

CMS Report

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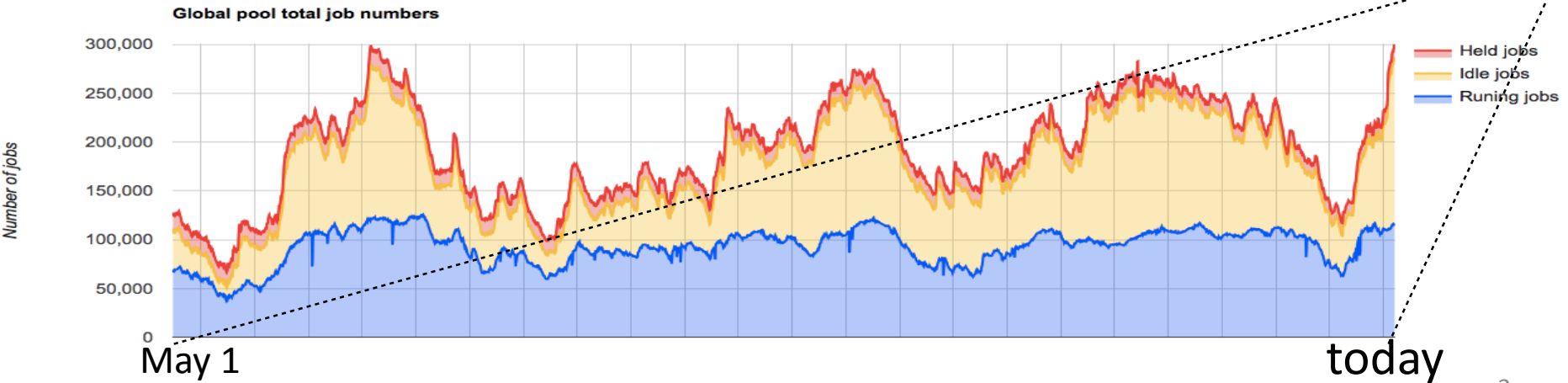
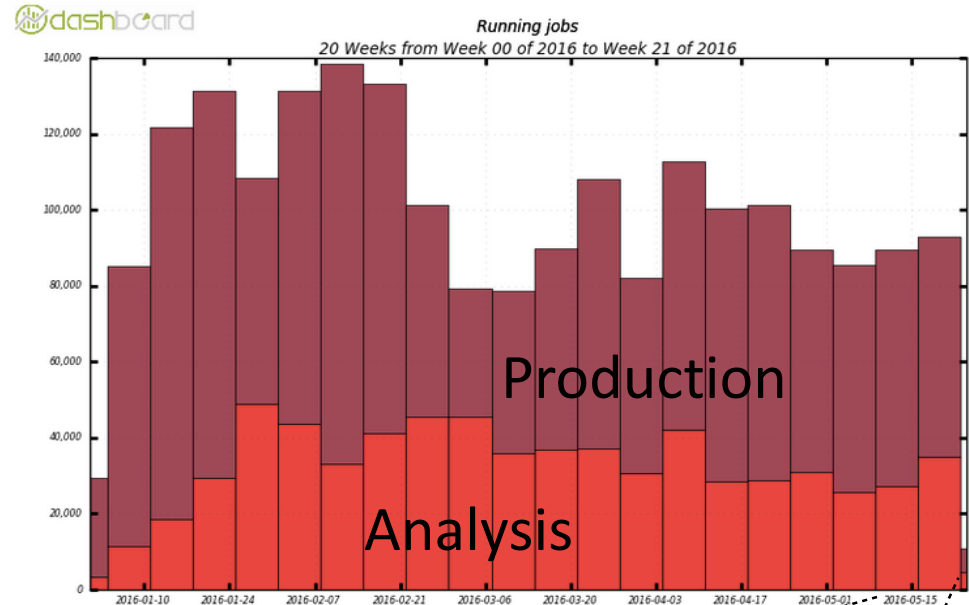
David Lange

