

CMS Status Report

Tommaso Boccali (INFN Pisa/CERN)
Markus Klute (MIT)

Outline

- 2018 pp data taking, a wrap up
- Ongoing HI run
- Preparation for Moriond 2019 and beyond
- 2019-2020 processing plans
- AoB

Not covered:

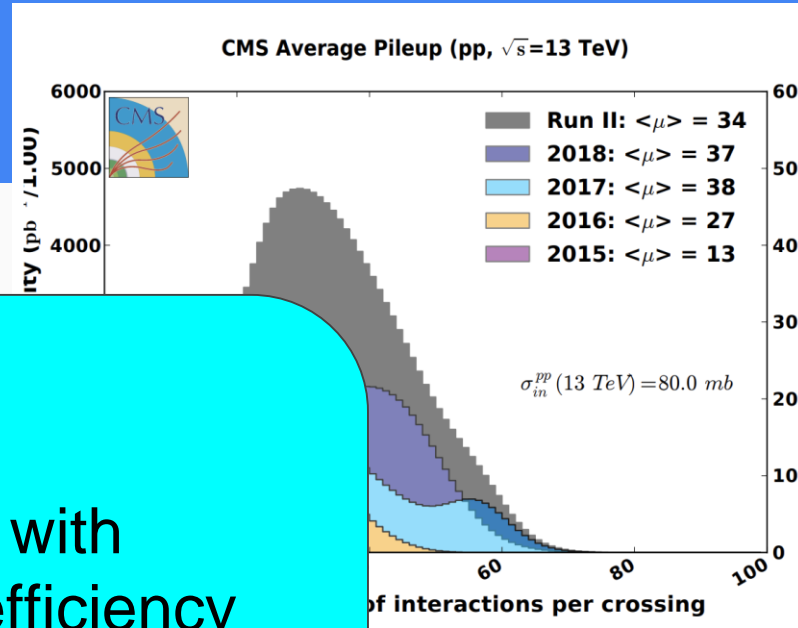
- HL-LHC estimates (presented @ Sept LHCC)

2018 pp data taking

- 67/fb delivered; ~ as expected
- Avg PU=37 (~ 2017 but much smoother)
- 1900 hours
- RAW data
- 17 PB, in 5
- Data certified
 - expected

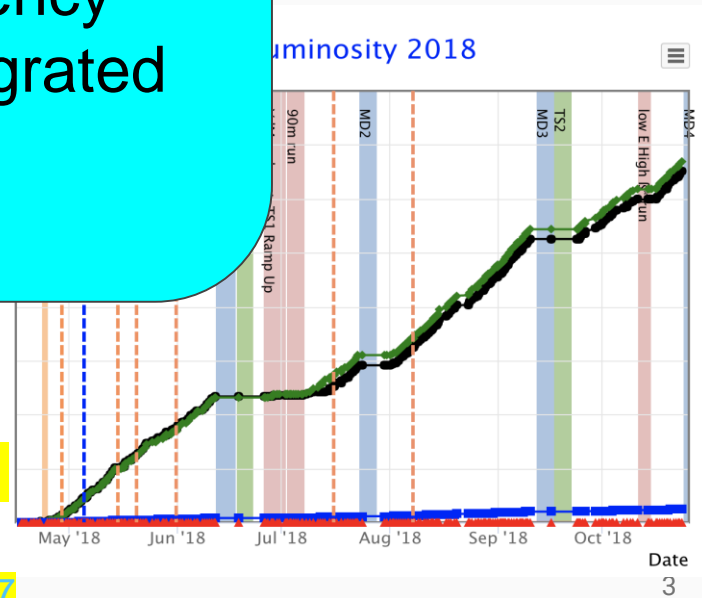
Take home message:
 2018 was the RunII year with

- Best CMS recorded efficiency
- Best CMS certified efficiency
- (incidentally, largest integrated luminosity)



