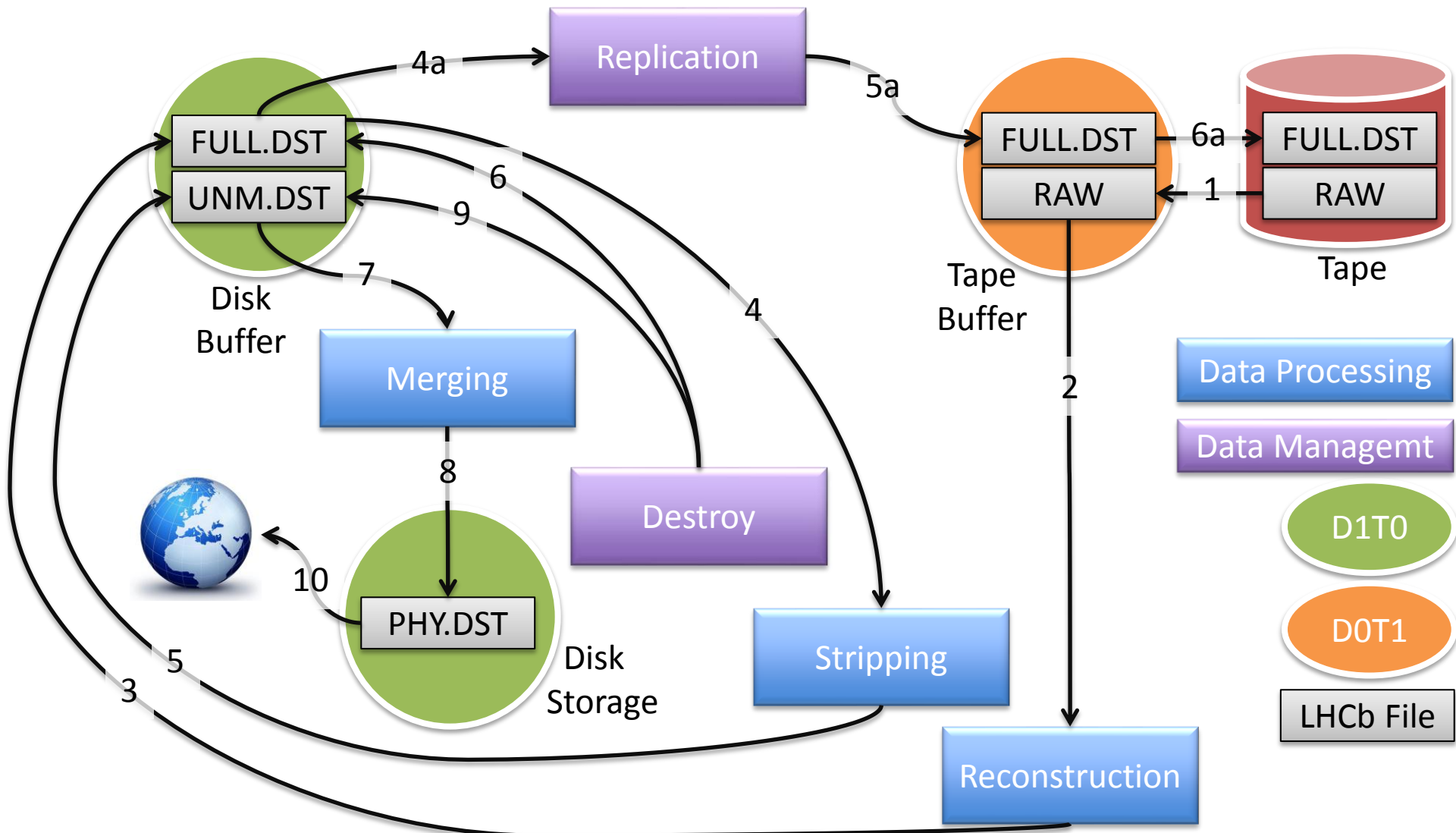# LHCb Grid Operations

Stefan Roiser

IT/ES

2012 Reprocessing

- Current main activity in distributed computing
  - Will last until end of this year for 2012 data
