LHCb Computing Report

Stefan Roiser

LHCC Referees Meeting

1 March 2016
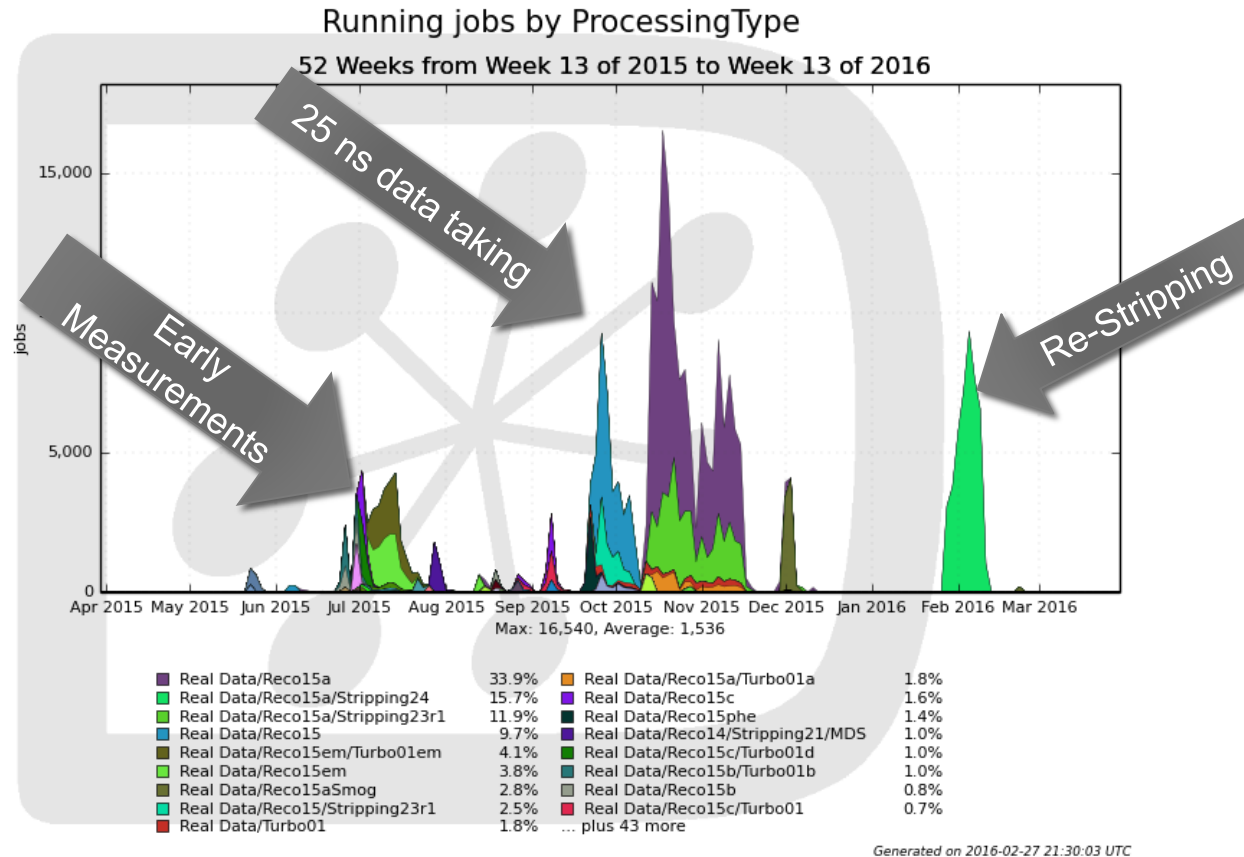
Changes in LHCb Computing Project

Computing Project Leader	Stefan Roiser	
Deputy Computing Project Leader	Andrew McNab	Changes as of January
Resource Coordinator	Concezio Bozzi	
Software Coordinator	Marco Cattaneo	
Distributed Computing Coordinator	Philippe Charpentier	
External Relations Coordinator	Peter Clarke	

Recap 2015 data processing activities

- All data processing during 2015 as planned
  - NO re-reconstruction of FULL stream data
    - Final Calibration/Alignment done in the pit
  - One re-stripping after data taking

