Laboratoire d'Annecy de Physique des Particules

MUST pour la Grille ATLAS en 2019

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cnrs

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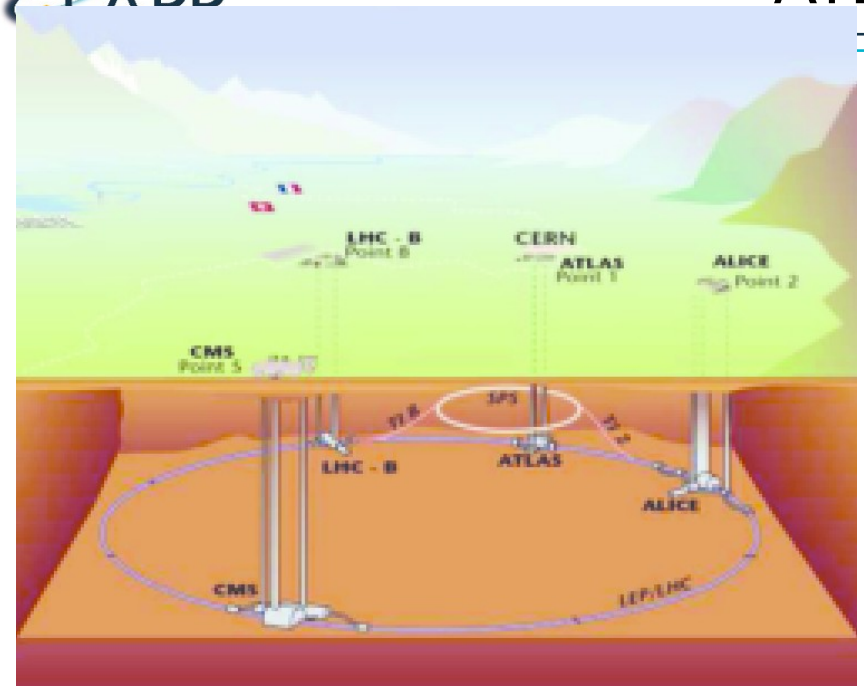
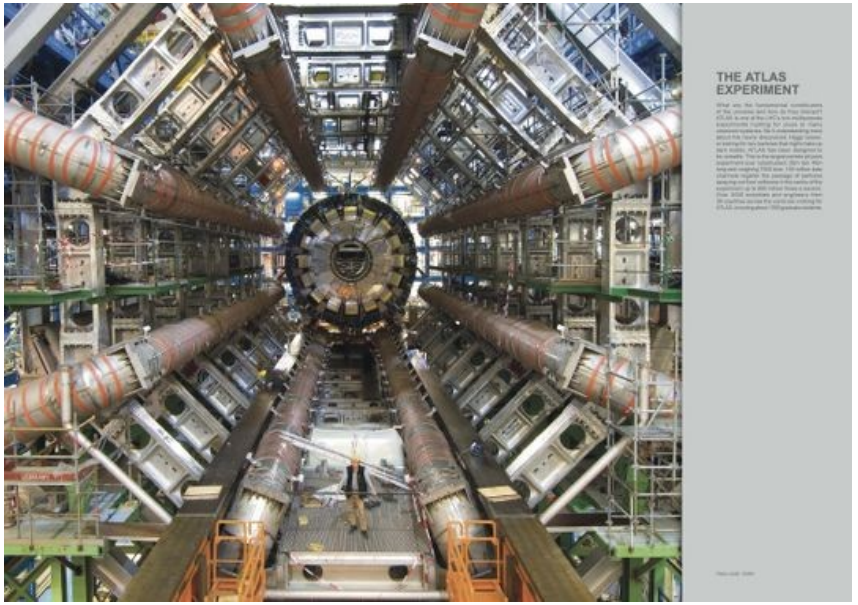
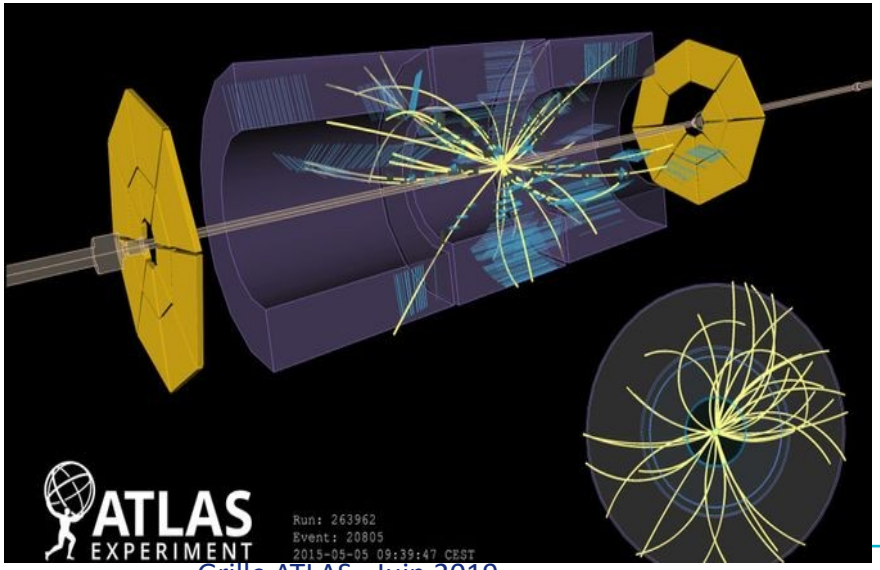
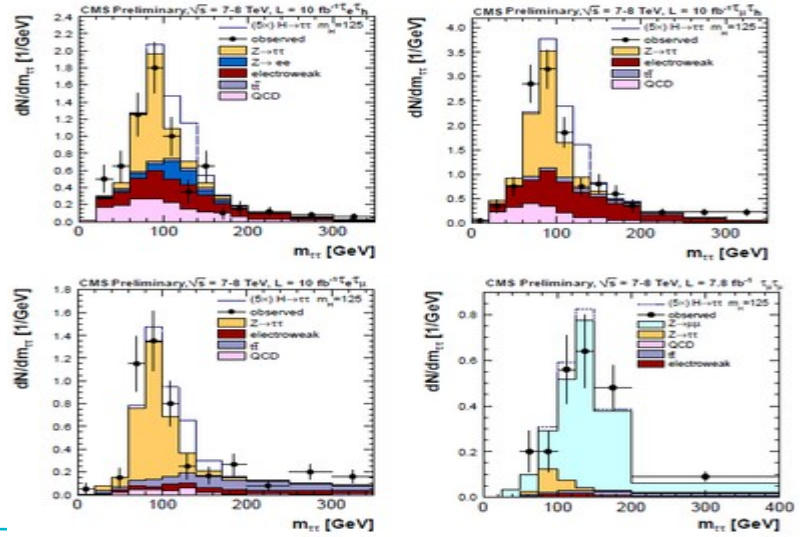
ATLAS