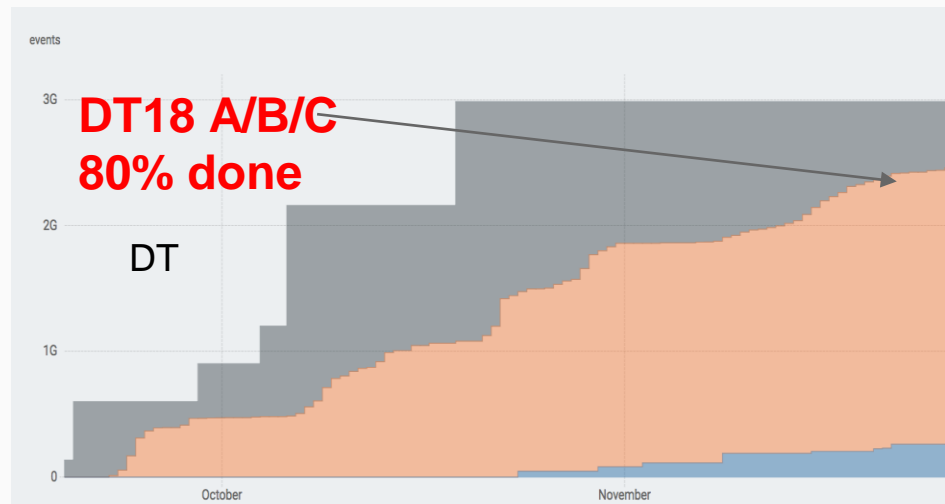
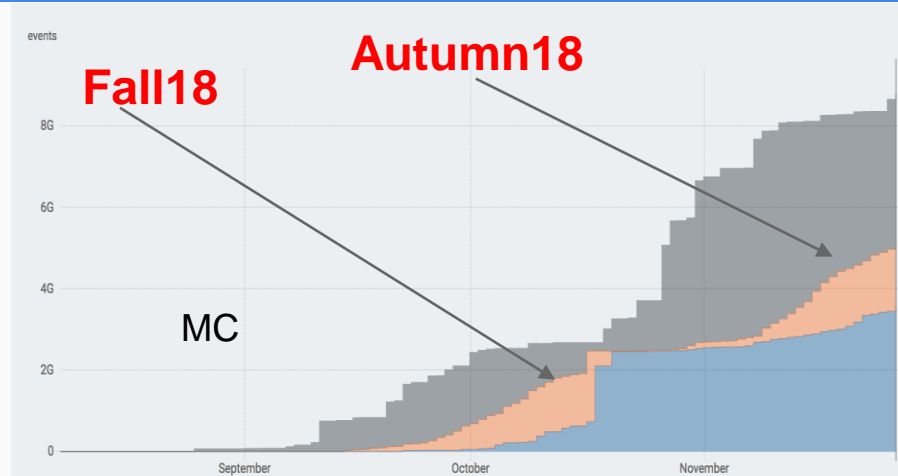
	Lum [fb]			
LHC Delivered	66.0			
CMS Recorded for Physics	62.76		50ns, lowpu	
Recorded & DC processed	61.70	0.38	99%	Certification nearly complete!
DCS Flags good	59.53	2.17	96%	
Certified good (golden)	57.66	1.87	97%	DPG-POG quality flags