Running jobs by ProcessingType
52 Weeks from Week 13 of 2015 to Week 13 of 2016

25 ns data taking

Early Measurements

Re-Stripping

Max: 16,540, Average: 1,536

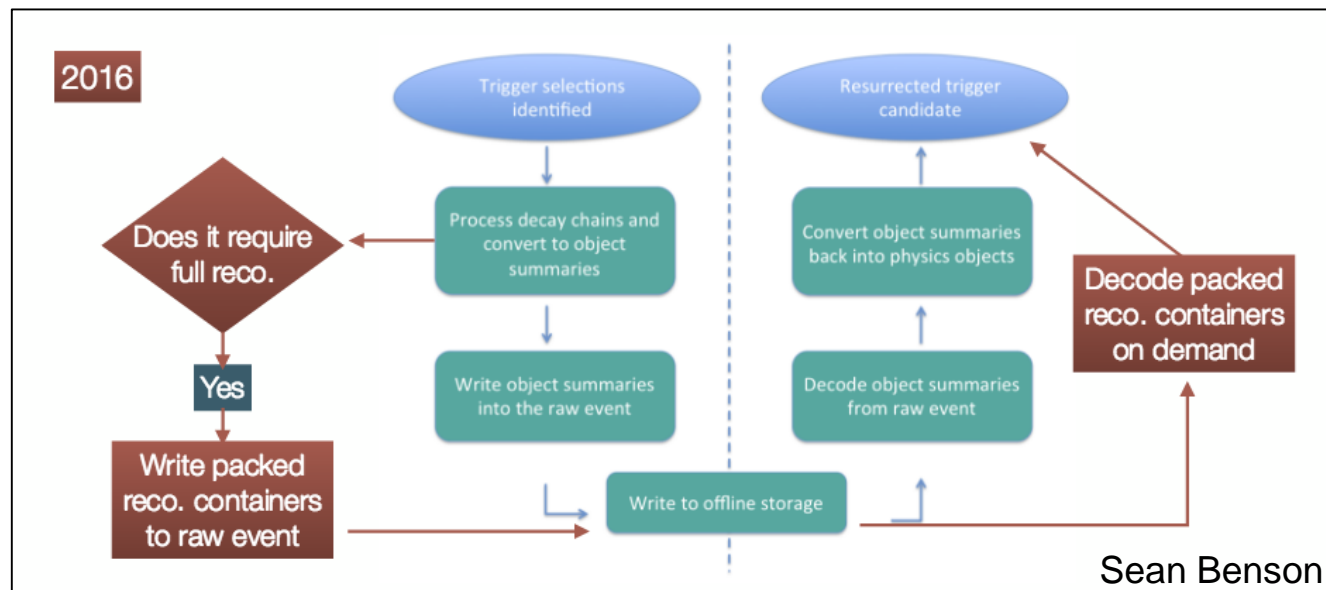|			
Real Data/Reco15a	33.9%	Real Data/Reco15a/Turbo01a	1.8%
Real Data/Reco15a/Stripping24	15.7%	Real Data/Reco15c	1.6%
Real Data/Reco15a/Stripping23r1	11.9%	Real Data/Reco15phe	1.4%
Real Data/Reco15	9.7%	Real Data/Reco14/Stripping21/MDS	1.0%
Real Data/Reco15em/Turbo01em	4.1%	Real Data/Reco15c/Turbo01d	1.0%
Real Data/Reco15em	3.8%	Real Data/Reco15b/Turbo01b	1.0%
Real Data/Reco15aSmog	2.8%	Real Data/Reco15b	0.8%
Real Data/Reco15/Stripping23r1	2.5%	Real Data/Reco15c/Turbo01	0.7%
Real Data/Turbo01	1.8%	... plus 43 more	

