CMS Status

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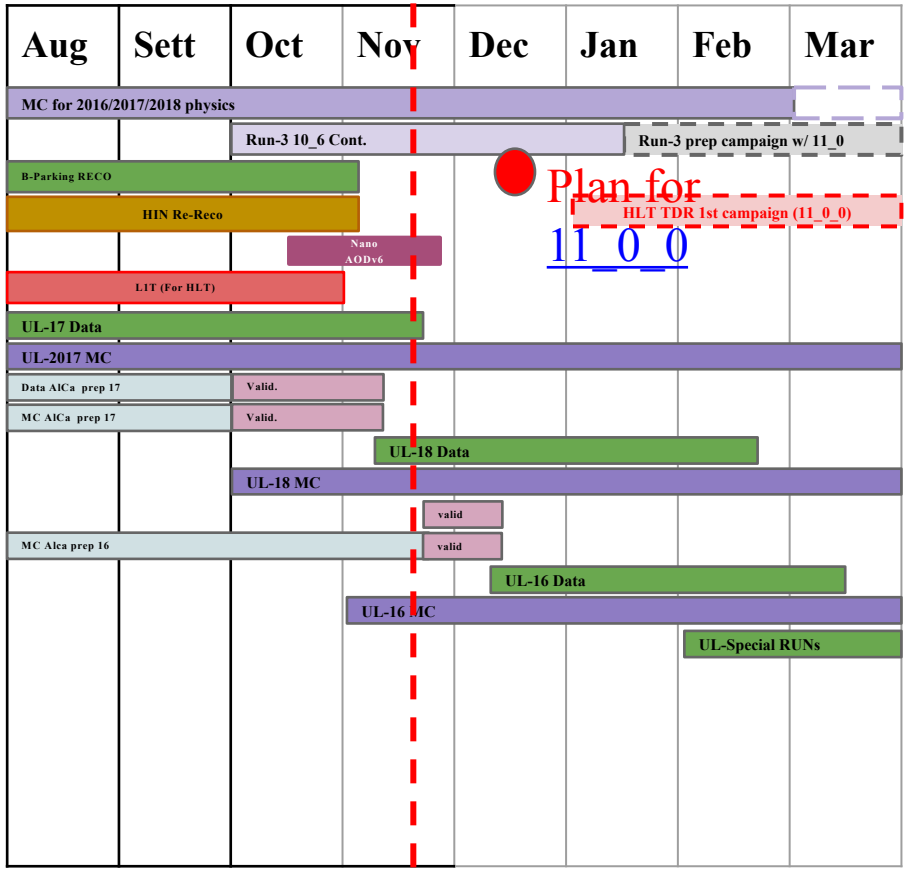
CMS Production Activities



Activities

Concluded

- Heavy Ion 2018 PbPb re-reconstruction
- L1 Trigger samples for HLT
- B parking reconstruction: 10^{10} B decays!
- "Ultra-legacy" reconstruction of 2017 data

