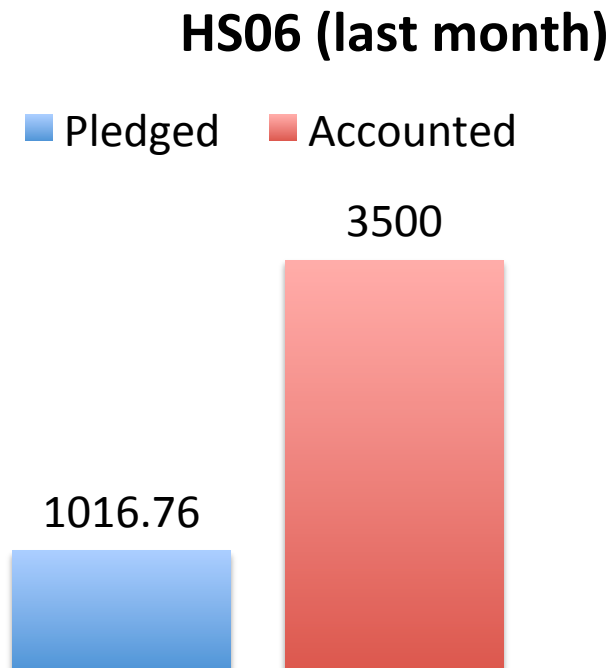
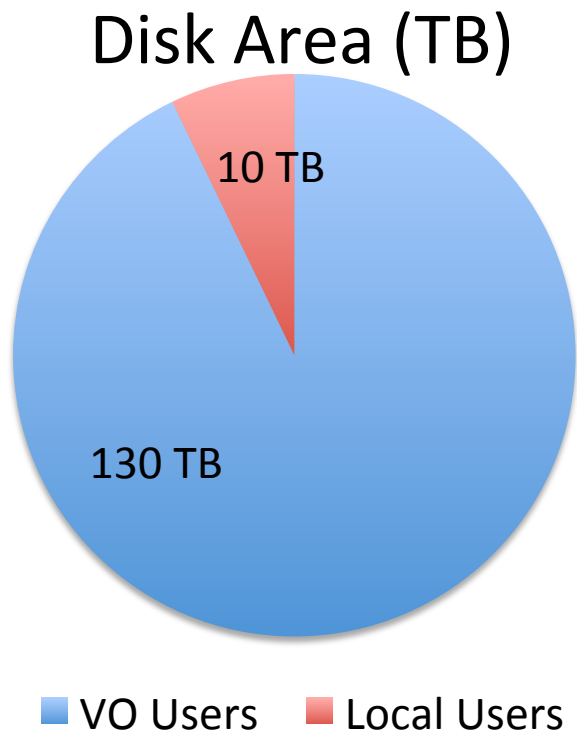

CNAF Status

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-
- Current Resources
 - Available software
 - Use of resources
 - Future plans



120 TB on tape

- cta - general purpose queue (wall time 2.5 days), used from VO and from local user
 - ✓ three profiles to submit jobs
 - ◆ `bsub -q cta -app run_1h`
 - ◆ `bsub -q cta -app run_24h`
 - ◆ `bsub -q cta -app run_inf -m sl6_long`

Queue (2)

- cta - general purpose queue (wall time 2.5 days), used from VO and from local user
 - ✓ three profiles to submit jobs
 - ◆ `bsub -q cta -app run_1h`
 - ◆ `bsub -q cta -app run_24h`
 - ◆ `bsub -q cta -app run_inf -m sl6_long`

To be used carefully:

- ☐ max 20 jobs running at the same time
- ☐ a special group should be defined ??

- Common area managed by the cta_gold group **/opt/exp_software/cta/local_software**

- Available SimTel_Array version:
 - ✓ **2015.04.27** (compilation option: ./build_all mini3 qgs2)
 - previous available versions: 2014.11.13b and 2014.11.13b_modified (to use the ASTRI configuration)

- configuration script:
source /opt/exp_software/cta/local_software/examples/scripts/setvar.sh

➤ root

/opt/exp_software/cta/local_software//root/5.34.26

➤ set of configuration files

/opt/exp_software/cta/local_software/examples/tars/
ASTRI_MiniArray_2015_05_06.tar.gz

➤ example of script to submit job:

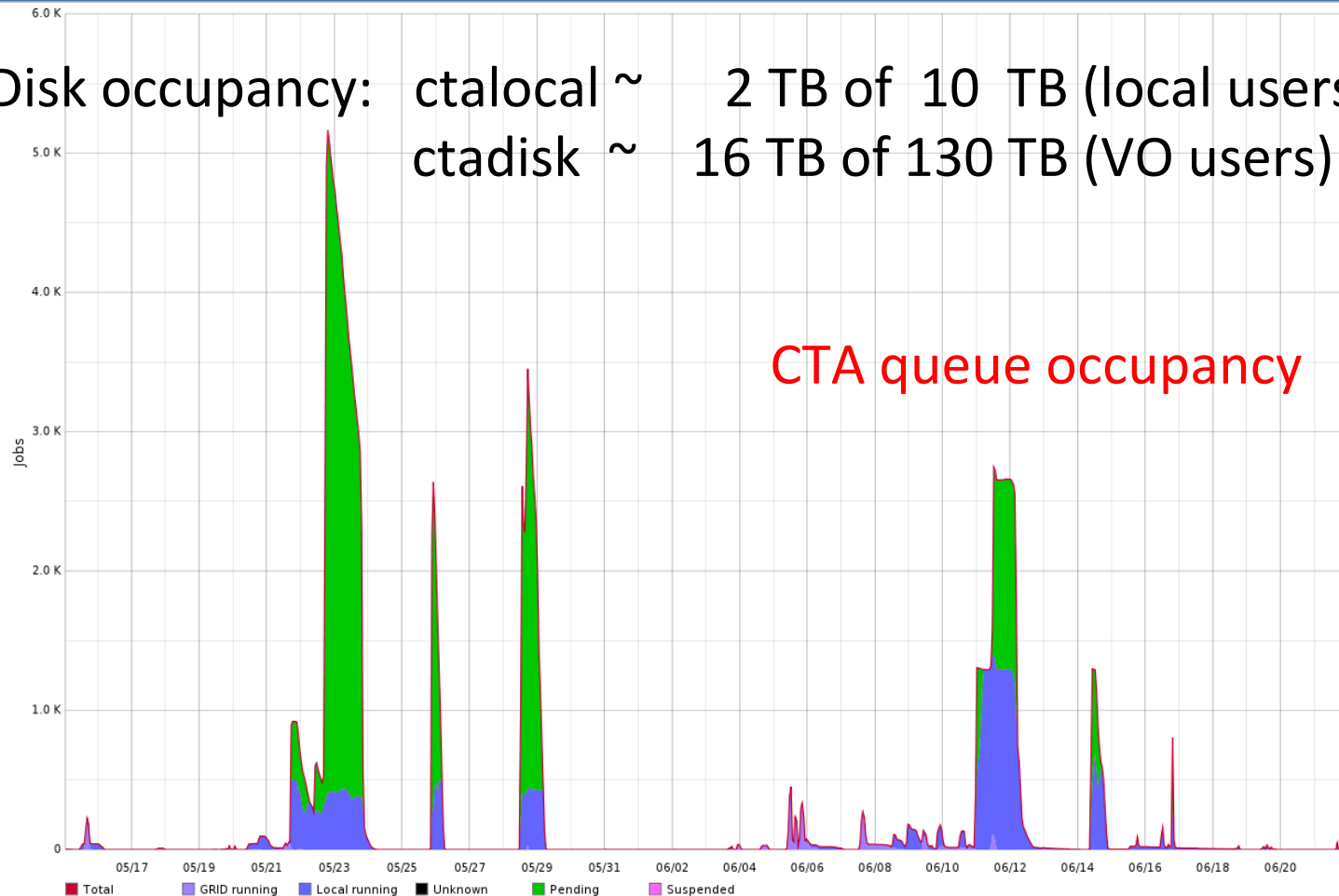
/opt/exp_software/cta/local_software/examples/scripts/
onejob.sh

- Previous version of simtel_array, compiled on the current UI, could not be executed on some pc architectures:
 - ✓ Select only “good” platforms