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Turbo stream

- Provides reconstructed physics objects out of the HLT
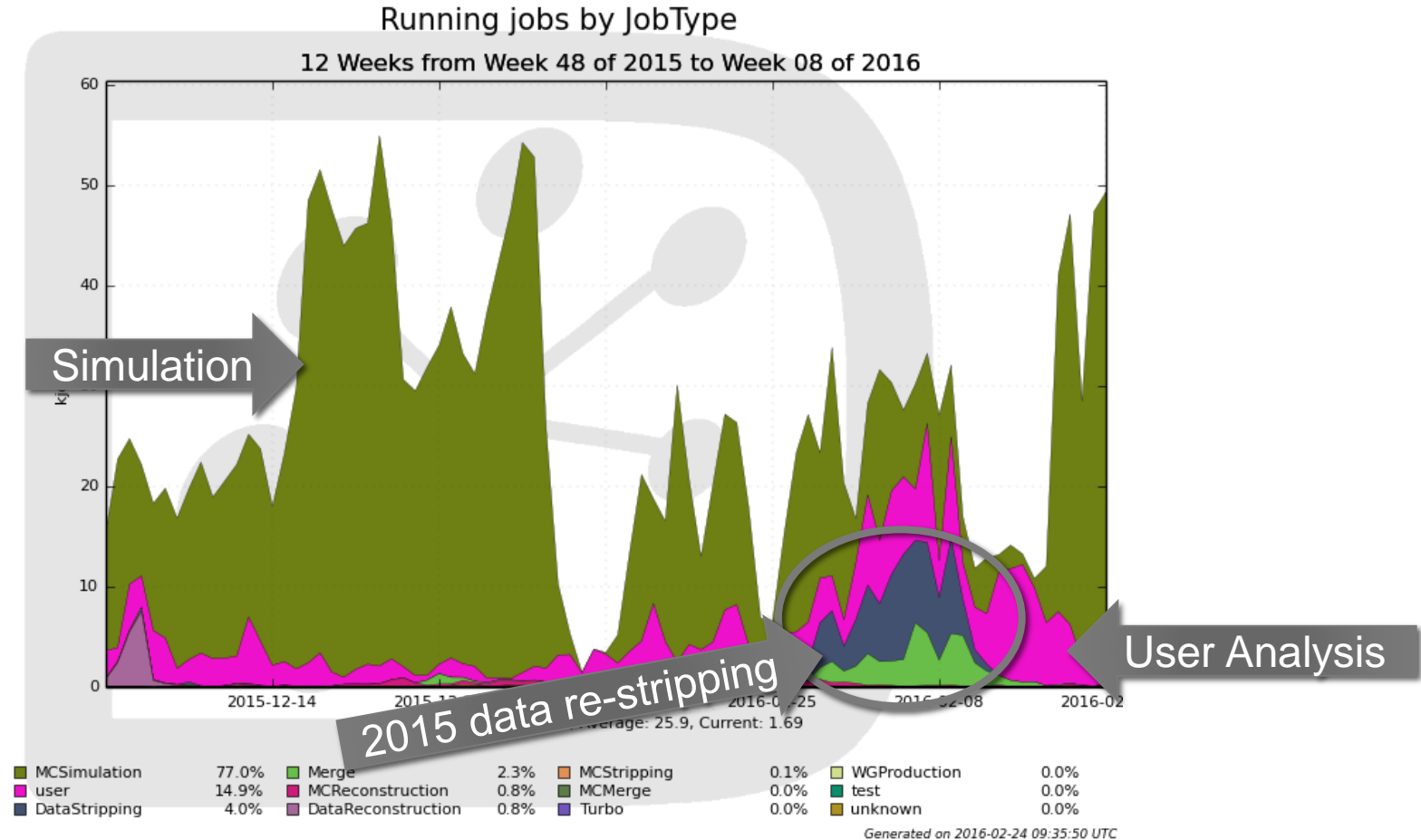
- As of 2016 allow to add more selected reconstruction info to TURBO stream