93.4% wrt DC processed data
 was 92.7% in 2017



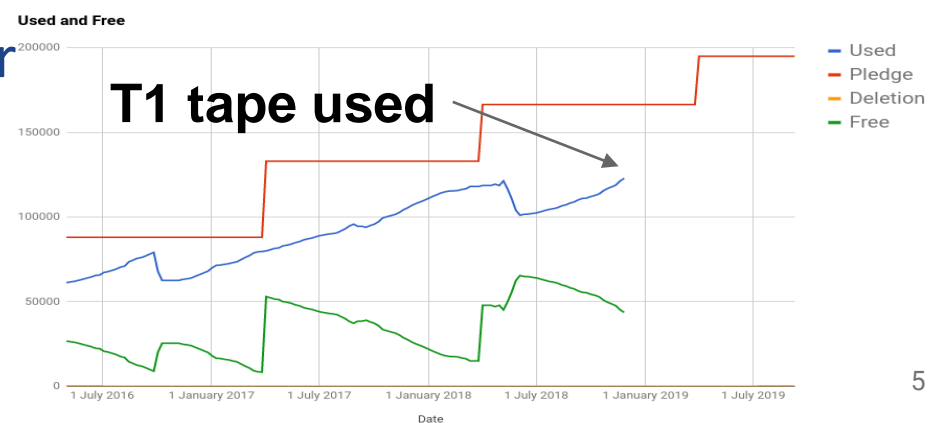
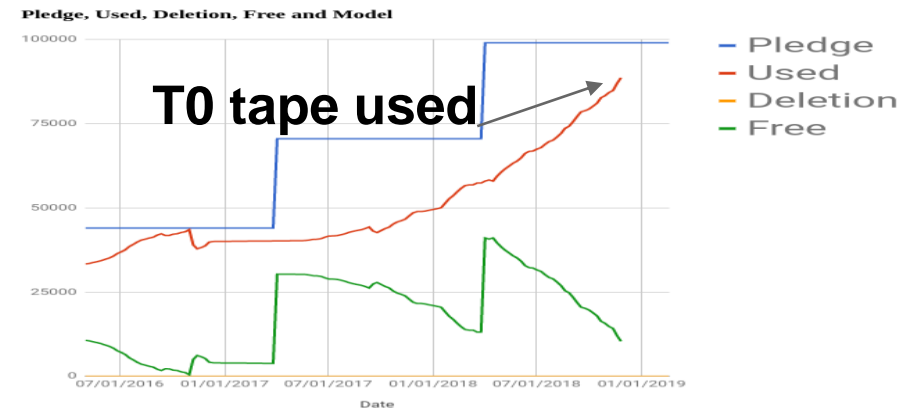
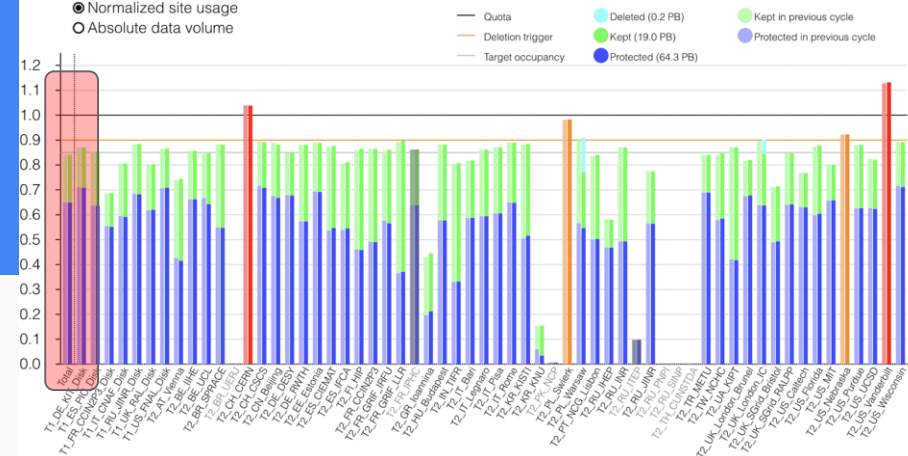
2018 pp processing

- **MC18:** “Fall18” + “Autumn18” campaigns; plan:
 - Need additional 1.5-2 B events for Moriond targeted analyses on 2018 data
- **DT18 May-Jul rereco:** priority Physics PDs available in publication quality; only low prio left
- For the first time, **CMS was able to keep Prompt “physics-grade”** from Jul on; no need for reprocessing for Moriond18