CMS offline/computing management changes

- CMS is now stably operating with 2 offline+computing project coordinators
 - Each having a 2 year term
 - Staggered as to have one coordinator per year
- September 1: D. Lange replaced by Liz Sexton-Kennedy (FNAL)

Resource usage remains high

- Global pool running at ~100k jobs regularly



Distributed analysis at all time high

- Unprecedented levels in 2016

- # of distinct individuals per week
- slots used at all Tier levels

- Started with a ramp at Run-1 levels

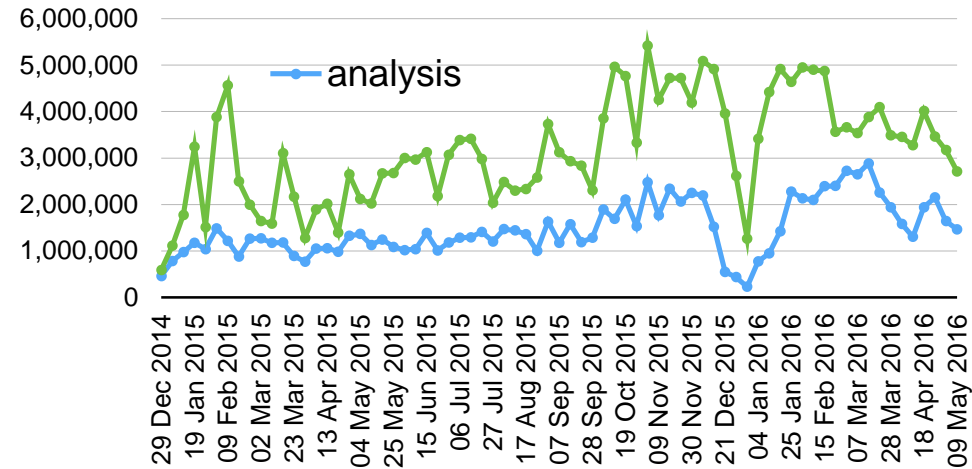
- to complete Moriond analyses

- Continued to stay high

- as samples - on average - started on be available more and more quickly

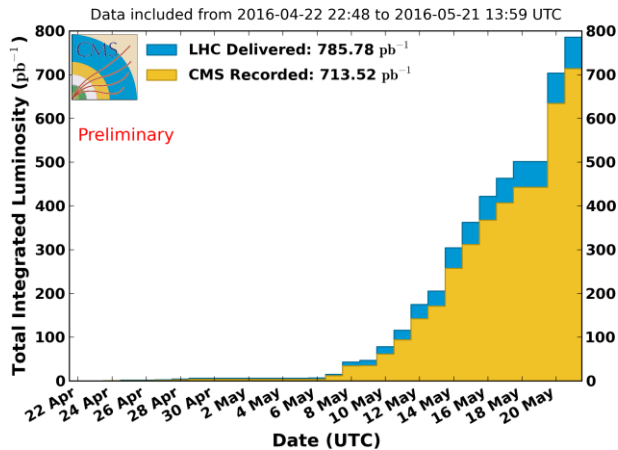
- Bigger load continues to be our best “real-life” test of LS1 (and beyond) improvements

- good also as we now have collected sufficient data on miniAOD usage for study later in the year



Tier-0 operations for 2016 run going well

CMS Integrated Luminosity, pp, 2016, $\sqrt{s} = 13$ TeV



- 2016 Tier-0 software and CMSSW software version deployed and running smoothly
 - Major changes in both areas are already complete
- New monitoring in place and regularly used by experts and shifters
- Starting preparation work for p-Pb run for Heavy Ion program. We will (again) rely on very good throughput into EOS from P5