  - To be used for selected lines
  - One size does NOT fit all

Sean Benson

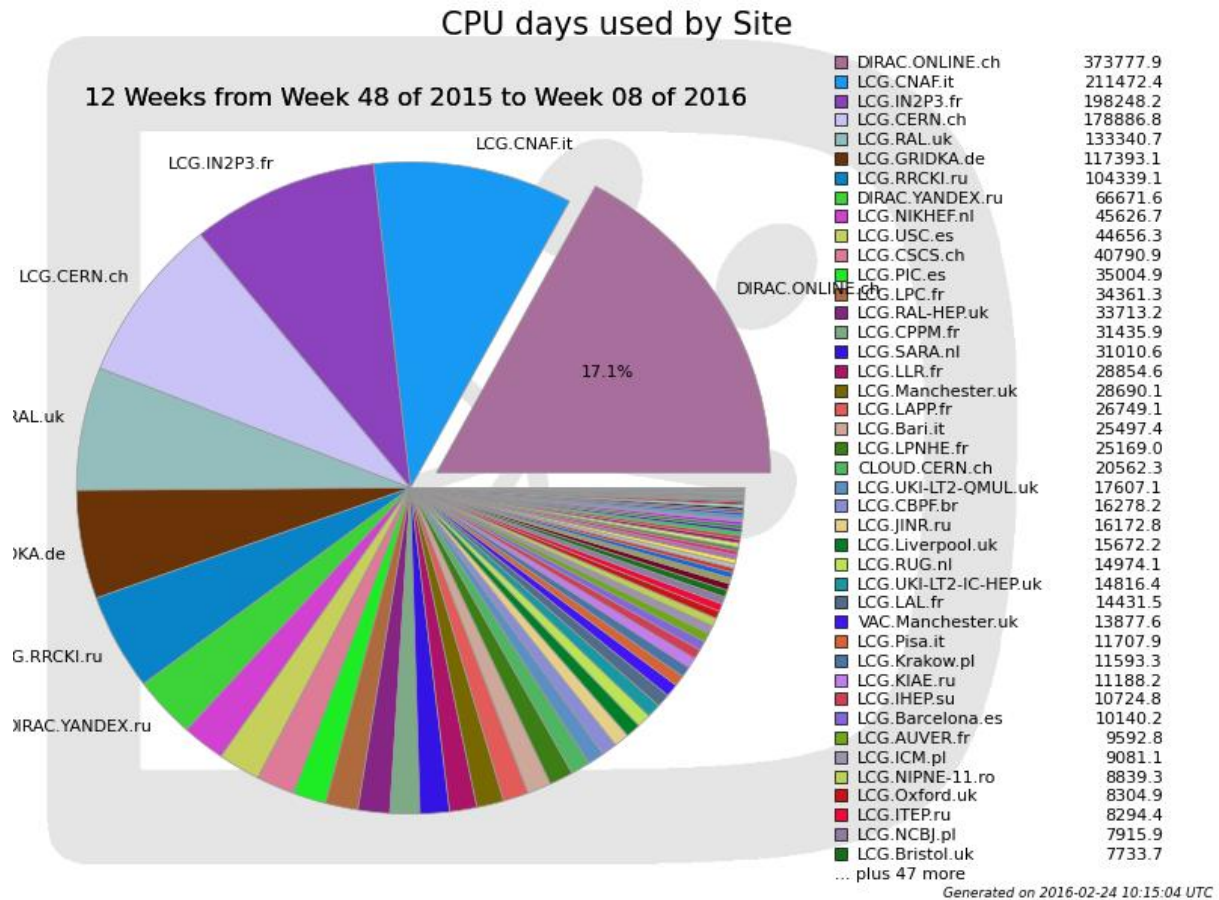- Plan to move even more physics streams from FULL stream to TURBO stream during Run 2