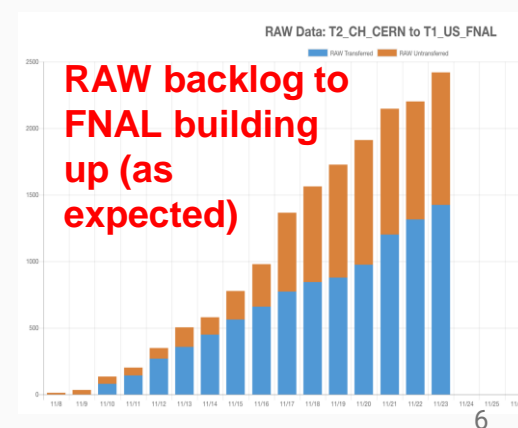
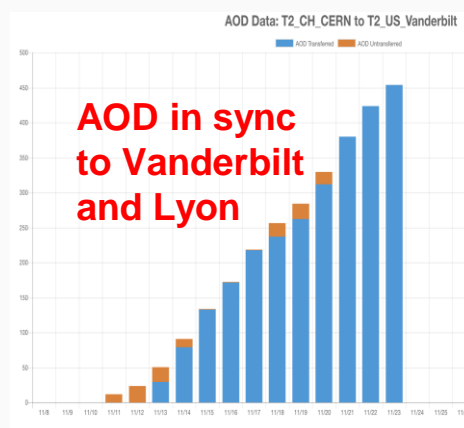
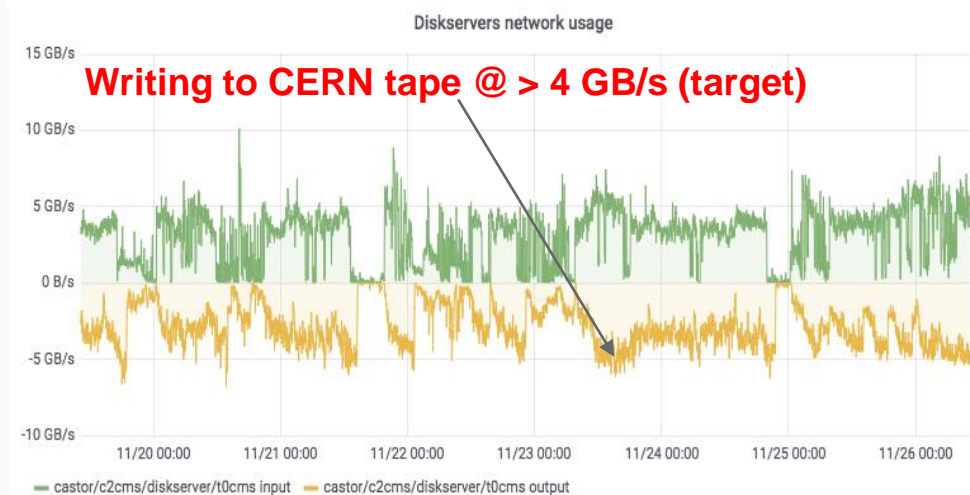
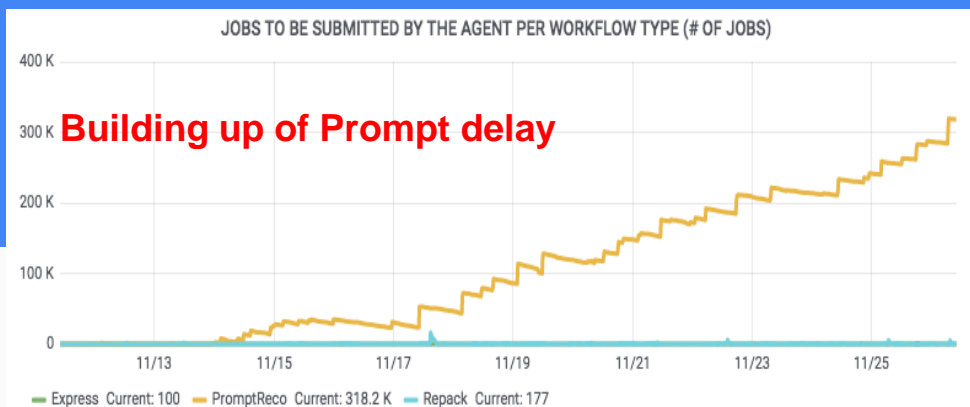
Storage status

- When we needed to transition between Fall18 and Autumn18, an **unbalance** on Disk was created (due also to the concurrent MiniAOD16 campaign)
- **Available disk for operations dropped to 15% (20% is the attention zone)**; a promptly action was implemented in order to restore functionalities
- **Now: dynamic disk at 35%**
- **Tape areas in good shape**