  - Q1/2013 will start processing of 2011 data
- Progressing very well, ahead of schedule
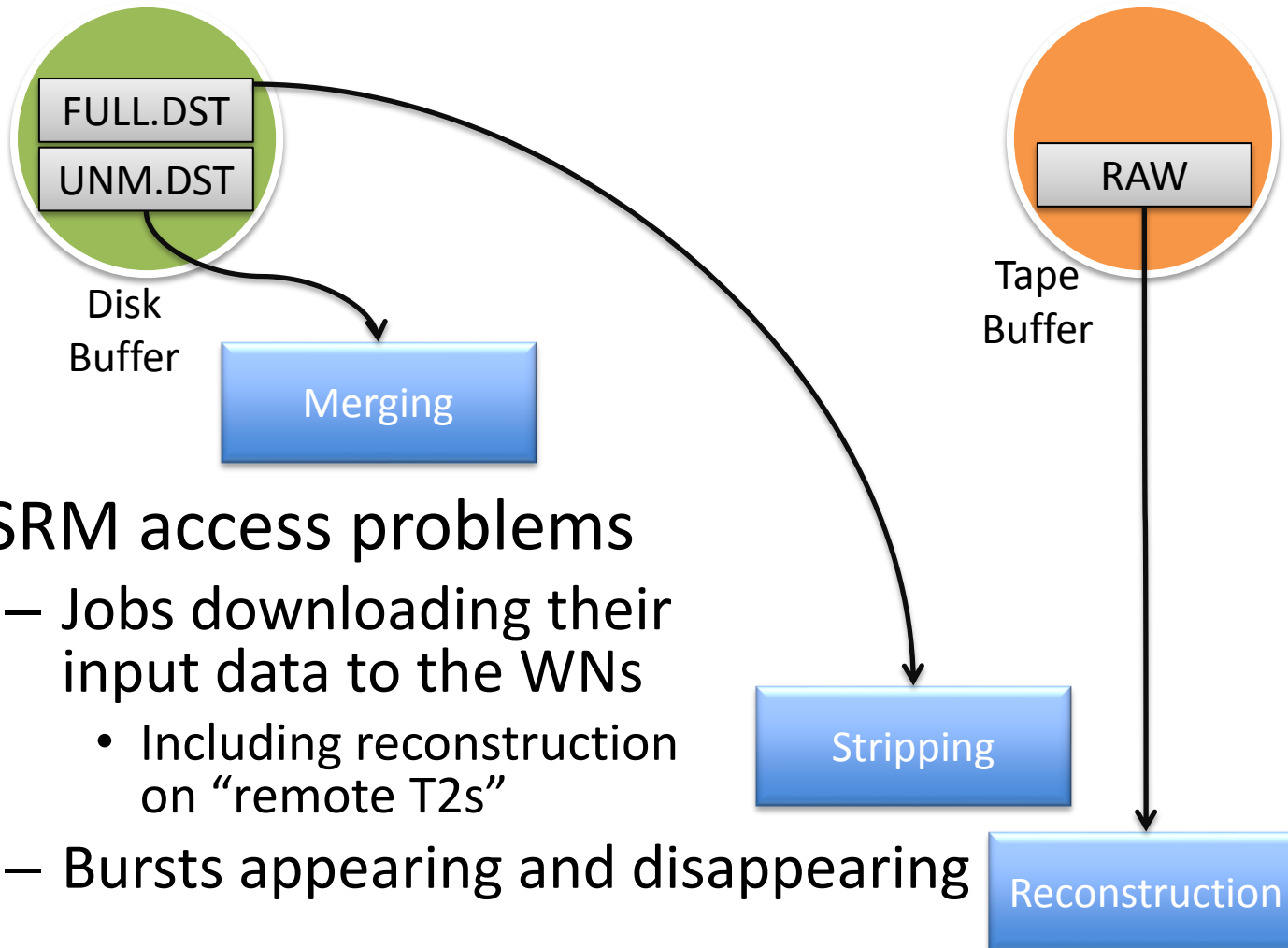 - Few site specific issues concerns mainly in data management