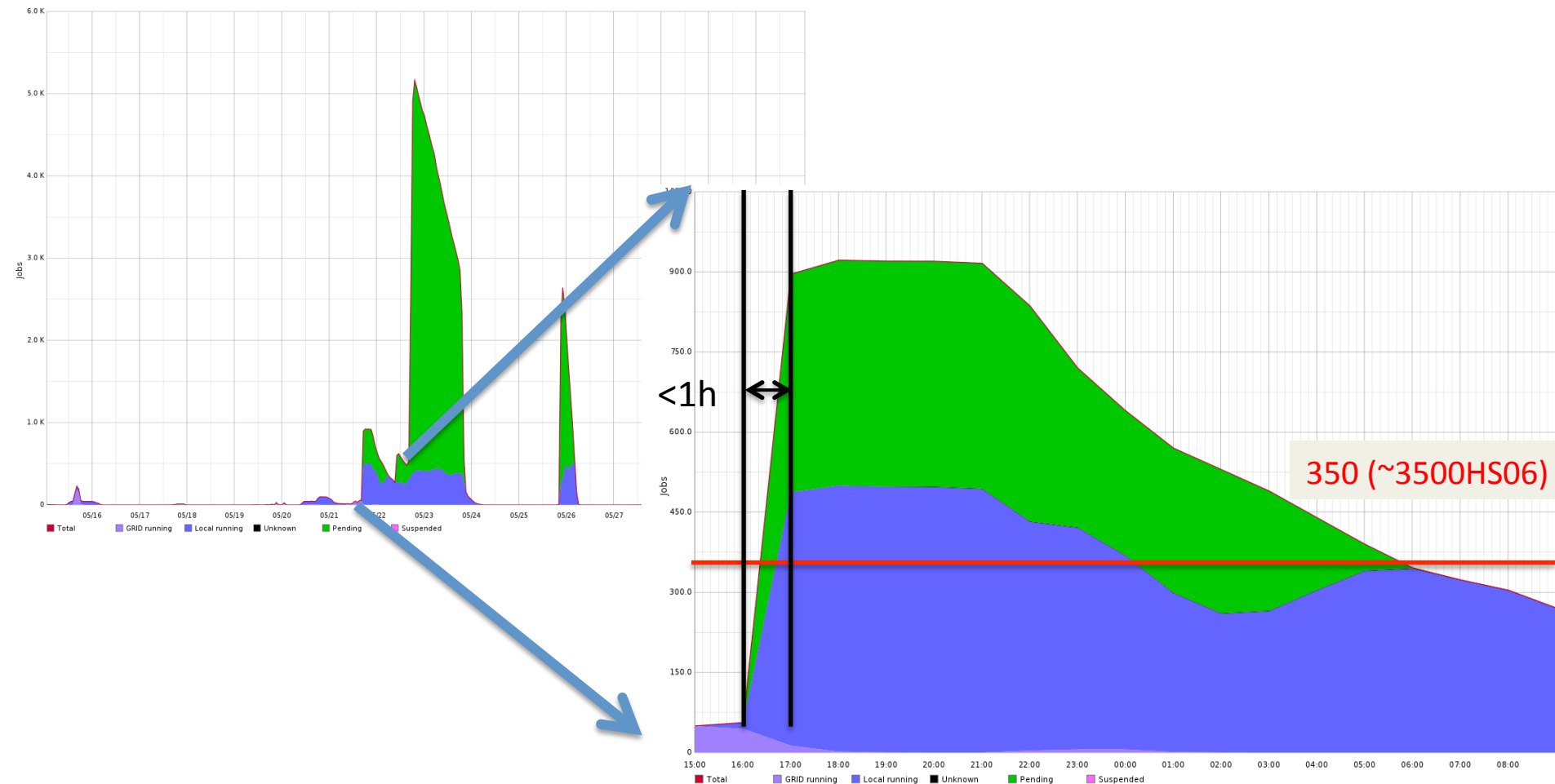
```
bsub -q $QUEUE $QOPTION -R "select[(model==AMD2380)||  
(model==WOOD283)|| (model=XEON3200)]" < $SCRIPTS
```
 - ✓ Recompile package on “bad” platforms at the beginning of the job
- Last simtel_array release, compiled on UI, **can** be executed on all of the available platforms

Usage of resources

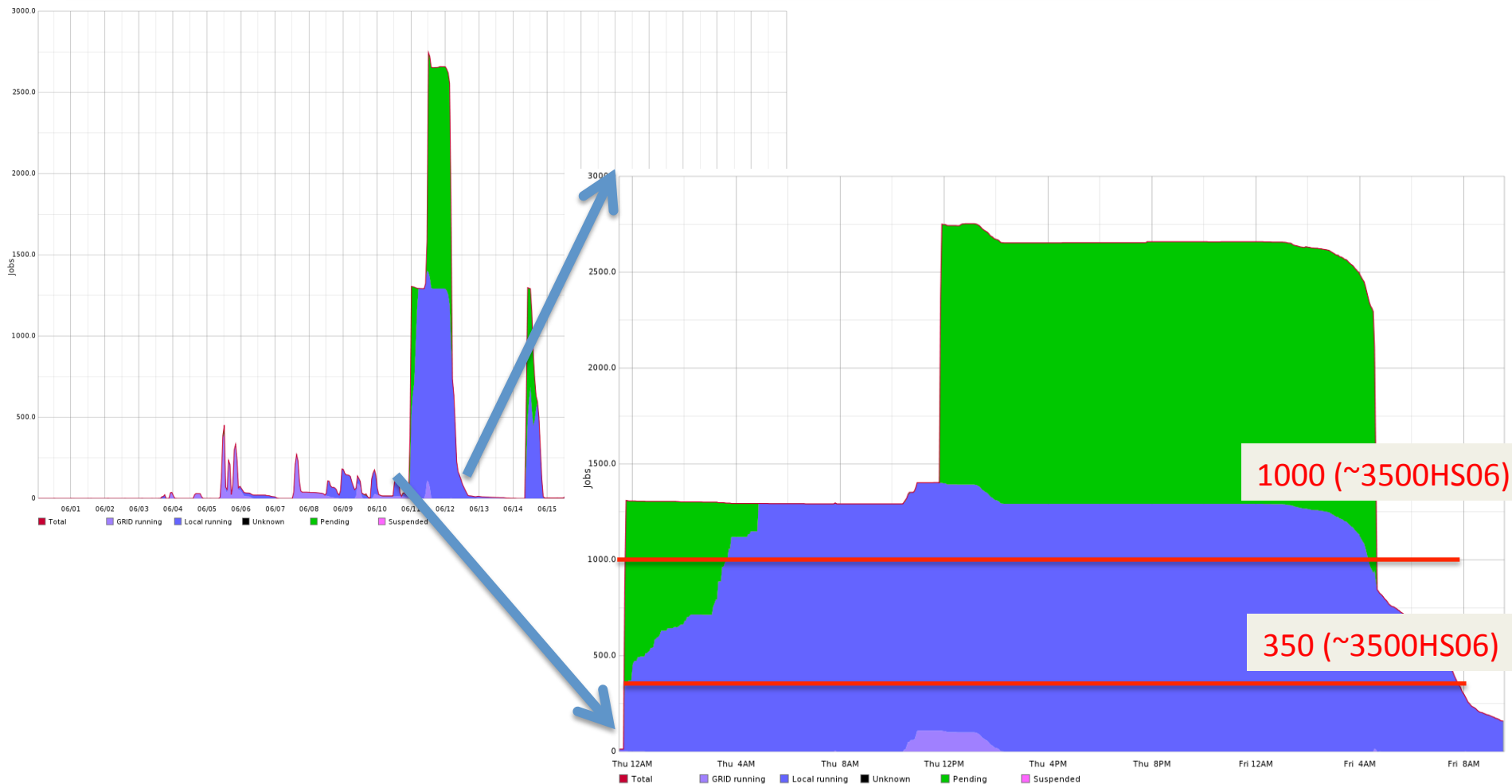
Disk occupancy: ctalocal ~ 2 TB of 10 TB (local users)
ctadisk ~ 16 TB of 130 TB (VO users)