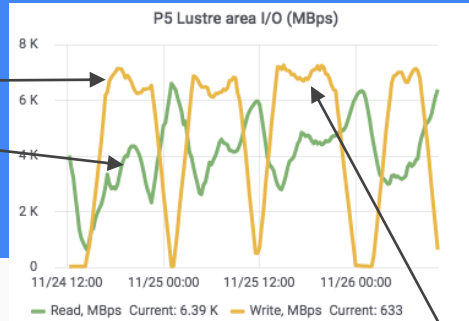


Heavy Ion Run

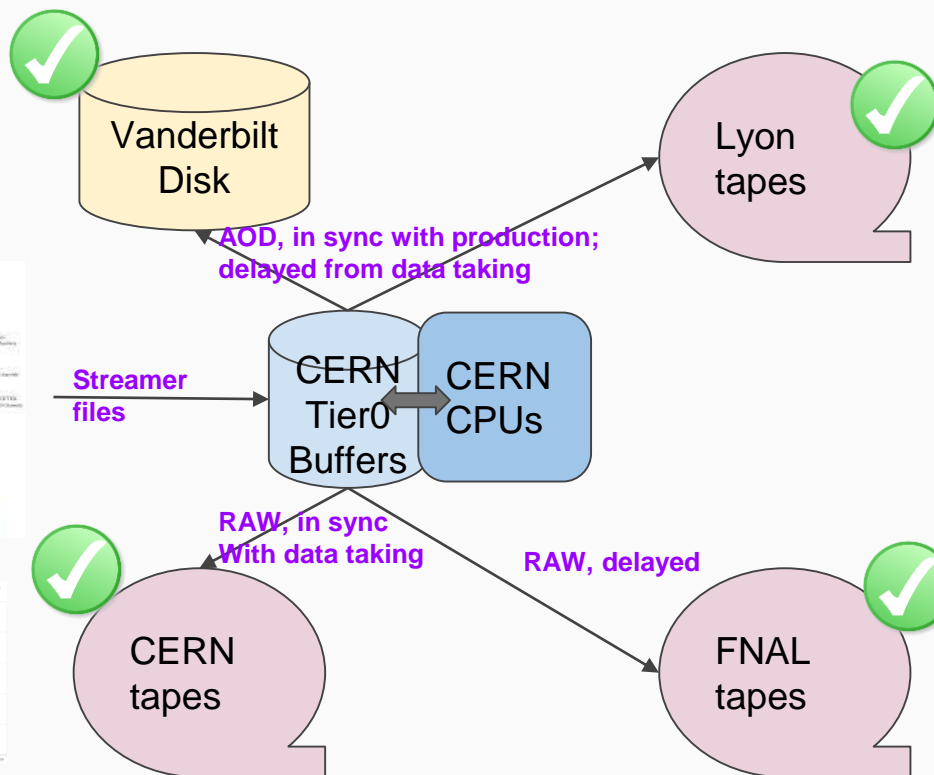
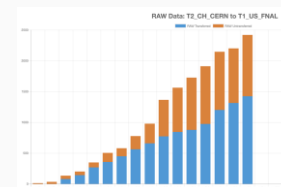
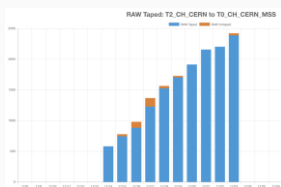
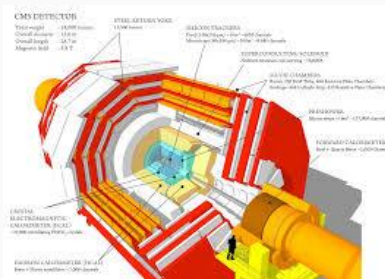
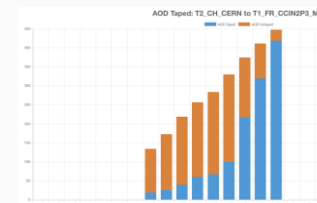
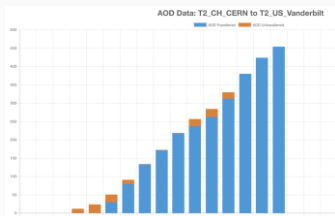
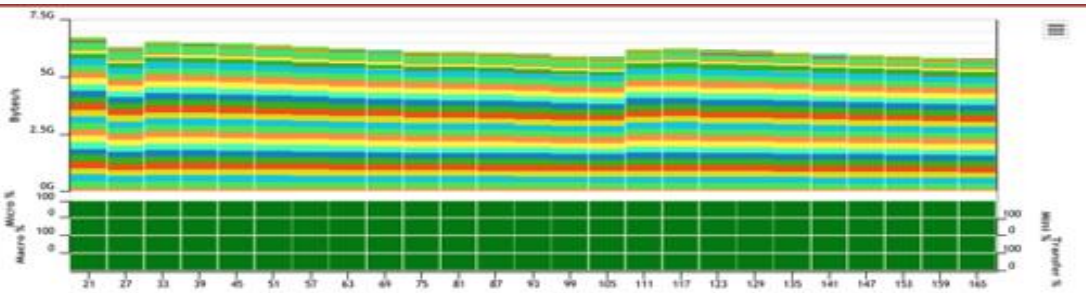
- Long range planning (+1y) is paying off; so far all is ~ as expected
- RAW data to CERN + FNAL; AOD to Vanderbilt + Lyon
- Building up Prompt backlog as expected - plan is to use the HLT as soon as available + continue processing till it is done (using full T0+HLT → ~Mid Jan)
- By Sunday afternoon:
 - 1.5B AOD already processed