Data Processing Workflow

FULL.DST = reconstructed physics quantities

UNM.DST = temporary output for physics stream, PHY.DST = file ready for physics user analysis

Data access by jobs
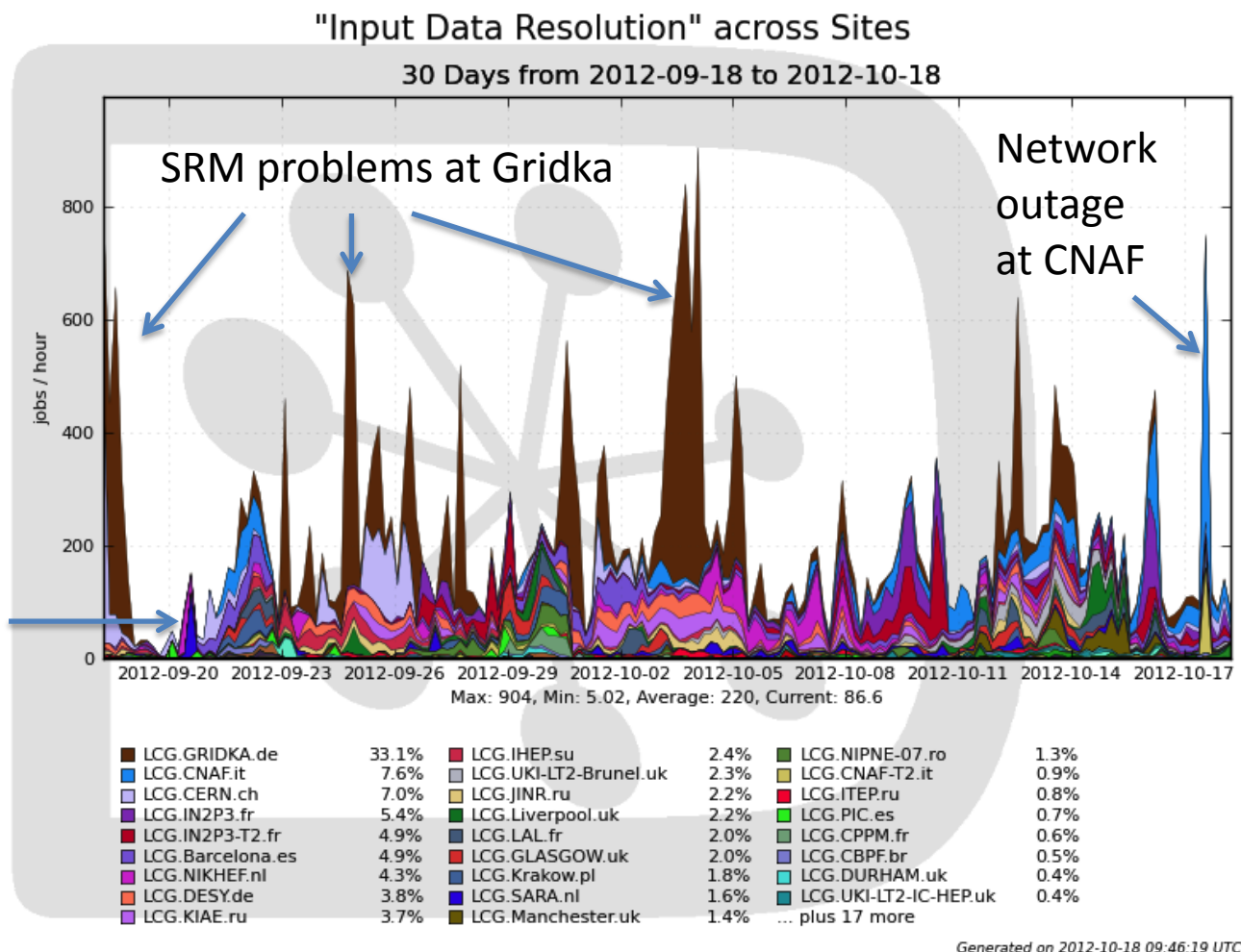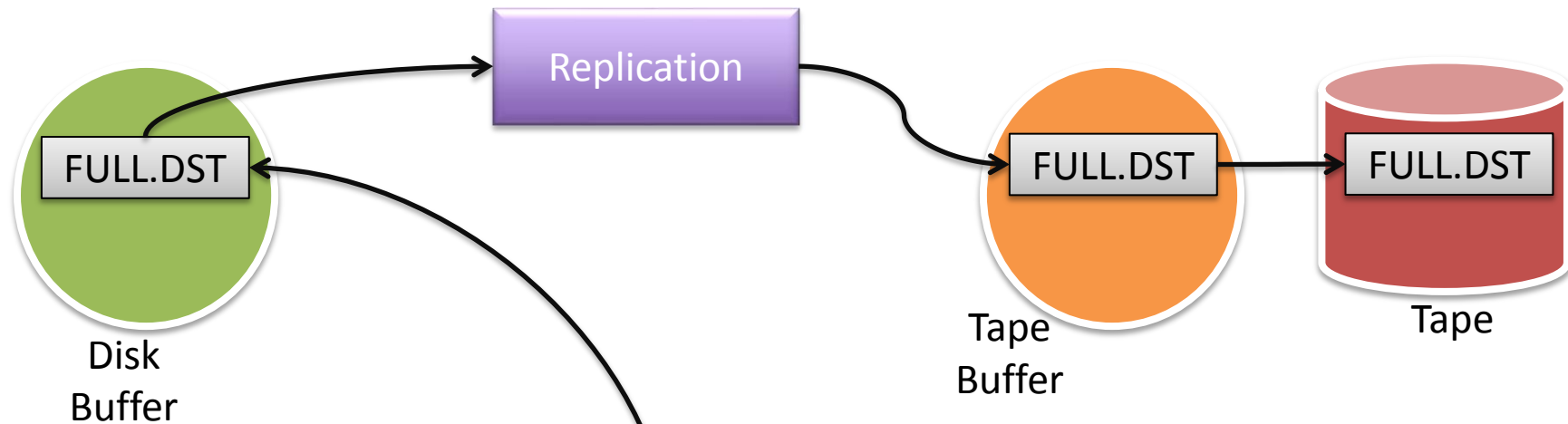
FULL.DST