Computing Operations Dec – Feb

Running jobs by JobType

12 Weeks from Week 48 of 2015 to Week 08 of 2016

Simulation

2015 data re-stripping

User Analysis

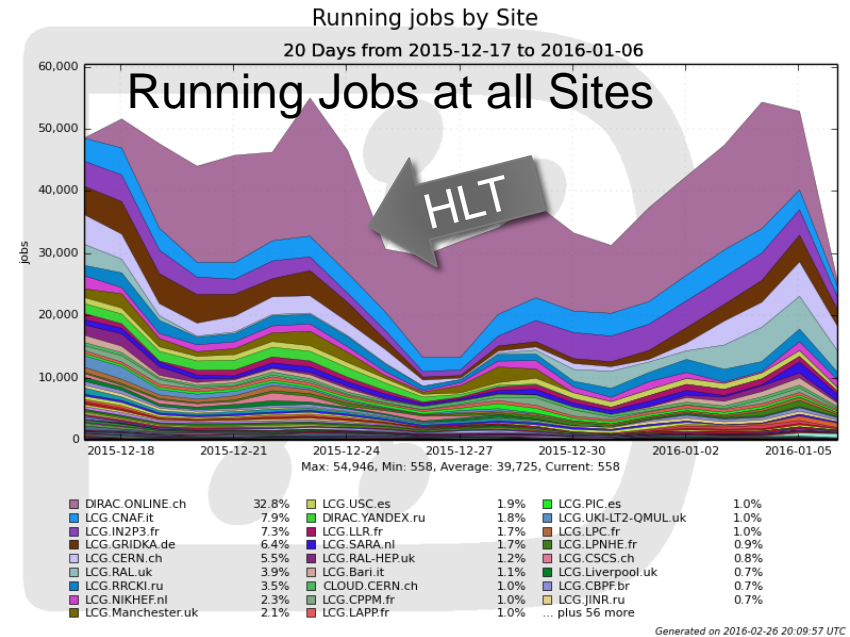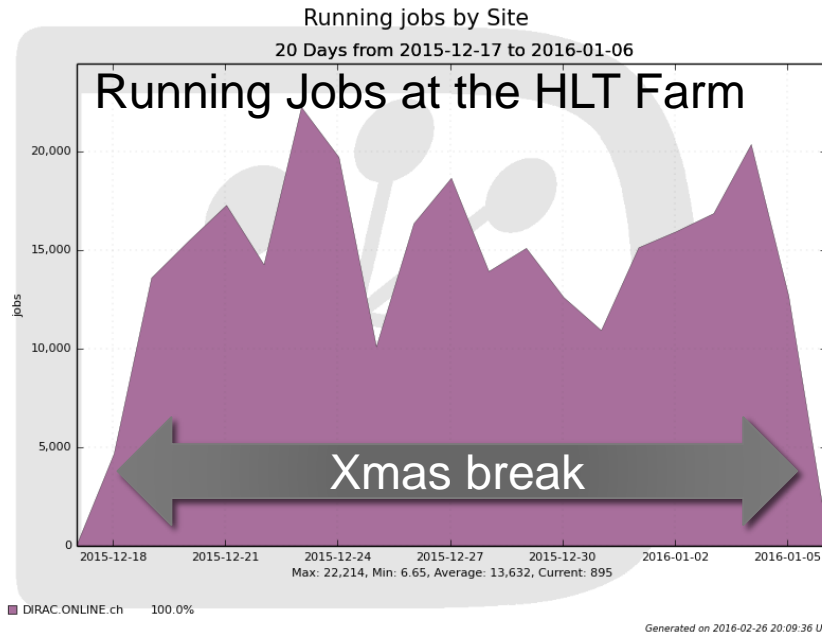|							
■ MCSimulation	77.0%	■ Merge	2.3%	■ MCStripping	0.1%	□ WGProduction	0.0%
■ user	14.9%	■ MCReconstruction	0.8%	■ MCMerge	0.0%	■ test	0.0%
■ DataStripping	4.0%	■ DataReconstruction	0.8%	■ Turbo	0.0%	■ unknown	0.0%

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- Dominated by Simulation
  - especially high usage during the Xmas break

CPU Usage Dec – Feb

Provisioning by resource type:

- 50 % CERN + T1 sites
- 35 % T2 sites
- 15 % HLT farm

CPU days used by Site

12 Weeks from Week 48 of 2015 to Week 08 of 2016

LCG.IN2P3.fr LCG.CNAF.it

LCG.CERN.ch

DIRAC.ONLINE.ch

17.1%

RAL.uk

)KA.de

G.RRCKI.ru

)IRAC.YANDEX.ru

Site	CPU days
DIRAC.ONLINE.ch	373777.9
LCG.CNAF.it	211472.4
LCG.IN2P3.fr	198248.2
LCG.CERN.ch	178886.8
LCG.RAL.uk	133340.7
LCG.GRIDKA.de	117393.1
LCG.RRCKI.ru	104339.1
DIRAC.YANDEX.ru	66671.6
LCG.NIKHEF.nl	45626.7
LCG.USC.es	44656.3
LCG.CSCS.ch	40790.9
LCG.PIC.es	35004.9
LCG.LPC.fr	34361.3
LCG.RAL-HEP.uk	33713.2
LCG.CPPM.fr	31435.9
LCG.SARA.nl	31010.6
LCG.LLR.fr	28854.6
LCG.Manchester.uk	28690.1
LCG.LAPP.fr	26749.1
LCG.Bari.it	25497.4
LCG.LPNHE.fr	25169.0
CLOUD.CERN.ch	20562.3
LCG.UKI-LT2-QMUL.uk	17607.1
LCG.CBPF.br	16278.2
LCG.JINR.ru	16172.8
LCG.Liverpool.uk	15672.2
LCG.RUG.nl	14974.1
LCG.UKI-LT2-IC-HEP.uk	14816.4
LCG.LAL.fr	14431.5
VAC.Manchester.uk	13877.6
LCG.Pisa.it	11707.9
LCG.Krakow.pl	11593.3
LCG.KIAE.ru	11188.2
LCG.IHEP.su	10724.8
LCG.Barcelona.es	10140.2
LCG.AUVER.fr	9592.8
LCG.ICM.pl	9081.1
LCG.NIPNE-11.ro	8839.3
LCG.Oxford.uk	8304.9
LCG.ITEP.ru	8294.4
LCG.NCBJ.pl	7915.9
LCG.Bristol.uk	7733.7

… plus 47 more

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HLT farm usage

Running jobs by Site
20 Days from 2015-12-17 to 2016-01-06

Running Jobs at the HLT Farm

Xmas break

Max: 22,214, Min: 6.65, Average: 13,632, Current: 895

DIRAC.ONLINE.ch   100.0%

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Running jobs by Site
20 Days from 2015-12-17 to 2016-01-06

Running Jobs at all Sites

HLT

Max: 54,946, Min: 558, Average: 39,725, Current: 558

DIRAC.ONLINE.ch	32.8%	LCG.USC.es	1.9%	LCG.PIC.es	1.0%
LCG.CNAF.it	7.9%	DIRAC.YANDEX.ru	1.8%	LCG.UKI-LT2-QMUL.uk	1.0%
LCG.IN2P3.fr	7.3%	LCG.LLR.fr	1.7%	LCG.LPC.fr	1.0%
LCG.GRIDKA.de	6.4%	LCG.SARA.nl	1.7%	LCG.LPNHE.fr	0.9%
LCG.CERN.ch	5.5%	LCG.RAL-HEP.uk	1.2%	LCG.CSCS.ch	0.8%
LCG.RAL.uk	3.9%	LCG.Bari.it	1.1%	LCG.Liverpool.uk	0.7%
LCG.RRCKI.ru	3.5%	CLOUD.CERN.ch	1.0%	LCG.CBPF.br	0.7%
LCG.NIKHEF.nl	2.3%	LCG.CPPM.fr	1.0%	LCG.JINR.ru	0.7%
LCG.Manchester.uk	2.1%	LCG.LAPP.fr	1.0%	... plus 56 more	

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- Over Xmas break the HLT farm provided additional 30 % of resources

- The farm was/is also used for other tasks such as sub-detector calibrations and bandwidth division tests
  - Either in common with distributed computing or reserved only for those