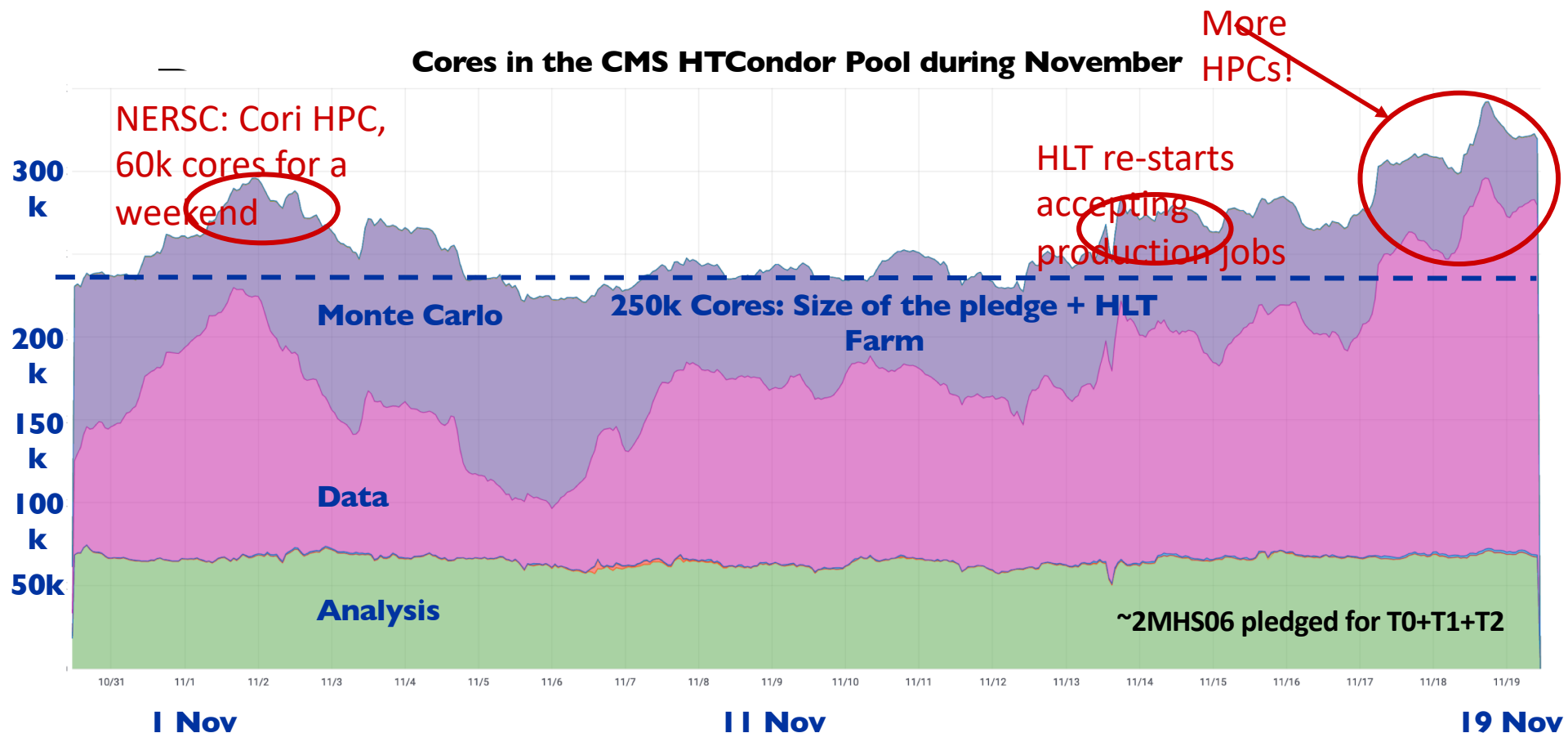
Ongoing

- Monte Carlo for current Run2 analyses
- Ultra-legacy of 2018 data/MC and 2017 MC

About to start

- Ultra-legacy of 2016 data
- HLT TDR and Run 3 MC (CMSSW_11_0_0)