UNM.DST

Disk Buffer

RAW

Tape Buffer

Merging

Stripping

Reconstruction

- **SRM access problems**
  - Jobs downloading their input data to the WNs
    - Including reconstruction on "remote T2s"
  - Bursts appearing and disappearing

Data access by jobs (ctd)

"Input Data Resolution" across Sites
30 Days from 2012-09-18 to 2012-10-18

SRM problems at Gridka

Network outage at CNAF

"Remote" Tier2s not finding input data , network congestion, ...

Max: 904, Min: 5.02, Average: 220, Current: 86.6

LCG.GRIDKA.de	33.1%	LCG.IHEP.su	2.4%	LCG.NIPNE-07.ro	1.3%
LCG.CNAF.it	7.6%	LCG.UKI-LT2-Brunel.uk	2.3%	LCG.CNAF-T2.it	0.9%
LCG.CERN.ch	7.0%	LCG.JINR.ru	2.2%	LCG.ITEP.ru	0.8%
LCG.IN2P3.fr	5.4%	LCG.Liverpool.uk	2.2%	LCG.PIC.es	0.7%
LCG.IN2P3-T2.fr	4.9%	LCG.LAL.fr	2.0%	LCG.CPPM.fr	0.6%
LCG.Barcelona.es	4.9%	LCG.GLASGOW.uk	2.0%	LCG.CBPF.br	0.5%
LCG.NIKHEF.nl	4.3%	LCG.Krakow.pl	1.8%	LCG.DURHAM.uk	0.4%
LCG.DESY.de	3.8%	LCG.SARA.nl	1.6%	LCG.UKI-LT2-IC-HEP.uk	0.4%
LCG.KIAE.ru	3.7%	LCG.Manchester.uk	1.4%	... plus 17 more	