Usage of resources



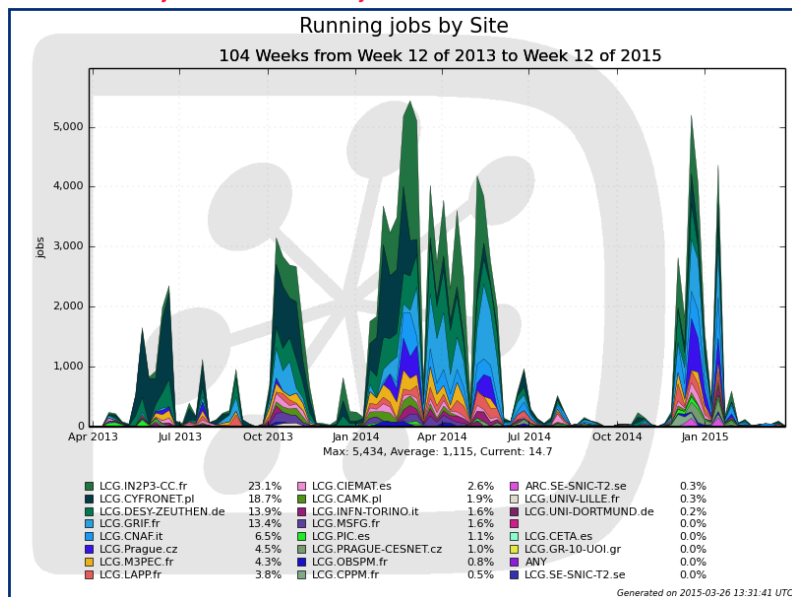
Usage of resources



- **About 20 centres** currently support the CTA VO. They are classified as:
 - **Production centres** if they provide CPU only -> **used for MC production**
 - **Analysis centres** if they provide both CPU and storage resources -> **used for MC production and Data Analysis**

CPU usage by Centre

- **Total used 2014: 94 M HS06**
- **87% CPU for MC production**
- **13% CPU for Users Analysis (7 active users)**
- **(2.6 M executed jobs in 2014)**
- **Total pledged 2015: 143 M HS06**
- 50% FRANCE; 20% POLAND; 14% GERMANY**
- 8% ITALY; 4% SPAIN; etc.**