CPU utilization



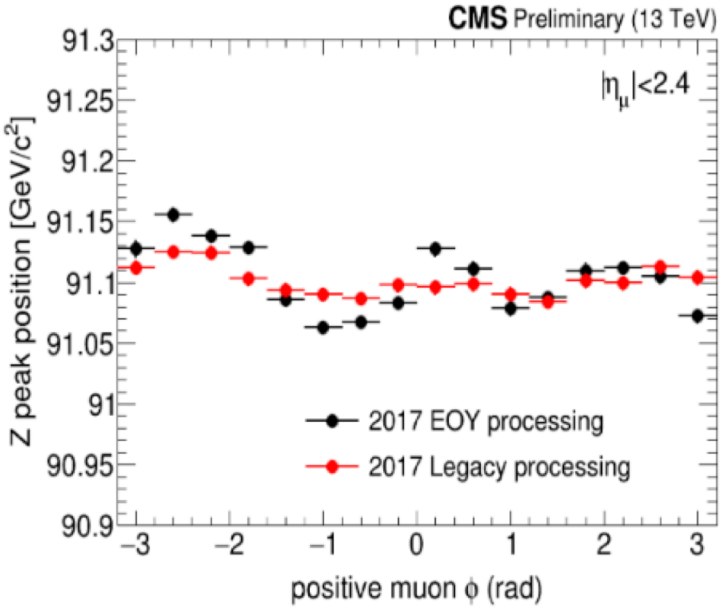
Presented to the LHCC in November

News from the RRB

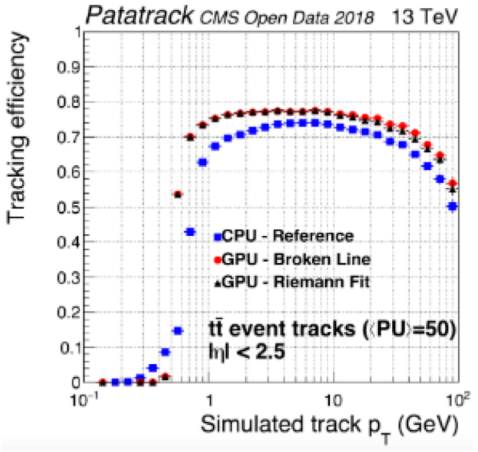
October 2019 link

Strong focus on using new techniques, improving calibrations, and object reconstruction

- Re-reconstruction ongoing on full Run2, to provide state of the art datasets
- Need greater precision in reconstruction in order to fully exploit Run 3
- Improved analysis techniques can bring extra benefits
- And can attract interested young scientists for the computing challenges of Phase 2



Progress on HL-LHC software and computing



Broad range of activities to gain better understanding of HL-LHC computing requests and modelling

- ECOM2x (evolution of the computing model) CMS task force, includes computing, trigger, physics, run coordination
  - Conclusion and report at the end of 2019
- Participation and collaboration to external activities: IRIS-HEP, HSF, etc.
- Driving heterogeneity paradigm shift, both for online and offline processing: implemented full support for offload on accelerators (e.g. GPUs) in the CMSSW framework
  - Considering to use GPUs HLT already in Run 3
    - Detailed plan with milestones prepared, final decision in one year
    - Identify performance portability library to have a single codebase for all processors

Progress on HL-LHC software and computing

- CMS sees HPCs as part of the computing infrastructure for scienceand fully expects exascale machines to be available by start of HL-LHC
  - Being able to use accelerators helps leveraging HPCs but is not sufficient
  - Working in collaboration with WLCG, CERN Openlab and other experiments to reduce impact of all issues

- CMS is adopting community solutions to improve long term sustainability of our software suite. Examples:
  - DD4HEP: Migrating geometry description, aim to use it in Run3 already
  - CRIC: In the process of adding to Computing Resource Description Catalogue (Atlas and others) the functionalities needed by CMS
  - RUCIO: Migrating tool for data management from Phedex (Atlas and others)

CMS resource requests

CMS Requests for 2020 and Estimates for 2021

12

CMS		2019		2020			2021	
		CRSG recomm.	Pledged	Request	2020 req. /2019 CRSG	C-RSG recomm.	Request	2021 req. /2020 CRSG
CPU	Tier-0	423	423	423	100%	423	517	122%
	Tier-1	650	620	650	100%	650	650	100%
	Tier-2	1000	960	1000	100%	1000	1200	120%
	HLT	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Total	**2073**	**2003**	**2073**	**100%**	**2073**	2367	114%
	Others						50	
Disk	Tier-0	26.1	26.1	26.1	100%	26.1	31.0	119%
	Tier-1	68.0	63.4	68.0	100%	68.0	77.0	113%
	Tier-2	78.0	72.0	78.0	100%	78.0	93.0	119%
	Total	**172.1**	**161.5**	**172.1**	**100%**	**172.1**	201.0	117%
Tape	Tier-0	99.0	99.0	99.0	100%	99.0	144.0	145%
	Tier-1	220.0	188.8	220.0	100%	220.0	245.0	111%
	Total	**319.0**	**287.8**	**319.0**	**100%**	**319.0**	**389.0**	**122%**

- 2020 requests constant resources
  - Sufficient for Run 2 legacy work
  - Prepartions for Run 3
- 2021 increases are driven by Run 3 assumptions
  - Increase in T0 tape based on contingency assumptions of 42 fb-1 of data delivered by the LHC

Pekka Sinervo, C.M. October 29, 2019

In 2020 requested no augmentation of sites → Flat budget used to anticipate 2021 requests, for which preliminary numbers were already available

Preliminary 2021 request:

- Large uncertainties from LHC schedule and accelerator performance
- Based on common assumptions w/ ATLAS
  - Baseline scenarios of 17 fb-1 used for disk and CPU
  - Upper limit scenario of 42 fb-1 used for tape
- Rather large increases of disk and tape requested, but no CPU @ T1