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Data Migration Disk -> Tape

Replication

FULL.DST

FULL.DST

FULL.DST

Disk Buffer

Tape Buffer

Tape

Destroy
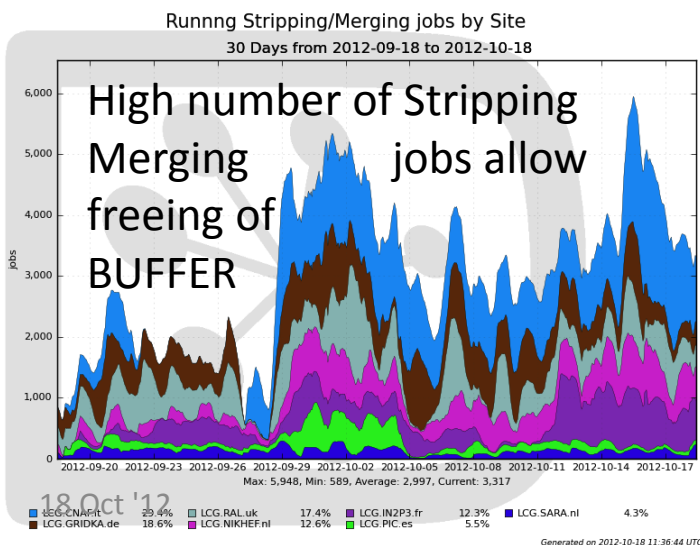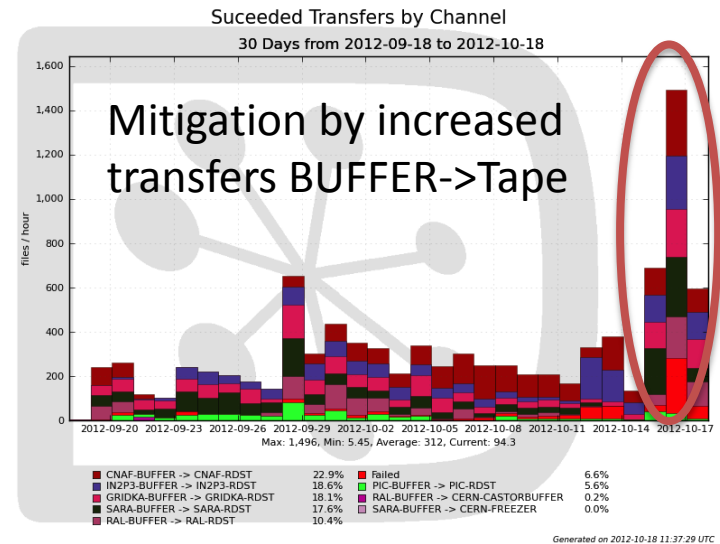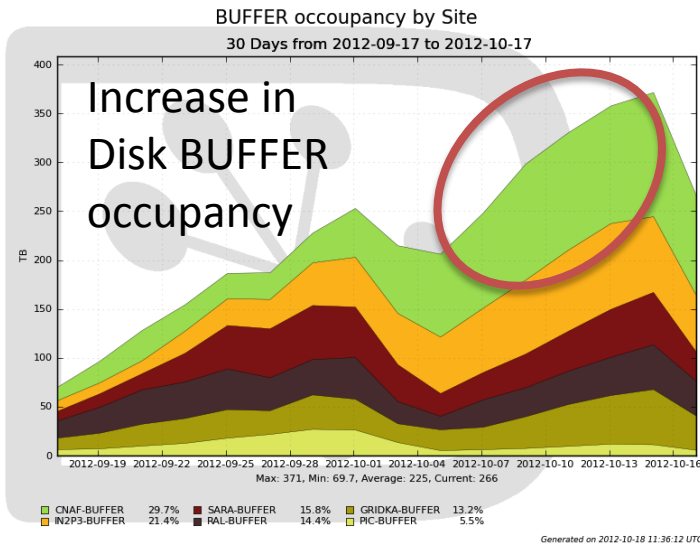
- FULL.DSTs are not only   produced by Tier1s but also "attached Tier2s"
  - Consequently   stress on disk buffer
  - Essential to migrate data efficiently onto Tape in order to let FULL.DSTs be deleted afterwards
- BUFFER is on the same SE than production data
  - Filling up the BUFFER can jeopardize the storage