Storage resources at 6 Analysis Centres

- **Total pledged 2015: 1.4 PB**
- **About 400 TB more disk than in 2014**

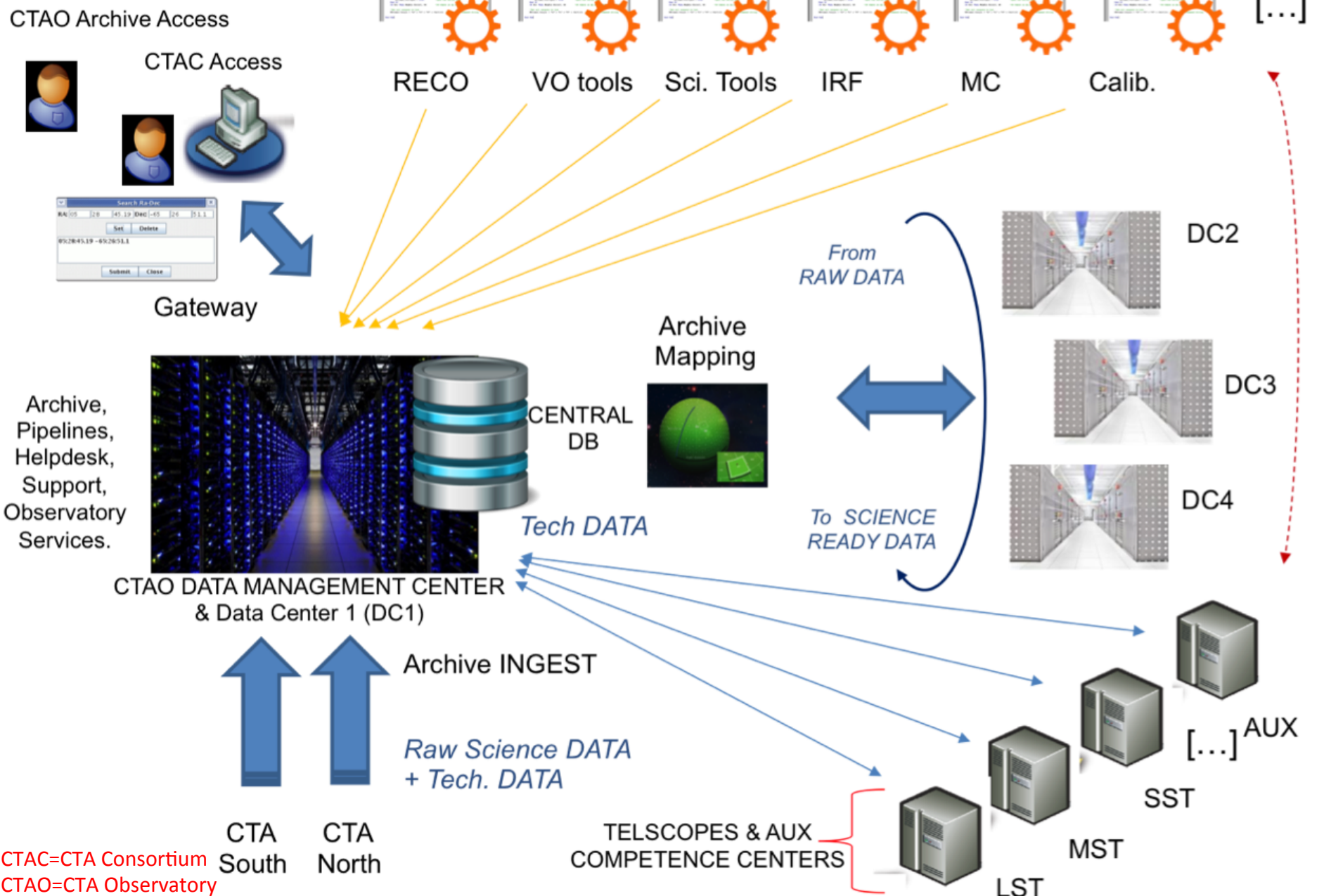
Centre	Allocated Disk 2014 (TB)	Pledged Disk 2015 (TB)	Used Disk (TB)
CYFRONET- LCG2 (PL)	448	600	206
DESY-ZN (DE)	336	336	204
IN2P3-CC (FR)	190	270	98
GRIF (FR)	50	120	61
IN2P3-LAPP (FR)	60	100	51
INFN-T1 (IT)	30	110	15
Total	1004	1426	635