DAQ → P5 Disk
P5 Disk → T0



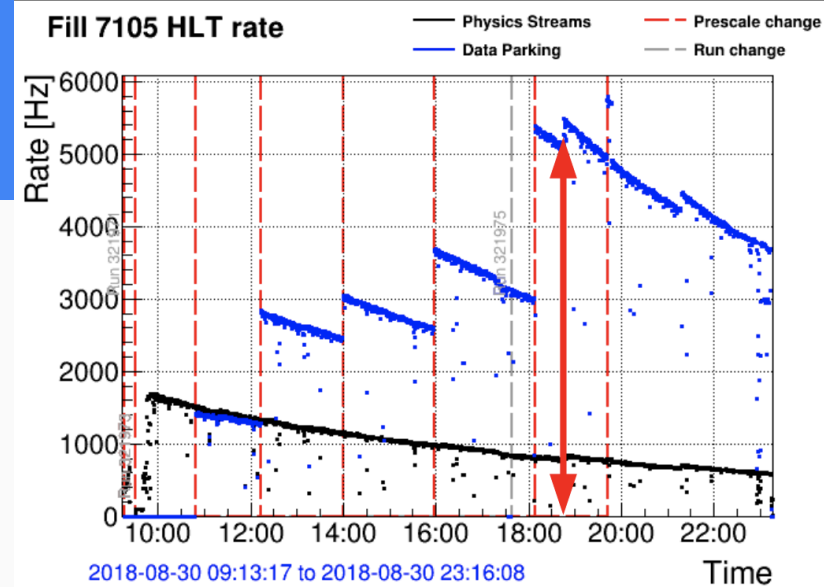
- Pushing CMS data acquisition up to the maximum: **7.3 GB/s**
- Stable running at 6.5-6.8 GB/s



B-parking

- Global CMS Effort in 2018 payed off, resulting in **12B triggered events on tape**
- Up to **5.5kHz**, average on fills > requested **2kHz**
- The end-of-fill strategy resulted into a $\langle \text{PU} \rangle \sim 20$ (vs 37 for standard triggers) and smaller events
- **As promised, all fits into standard resources (no additional requests, even for the future since the effort is going to be closed by early 2019)**

- Now studying **processing strategy**
 - 1.1B events were **already fully processed** in order to help development of trigger / reconstruction
 - A **full RECO pass** with same release as for Moriond18 in Feb-Mar 2019 for B Physics studies during LS2 and beyond



[/ParkingBPH*/Run2018*-v1/RAW](#)

TOTALS:

Datasets: 23

Size on Tape: 7596 TB (single copy)

Events: 11878715564

Avg Size 639528 bytes / event

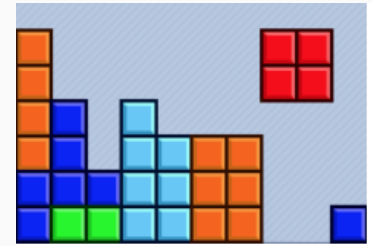
Run3 as a preview of Phase2 ?