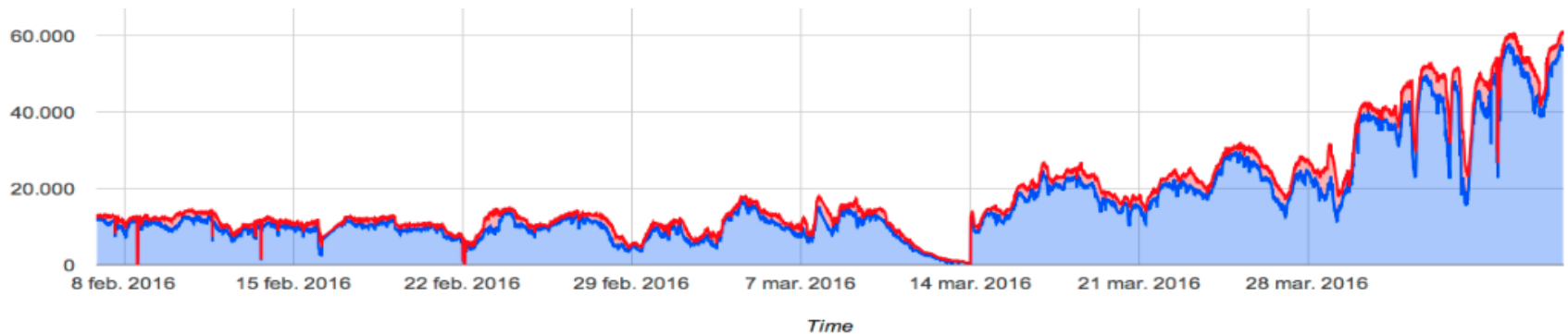
of jobs
(mostly 4 core)

TIER-0 JOBS @ TO_CH_CERN



Tier-2 pilots transitioned to multicore

- Campaign undertaken during February and March to have multicore pilots deployed across CMS Tier-2s for MC production which started in April



- Now in good shape for deploying multicore MC
 - **Tier-1 and Tier-2 resources ready**
 - **CMSSW software for 2016 ready**
 - We are in the process of deploying changes in CMS submission infrastructure to match # of cores to request to available cores
 - We anticipate to always have resources with a variable set of available cores (e.g., opportunistic resources with Ncore=1)

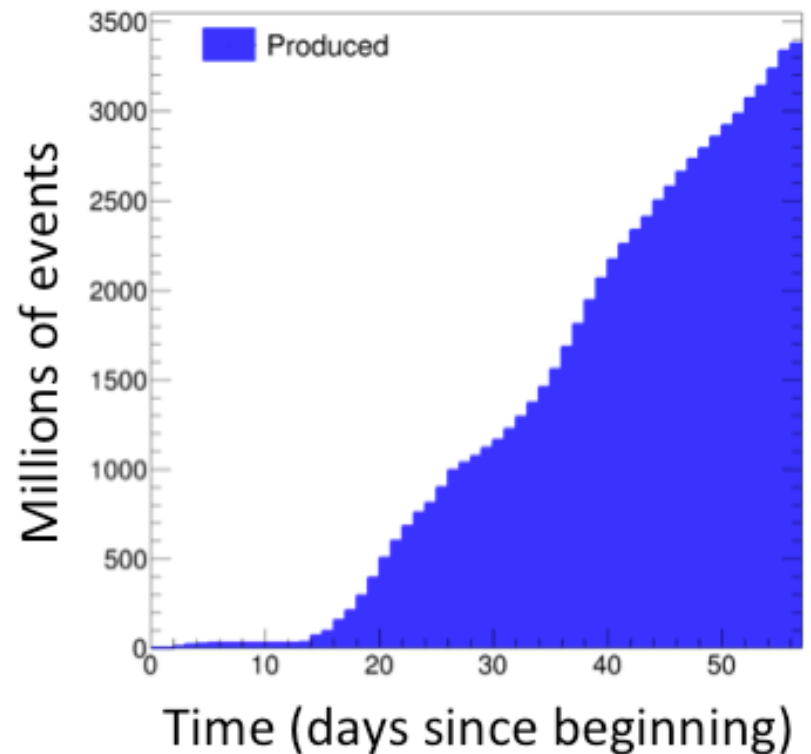
Multicore pilots now stably running

- Global pool now running multicore pilots for the vast majority of CMS resources
 - Transition to m-core at T1 done in late 2015
 - Transition to m-core for (most) T2s since Feb-March 2016