Data Migration Disk -> Tape (ctd)

BUFFER occupancy by Site
30 Days from 2012-09-17 to 2012-10-17

Increase in Disk BUFFER occupancy

Suceeded Transfers by Channel
30 Days from 2012-09-18 to 2012-10-18

Mitigation by increased transfers BUFFER->Tape

Runnng Stripping/Merging jobs by Site
30 Days from 2012-09-18 to 2012-10-18

High number of Stripping Merging jobs allow freeing of BUFFER
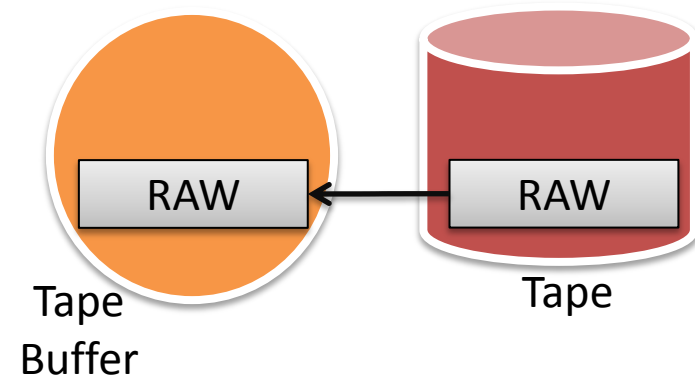
- Situation under control
  - After increasing of transfer rates
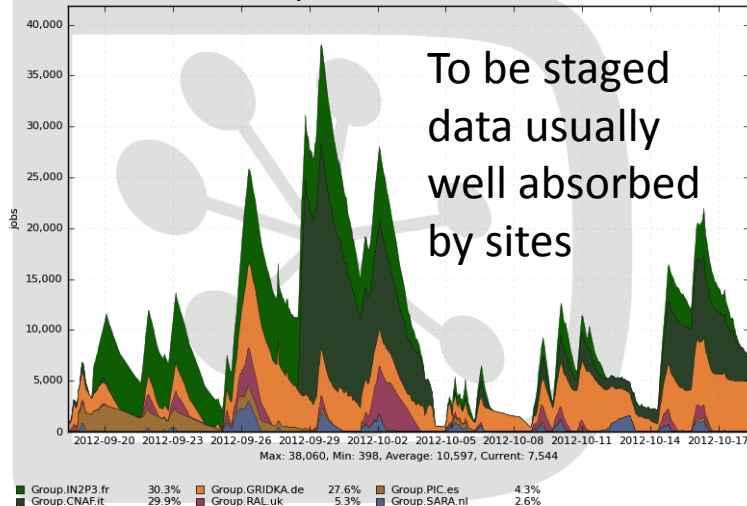 - Buffer occupancy decreasing

Data Staging

- During reprocessing all RAW data of a year is being staged
  - Much more staging than during "prompt reconstruction"
  - RAW data serves also as input to "attached sites"
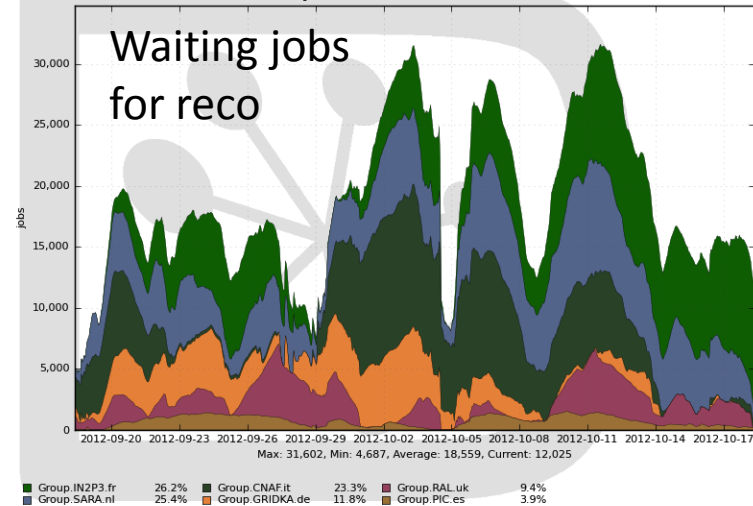- Stager shall provide enough resources to feed all sites