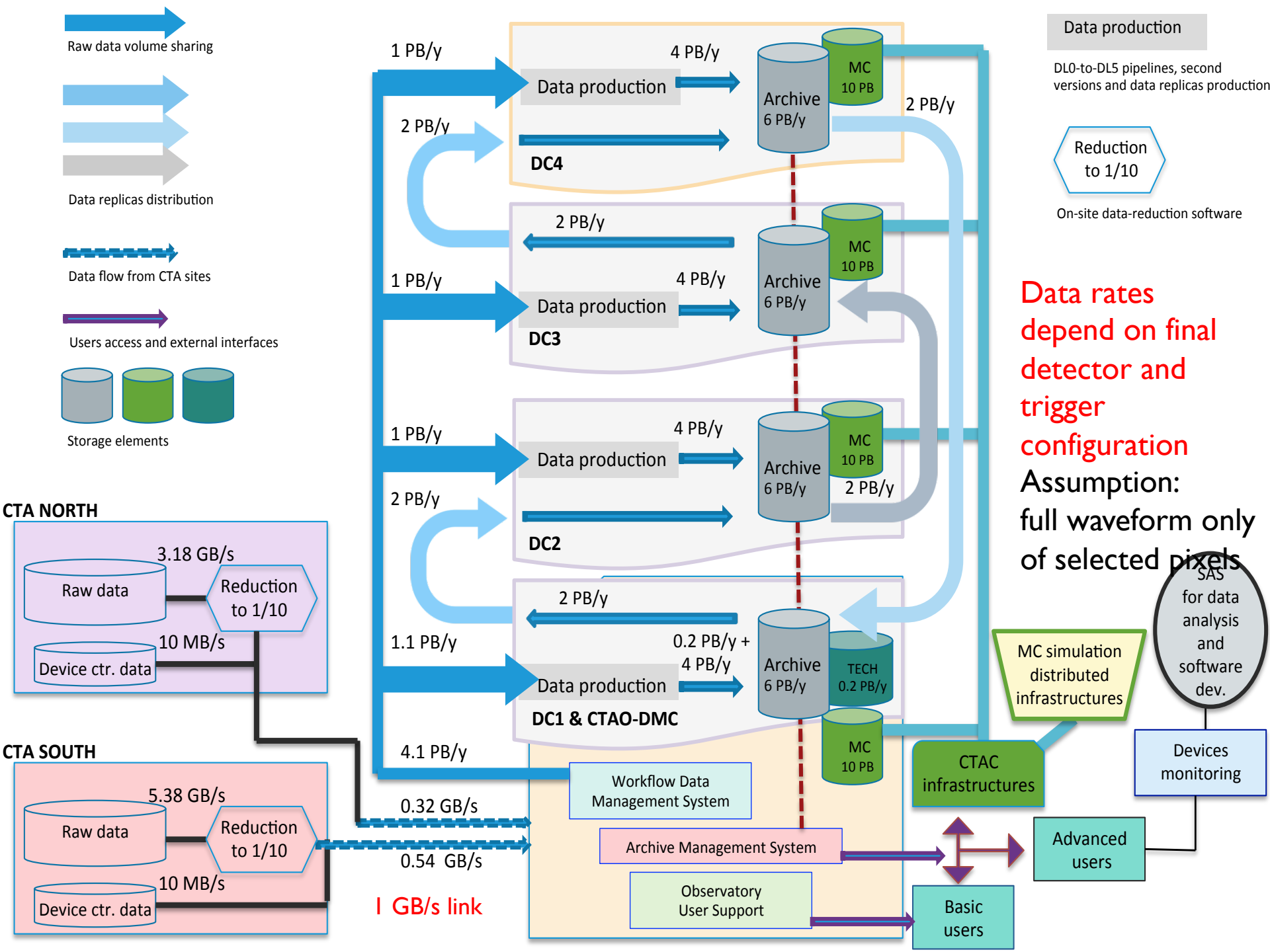
Additional Resources for 2016

- CTA Observatory sites by the end of 2015
 - HS06(2015): 3500, 2970 for VO + 530 for INFN users
 - cpu resources for Collaboration production in 2016
 $\approx$ HS06(2015)+10%
 - cpu resources for INFN user analysis in 2016 $\approx$
HS06(2015)+50%
 - +50% of available disk space to support user analysis
and new productions
 - 500 HS06 additional resources + 60 TB disk space
- Total cpu : 4000 HS06 Total disk space : 200 TB

Organization

SOFTWARE DEVELOPMENT COMPETENCE CENTERS







Data production

DL0-to-DL5 pipelines, second versions and data replicas production

Reduction to 1/10

On-site data-reduction software

Data rates depend on final detector and trigger configuration

Assumption: full waveform only of selected pixels

SAS for data analysis and software dev.