CPU Usage for 2015 requests

REGION	lhcb
AfricaArabia	0
AsiaPacific	0
CERN	146,997,680
NGI_AEGIS	0
NGI_ARMGRID	0
NGI_BG	1,481,552
NGI_CH	7,610,152
NGI_CHINA	0
NGI_CZ	0
NGI_DE	129,315,896
NGI_FRANCE	374,537,512
NGI_GRNET	4
NGI_HR	0
NGI_HU	0
NGI_IBERGRID	111,990,272
NGI_IL	722,368
NGI_IT	265,840,228
NGI_NDGF	0
NGI_NL	139,494,228
NGI_PL	53,922,632
	9,523,104
	0
NGI_SK	0
NGI_TR	0
NGI_UA	0
NGI_UK	370,584,140
ROC_Canada	0
ROC_LA	16,532,128
Russia	164,764,412
Total	**1,793,316,308**

LHCb CPU 2015 CPU requests
[LHCb-PUB-2014-041]

| CPU Work in WLCG year (kHS06.years)	2015
Prompt Reconstruction	19
First pass Stripping	8
Full Restripping	8
Incremental Restripping	0
Simulation	134
VoBoxes and other services	
User Analysis	17
Total Work (kHS06.years)	**186**
Efficiency corrected average power (kHS06)	**220**

≈ 204.7

Convert from HS06.hours

- Currently ~ 10 % above 2015 requests
- LHCb supports the MB proposal to move to wall clock time for CPU accounting

Disk Usage
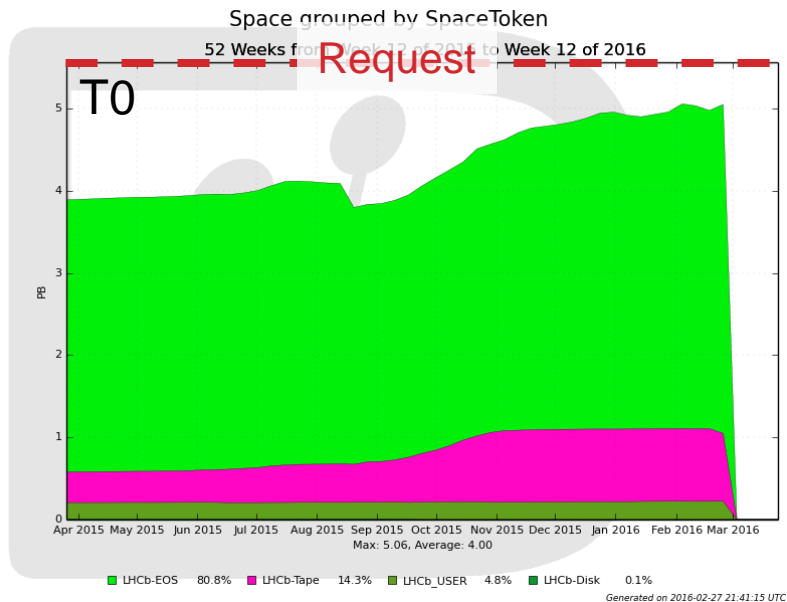
- Good usage of 2015 pledges
- Slightly below at CERN, good match at T1 & T2 sites
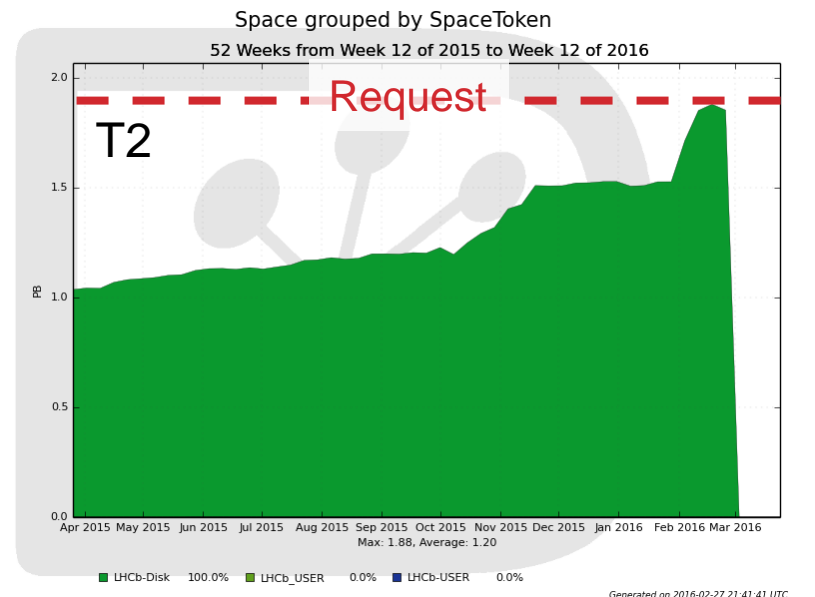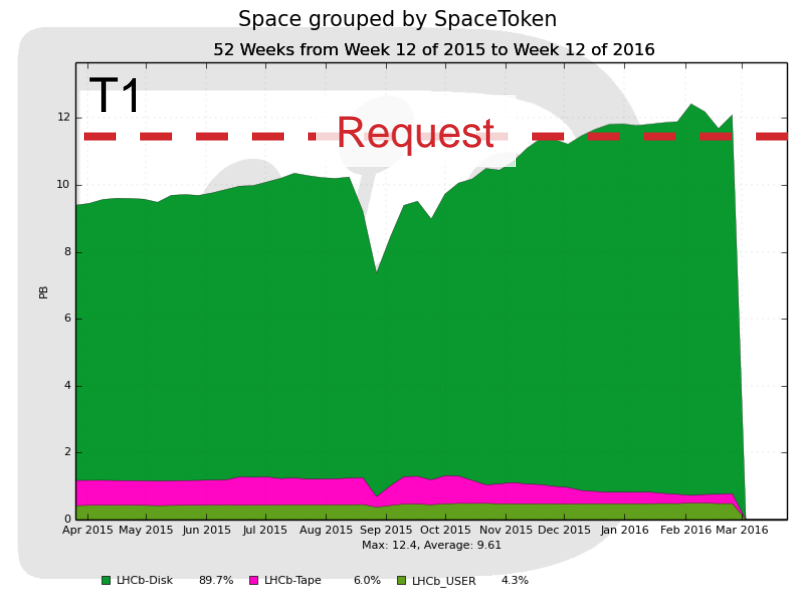
Next data processing steps