Major Monte Carlo campaign underway and going according to our planning

- Given large luminosity expected to be available this summer, large samples are needed to enable the CMS analysis program.
 - **Our initial focus is on samples needed for analysis results planned for ICHEP**
 - Most samples use existing detector simulation samples so that resources are fully focused on the digitization and reconstruction
 - **After ICHEP we expect to include several improvements for the remaining 2016 MC production campaign**



Workflow changes for upgraded L1 Trigger

- A major Level-1 trigger upgrade has been deployed for 2016 data taking
 - Good trigger emulation important for MC simulation production (and data taking).
 - The upgraded trigger simulation was not part of our initial production as the development for much of this upgrade is just now finishing
- Solution: Save temporarily the raw data in simulation samples where the accurate trigger results are required
 - Once the L1+HLT workflow is fully validated, we will then run them over the raw information and update the AOD (without redoing the reconstruction)
 - Thank you to CERN for providing CMS temporary EOS storage to enable this workflow.

Software development towards 2017

- Major detector changes planned for 2017
 - All new pixel detector including 4th layer of pixels
 - Especially important as pileup increases as the upgrade addresses both data flow limitations in current detector
 - Biggest impact for software is new track seeding capabilities given 4th layer
 - Upgraded electronics in HCAL endcap
 - This upgrade was previously planned for LS2 but has been partially moved to the EYETS given aging effects observed during data taking
 - Provide TDC capability and effective depth segmentation

CMS will produce all new detector simulation samples for 2017-2018 data taking. Major reconstruction software changes planned to be ready for production before data taking starts

Software for
HL-LHC TDRs in
developed at
the same time

Detector simulation and Geant4

- Detector simulation is among the most important CMS software developments for 2016. Primary goals are
 - Final 2017 detectors (Pixel, HCAL)
 - TDR version of HL-LHC detectors (primarily tracker, endcap calorimeter, muons)
 - Update of Geant4 and physics lists
 - We see substantial physics changes between simulations done with 10.0, 10.1 and 10.2
 - Has prompted us to revive test beam analysis
 - Discuss with the Geant4 hadronic physics group underway

We expect all of these effects to converge in the all for MC sample production in time for 2017 running and TDR timelines