LHC - B
Point 8
CERN
ATLAS
Point 1
ALICE
Point 2
CMS
Point 5
SPS
LHC - B
ATLAS
ALICE
CMS
LEP/LHC


THE ATLAS EXPERIMENT

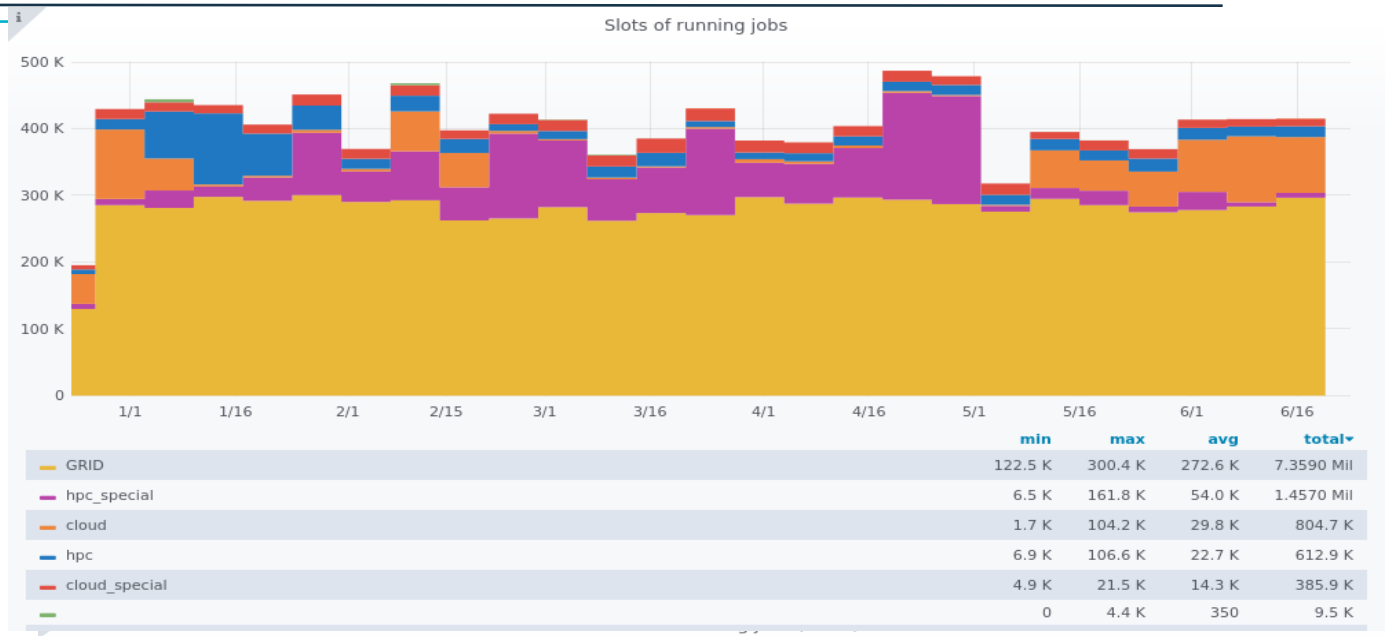

ATLAS
EXPERIMENT
Run: 263962
Event: 20805
2015-05-05 09:39:47 CEST


CMS Preliminary, √s = 7-8 TeV, L = 10 fb⁻¹ τeτh
CMS Preliminary, √s = 7-8 TeV, L = 10 fb⁻¹ τμτh
CMS Preliminary, √s = 7-8 TeV, L = 10 fb⁻¹ τμτe
CMS Preliminary, √s = 7-8 TeV, L = 7.8 fb⁻¹ τhτh
(5×) H→ττ m_H=125
observed
Z→ττ
Z→ ee
Z→ μμ
electroweak
tt
QCD
dN/dm_ττ [1/GeV]
m_ττ [GeV]