RAW

RAW

Tape Buffer

Tape

Data Staging (ctd)

Jobs in Staging by Site (for Reconstruction)
30 Days from 2012-09-18 to 2012-10-18

To be staged data usually well absorbed by sites

Max: 38,060, Min: 398, Average: 10,597, Current: 7,544

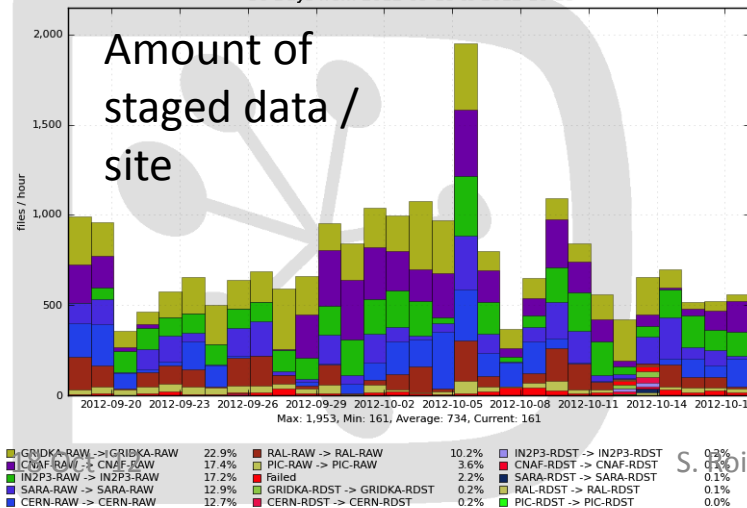|			
■ Group.IN2P3.fr	30.3%	■ Group.GRIDKA.de	27.6%	■ Group.PIC.es	4.3%
■ Group.CNAF.it	29.9%	■ Group.RAL.uk	5.3%	■ Group.SARA.nl	2.6%

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Jobs in Waiting by Site (for Reconstruction)
30 Days from 2012-09-18 to 2012-10-18

Waiting jobs for reco

Max: 31,602, Min: 4,687, Average: 18,559, Current: 12,025

■ Group.IN2P3.fr	26.2%	■ Group.CNAF.it	23.3%	■ Group.RAL.uk	9.4%
■ Group.SARA.nl	25.4%	■ Group.GRIDKA.de	11.8%	■ Group.PIC.es	3.9%

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Files Staged by Site (for Reconstruction)
30 Days from 2012-09-18 to 2012-10-18

Amount of staged data / site

Max: 1,953, Min: 161, Average: 734, Current: 161

■ GRIDKA-RAW -> GRIDKA-RAW	22.9%	■ RAL-RAW -> RAL-RAW	10.2%	■ IN2P3-RDST -> IN2P3-RDST	0.3%
■ CNAF-RAW -> CNAF-RAW	17.4%	■ PIC-RAW -> PIC-RAW	3.6%	■ CNAF-RDST -> CNAF-RDST	0.1%
■ IN2P3-RAW -> IN2P3-RAW	17.2%	■ Failed	2.2%	■ SARA-RDST -> SARA-RDST	0.1%
■ SARA-RAW -> SARA-RAW	12.9%	■ GRIDKA-RDST -> GRIDKA-RDST	0.2%	■ RAL-RDST -> RAL-RDST	0.1%
■ CERN-RAW -> CERN-RAW	12.7%	■ CERN-RDST -> CERN-RDST	0.2%	■ PIC-RDST -> PIC-RDST	0.0%

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- Concern about Gridka staging efficiency
  - Resolution of the problem foreseen for end of 2012
- Other sites with occasional errors