MC simulation distributed infrastructures

Devices monitoring

Advanced users

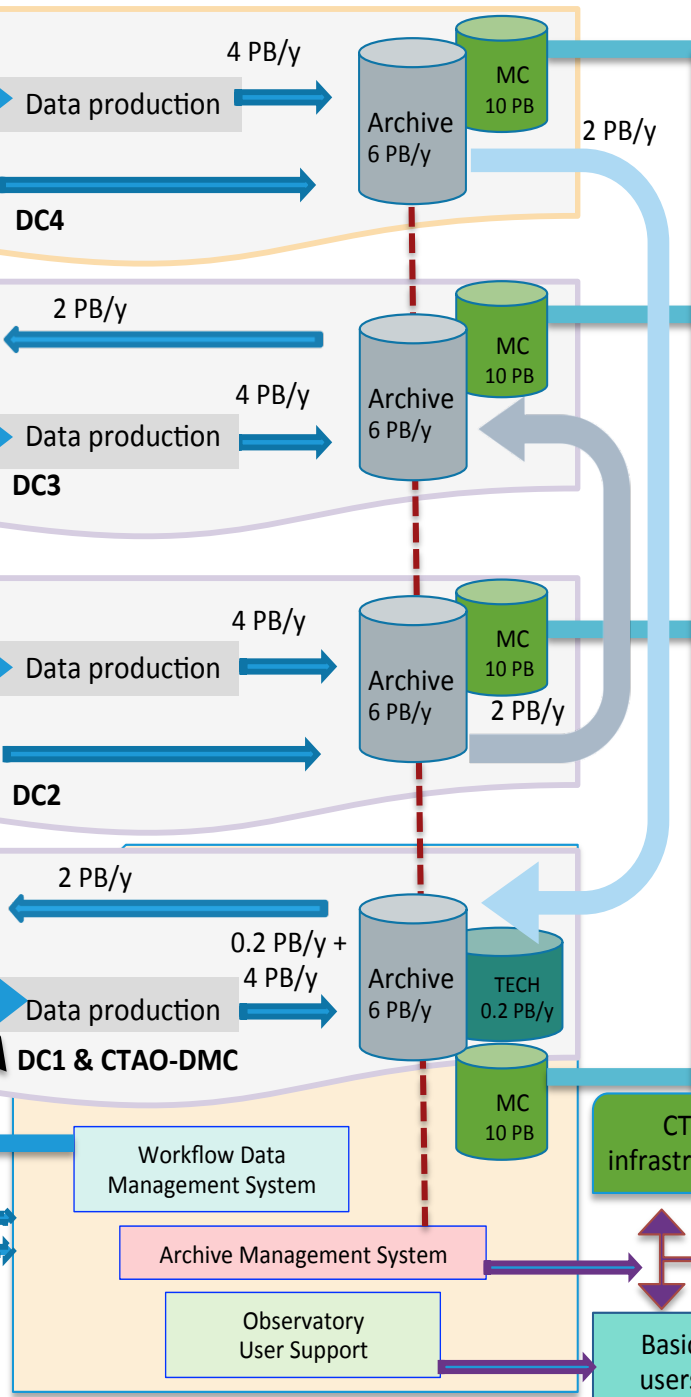
Basic users

CTAC infrastructures

Observatory User Support

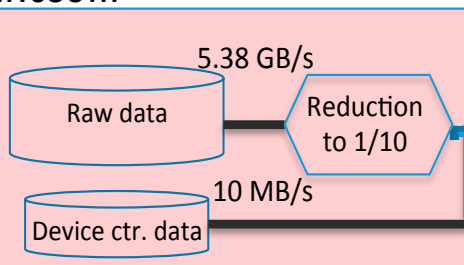
Archive Management System

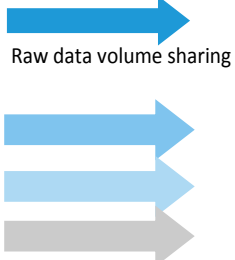
Workflow Data Management System



- ✓ Data (3.6PB/y) are received by the ingestion unit of CTA Archive system, which is operated by a dedicated Observatory Data Management Center (CTAO-DMC).
- ✓ 4 centers will share the workload (DC1-DC4).

CTA SOUTH



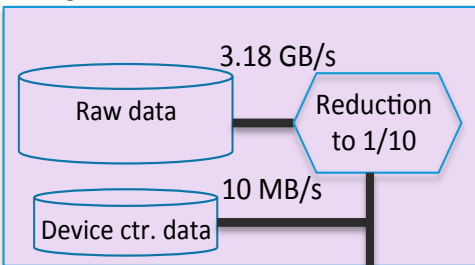


Each Data Center

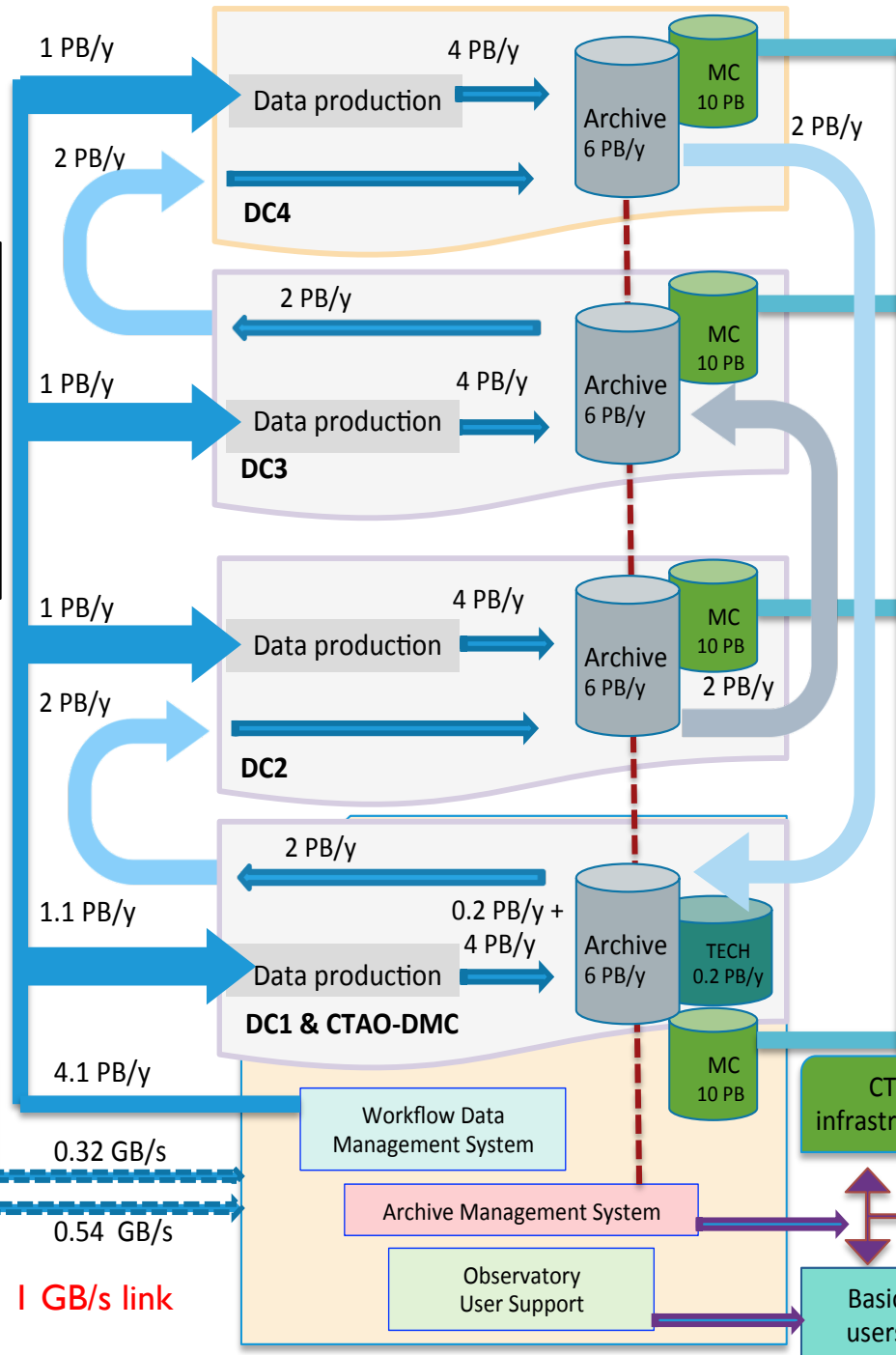
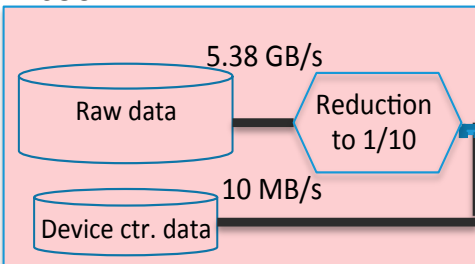
- ✓ processes 25% of CTA raw data
- ✓ stores ½ of full CTA data (it will be a back-up of a different 25%)