- **Trigger will change greatly during Phase-2**
 - some of the required reconstruction changes are being studied/prepared now and part of these may be deployed already during Run3 in preparation of the final one to be used in Phase-2
 - at Level-1 we will deploy a new Track Finder in the barrel region based on the Kalman filter
- **During the past MD we collected a High PU Fill (up to 140 PU)**
 - extremely useful for Phase-2 HLT studies



End of 2018-2019 processing plans

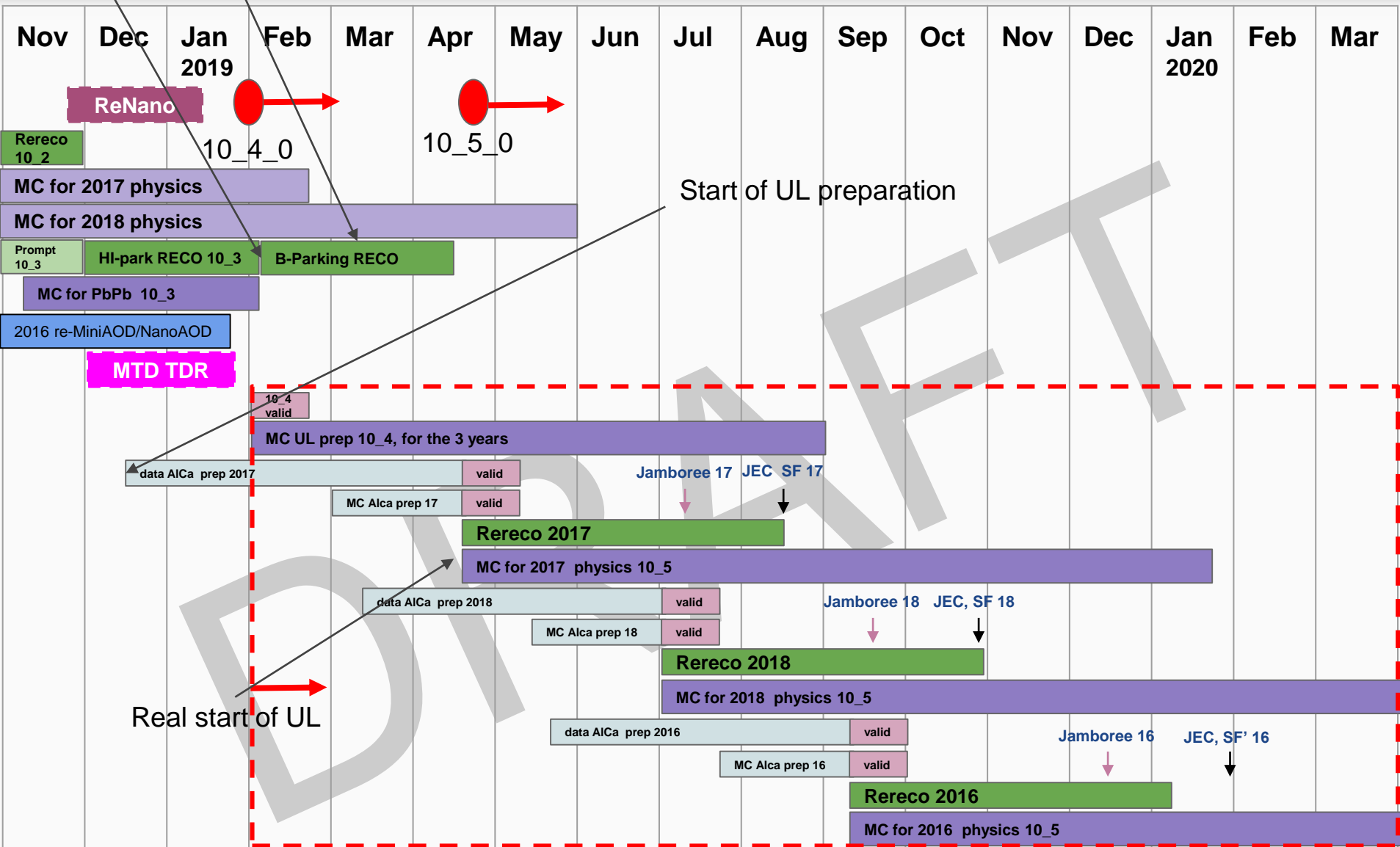
- Complicated Tetris of activities planned. All very success oriented
- **HI Processing:** will keep all the processing in prompt using only T0 + HLT
 - Processing expected to last to mid-end Jan
 - RAW 2nd custodial copy to FNAL by March
- **B-Parking:** processing slot @ T0+HLT after the HI
 - Needs careful tape prestaging
 - ~2 months expected for full RECO pass on 12B events
- **Moriond18 MC samples**
 - Use T1+T2 resources; ~3.5 B events by Mid December (“Moriond”), another ~6B by mid Mar (“LHCP”)
- **MTD TDR samples**
 - TDR due Q1 2019; O (10) M Full Content Events needed by start of Jan (devel still ongoing)
- **A number of Re-MiniAOD and Re-NanoAOD (low CPU occupancy)**
- **From April 19 (~1y): Grand Plan for RunII “Ultra Legacy”**
 - Run II results combining 2016-2018 (probably processing order 17-18-16)
 - Datasets for long term combination of Run II results with Run III and later
 - Include performance improvements and fixes w.r.t. existing datasets
 - On top of 2016, 2017 existing rereco and MC productions
 - Provide first full rereco of 2018