- Before restart of data taking
  - Finish Run 2 incremental stripping
  - Turbo reprocessing
    - NB: 2015 data also contained RAW information which allows this
  - Run 1 incremental stripping
    - Currently pre-staging the input data
  - Several other smaller campaigns (proton-Argon Stripping, PbPb processing)
- Sim 09
  - Next version of the simulation framework
  - Currently in validation

Upgrade Work towards Run 3

- Big upgrade step for LHCb for Run 3 in all areas
  - Run 4 upgrade comparably small to this step
- Currently finishing a "roadmap document"
  - To assess current situation, identify areas of needed improvements, estimate person power needed
  - Focus on improvements in applications
    - Event Model, Framework, Adoption of new platforms, Simulation,
- Computing TDR to be released by Q4/2017
- Personpower situation possibly a big concern
  - Operations of Run 2 in conflict with the upgrade activities

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  - Operations of Run 2 in conflict with the upgrade activities

Roadmap discussed with collaboration next week
Detailed presentation to LHCC planned for June

Summary

- Very good usage of 2015 requested cpu & disk resources
- Very good usage of HLT farm resources
  - +30 % additional resources over Xmas break
- Several more big data processing campaigns planned before 2016 data taking

- Next big computing step is the preparation for Run 3
  - Concrete planning has started. Several decision points by the end of this year.
  - TDR by end of 2017
  - More details at the forthcoming LHCC meeting

Summary slide

LHCb Summary

- Very good usage of computing resources

- 2015 WLCG resources
  - CPU requests already used up
  - Almost all disk resources used

- HLT farm
  - E.g. additional 30 % of resources over Xmas break

- LHCb currently concentrating on upgrade for Run 3
  - Computing TDR scheduled for Q4/17
  - Roadmap discussed next week within the collaboration
  - Detailed information to the LHCC to be given in June

Running jobs by Site
20 Days from 2015-12-17 to 2016-01-06

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LCG.GRIDKA.de	6.4%	LCG.SARA.nl	1.7%	LCG.LPNHE.fr	0.9%
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