Storage elements

CTA NORTH



CTA SOUTH



Data production

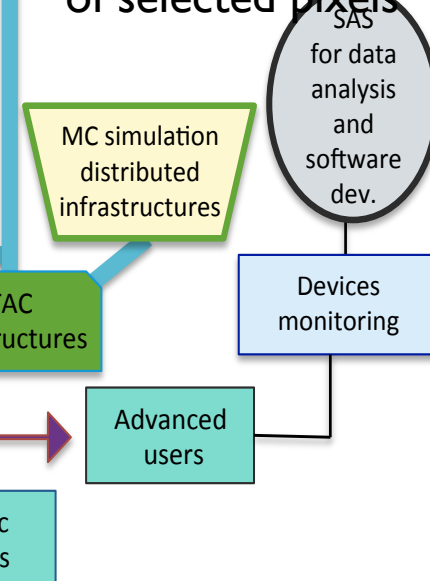
DL0-to-DL5 pipelines, second versions and data replicas production

Reduction to 1/10

On-site data-reduction software

Data rates depend on final detector and trigger configuration

Assumption: full waveform only of selected pixels



Data Volume Needs

- Expected data rate (CTA fully deployed, reduction 1/10) ~ 3.6 PB/y (DL0)
- Products of reconstruction and analysis pipeline: DL2~3 PB/s and DL3+DL4+DL5=580 TB/y
- New version of data production per year, keeping the n-1 version: twice the DL2-DL5 volume every year ~ 7 PB/y
- 100 TB/y of technical data

+11 PB/y

Year	2017	2018	2019	2020	2021
Cumulative raw data volume(PB)	3.6	9	11	13.5	17
Cumulative event data volume(PB)	4	11	16	23	32
Monte-Carlo data volume(PB)	5	11	16	20	20
Technical data volume(PB)	0.01	0.04	0.09	0.16	0.26
Cumulative Data (PB)	9	22	31	43	52

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cumulative raw data volume(PB)	20	24	28	31	35	39	42	46	50	53
Cumulative event data volume(PB)	42	53	64	75	86	97	108	119	130	141
Monte-Carlo data volume(PB)	20	20	20	20	320	20	20	20	20	20
Technical data volume(PB)	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3
Cumulative Data(PB)	63	74	85	96	107	118	129	140	151	162

User analysis CTA @ CNAF

Year	CPU time [HS06]	disk space [TB]
2014	2000	30
2015	3500(2975+ 525)	140
2016	4070(3270+ 800)	200
2017	4800(3600+1200)	300
2018	5700(3900+1800)	500

Hosting and data processing CTA @ CNAF

Year	CPU time [HS06]	disk space [TB]
2014	2000	30
2015	3500(2975+ 525)	140
2016	4070(3270+ 800)	200
2017	6900(3600+1200+2100)	1300(300+1000)
2018	9900(3900+1800+4200)	2500(500+2000)

+11 PB/y one the Observatory will be completed