CCIN2P3 2020 T1 pledges

CMS preliminary request

Resource	Site	2020 CMS Approved Request (Spring 19)	2021 CMS Request (Fall 19)	Increase
CPU (kHS06)	T0+CAF	423	517	22%
	T1	650	650	0%
	T2	1000	1200	20%
Disk (PB)	T0+CAF	26.1	31	18%
	T1	68.0	77	13%
	T2	78.0	93	19%
Tape (PB)	T0+CAF	99	144	45%
	T1	220	245	11%

T1 pledge evolution

2019

	CMS	% of Req.
CPU (HEP-SPEC06)	49,000	8%
Disk (Tbytes)	5,250	8%
Tape (Tbytes)	16,900	8%

2020

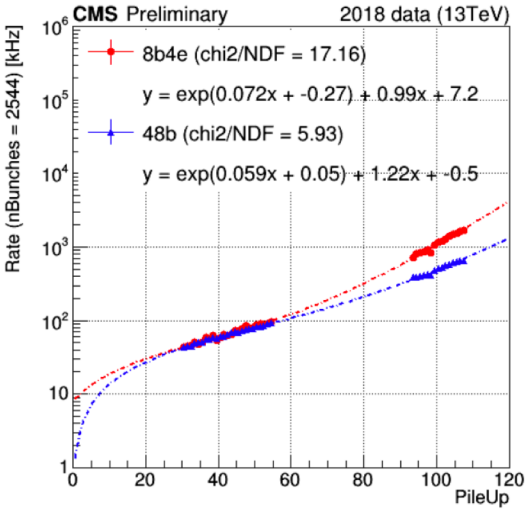
CMS	% of Req.
54,000	8%
6,100	9%
18,700	9%

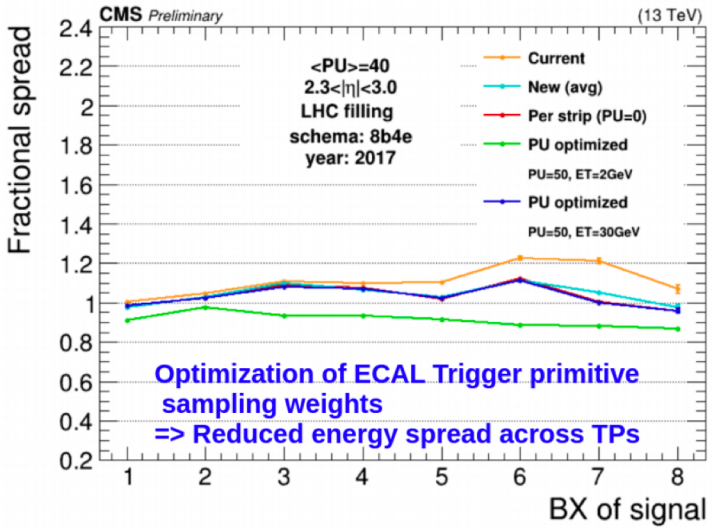
- At T1, CMS requests disk & tape, but no CPU for 2021
- After discussions with Eric Fede, we focused on disk this year, as we are expecting to change the tape technology for 2021
- A modest boost of CPU was also deemed necessary for our T1
- Expect our 2021 pledge to focus heavily on tape

From the LHCC open session

Run 3 preparations for physics

- Integration of new detector features (e.g. HCAL depths information) at trigger/reconstruction level is ongoing.
- Huge efforts preparing software for Run3.
  - Increase fast sim quality, speedup full sim (already 10% faster than in Run2)
  - Optimizing usage of data tiers, advertising and developing light data formats.
- Assessing/mitigating the impact of Run 3 data taking conditions.
  - One example: ECAL/Level 1 sensitivity to pile up and LHC bunch crossing scheme.





Other news

- Now routinely running w/ 250k cores. large scale test of HTcondor with 0.5 million (virtual) cores was done
- CMS includes a 15% margin on tape storage, which WLCG has recommended to remove. Communication is ongoing (?) with T1s to define tape recycling procedures, resource planning, etc., given that different technologies and practices are employed at each site
- CMS Computing TDR to be submitted to LHCC in 2023. ECoM2X document expected this month is crucial input.

Summary

- Still in intense period of Run 2 production, fully utilizing resources
- Run 3 preparations are ramping up, with HL-LHC upgrade work continuing
- Resource requests for Run 3 taking shape, but still have large uncertainties due to ongoing LHC schedule discussions and poorly know accelerator parameters