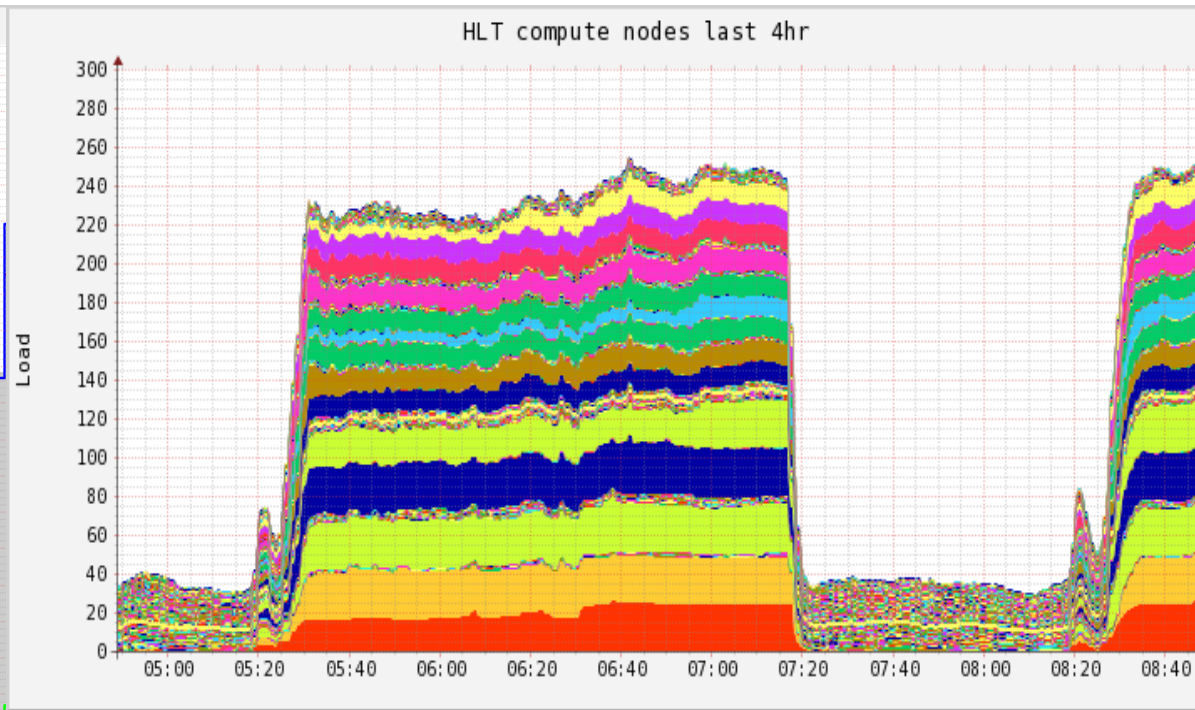
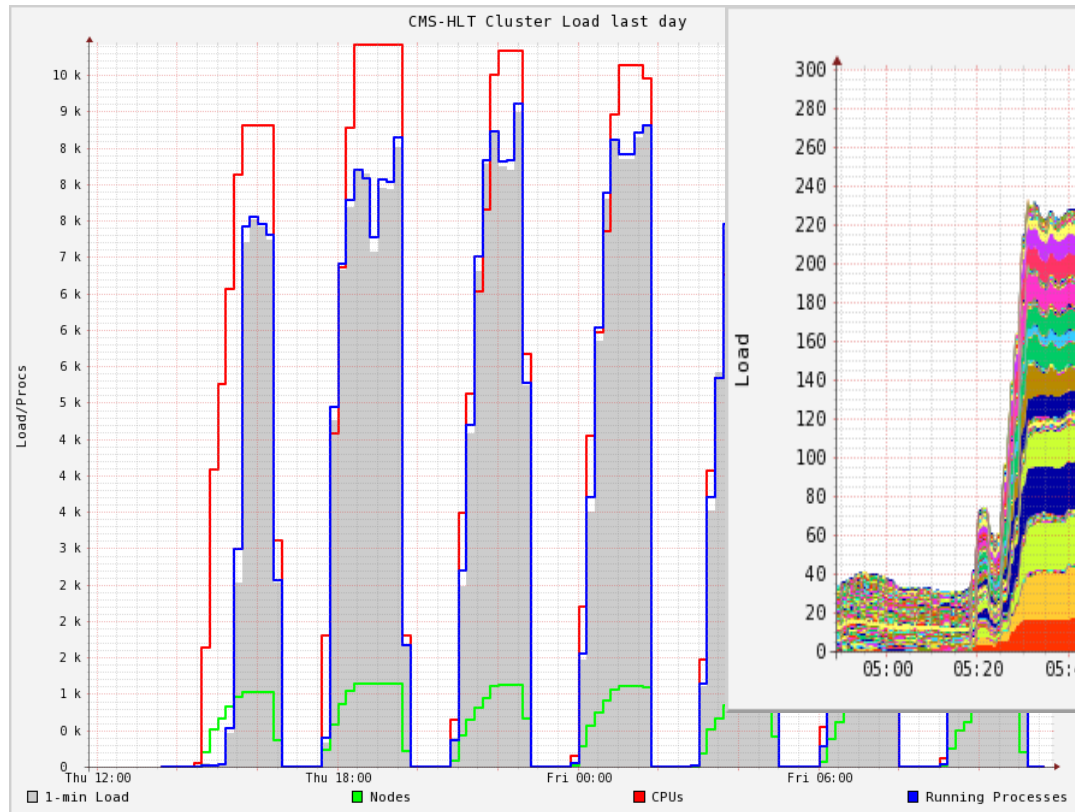
Conclusion

- 2016 startup going well. Resource usage is high and is expected to continue given LHC performance
- Lots of new development in parallel:
 - Transition to multicore for all workflows
 - Exploitation of opportunistic resources
 - 2017 and HL-LHC simulation and reconstruction projects

Work towards efficient use of HLT “cloud” in interfill periods continues to advance

Cycling tests

Load on hypervisors



- Next studies: Improve overall efficiency by pausing VMs