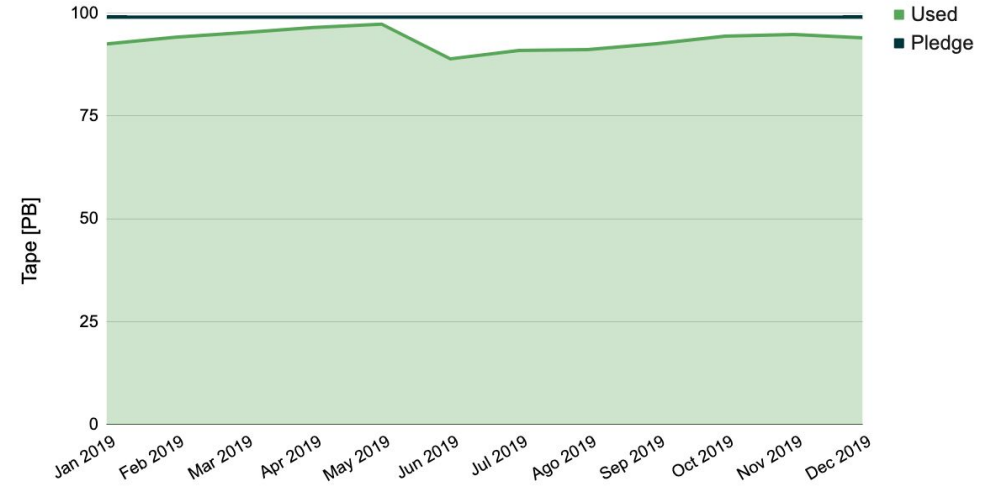


2019 Resource Utilization

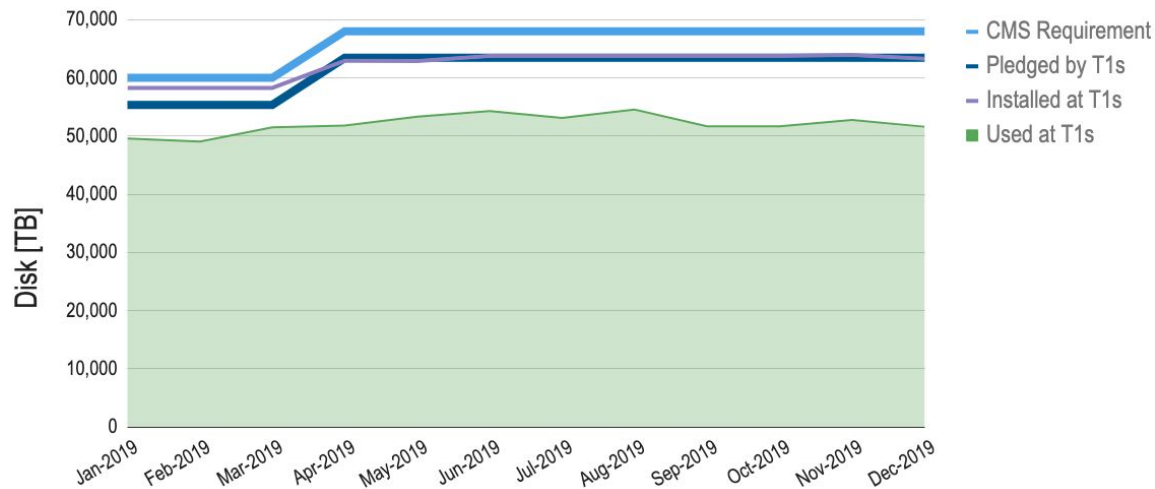
2019: CERN Disk usage



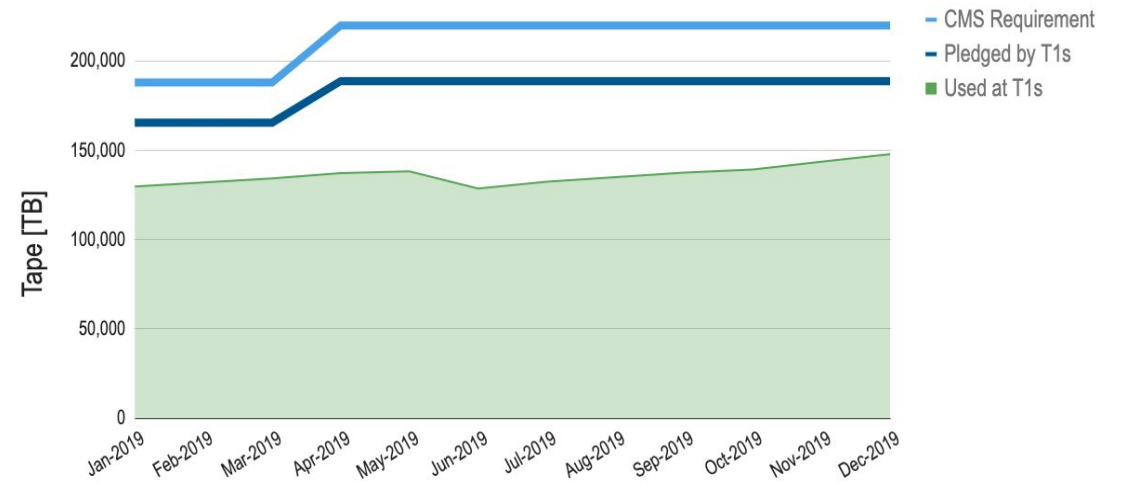
2019: CERN Tape usage



2019: T1 Disk usage



2019: T1 Tape usage



Preparation of WLCG HL-LHC Review





- **See Simone's slides on review setup**

- CMS will prepare a document to support the review starting from our internal Ecom2x report with the following timeline
 - March O&C week: complete draft available and discussion of content
 - March 4th: discussion of HL-LHC resource needs during O&C Weekly
 - April CMS week: presentation to and discussion with CMS, minimal comments possible at that stage
 - After CMS week: sharing of the 5 components for final polishing
 - **May 1st: delivery to review committee**

- Post-review: Update and publication as interim report

- **Assumptions for HL-LHC and trigger rate - common with ATLAS.**
 - $7.5 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ and 200 pileup
 - 10kHz trigger rate
 - We will also show estimates for a “CMS scenario” consistent with CMS Phase-2 TDRs



- **Major progress** in production of Run II legacy data and MC
- **Finalizing LS2 projects** including the move to community solution (DD4HEP, CRIC and RUCIO)
- **Prepared report** on resource utilization for 2019 and update to resource request for 2021
- **Preparing WLGC HL-LHC Review**