DRAFT: UL structure and timelines

HI closing

B-Parking



Ultra Legacy and the rest

- **Planning for 25 B DT + 35 B MC**
 - On $\sim \frac{2}{3}$ of CMS resources (including T0 and HLT) need 12 months of full scale processing
 - Plan is to have Data done by End of 2019, MC by \sim April 2020
 - Quite a few critical aspects:
 - Timely availability of calibrations (need preproductions)
 - Tape systems ability to sustain the stage-in of RAW data
- **At the same time (not in the Gantt)**
 - Analyses continuing as today, on O(50k) cores
 - O(30k) cores needed for the Productions for MDT/L1/HLT TDRs
 - Low intensity Phase II productions for analyses preparation
- **If all goes well:**
 - From April 2020 production switching to Run III preparation, with a dress rehearsal of O(10) B events processed
 - Needed to test new services / sw : Rucio, DD4HEP, beta of GeantV transport engine, ...

Evolution of Computing Model 2X - ECoM2X

- As reported at previous meetings, **ECoM2X** is a task force with all the CMS coordination areas (Physics, Computing, Trigger, PPD)
- Activities going on on many fronts, **aiming to a first assessment of results by the end of 2018**
 - Modelling of resource needs
 - Understanding of Physics inputs (rates, MC/DT, ...)
 - Technology tracking - HW and heterogenous SW solutions
 - External funding opportunities
- A notable fact: together with ATLAS O+C Management, we are applying for a **EU funded Training Network** on SW R&D for Phase II
 - Endorsed by Experiments, CERN and IRIS-HEP (“twin project” in US - already granted 25M\$)
 - To be submitted by Jan 2019
 - CERN, ES, FR, DE, UK, SK, NO, IT
 - **PI: Borut Kersevan (Ljubljana)**

Conclusions

- A busy year for CMS Computing; after requests were confirmed:
 - Parking B accommodated (2kHz more trigger)
 - Revisioned HI plans (3x more data)
- ... But all in all extremely successful
 - CERN T0+T2 merging was essential (see previous LHCCs)!
 - We will provide 2018 MC+DT events for Moriond18 analyses
 - We will have completely processed datasets for Parking B and HI by ~ March
 - Plans are to have RunII closed (production wise) by Apr 2020
 - Many transitions started in SW/Services towards common solutions
 - Rucio, DD4Hep, CRIC, GeantV, ...
- ECoM2X progressing, first results in early 2019