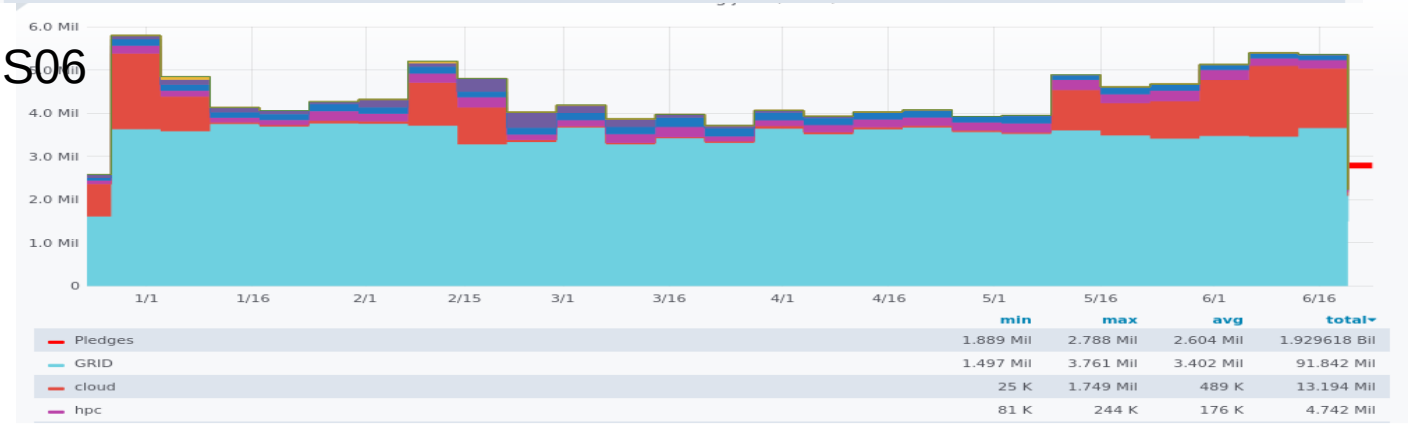
Etat de la Grille ATLAS en 2019

400k cores

(1-core and 8-core jobs)



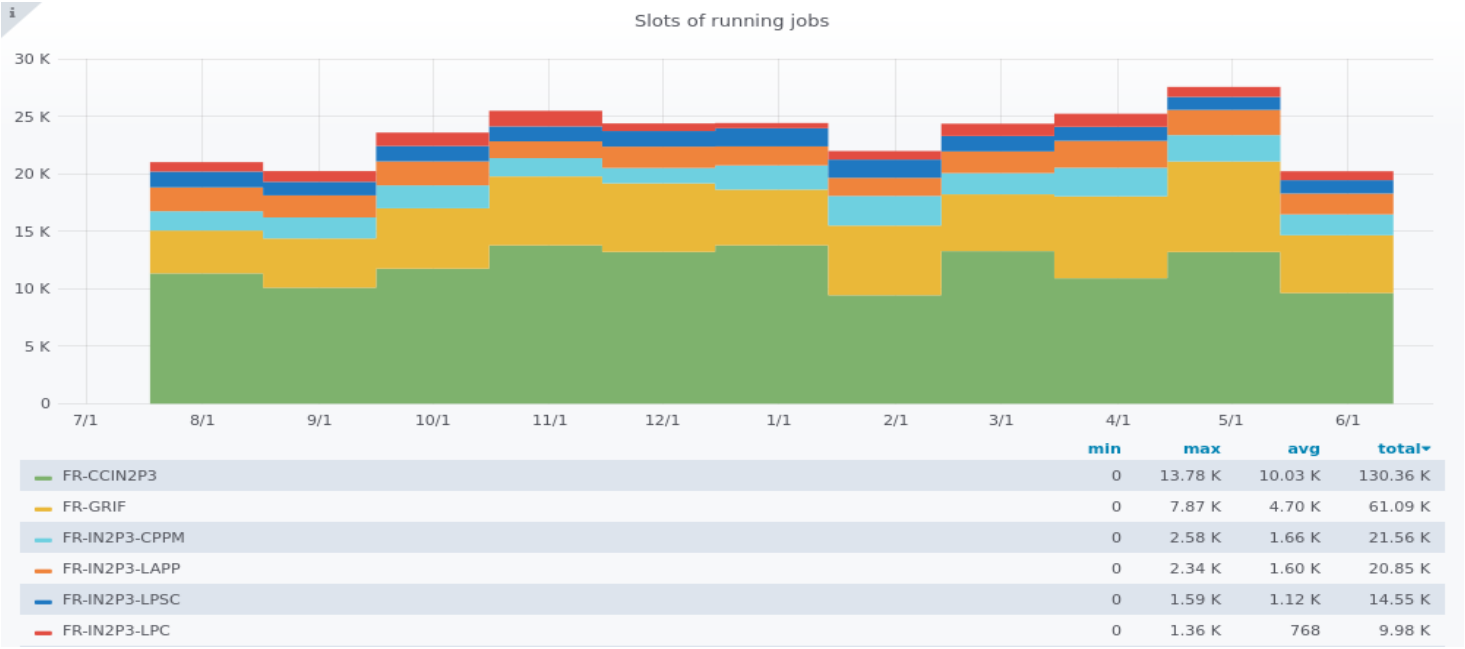
5 million HS06



* Cloud = ATLAS trigger farm recycled during LHC shutdown
* Commercial cloud still too expensive
* HPC not providing significant improvement in CPU capacity yet

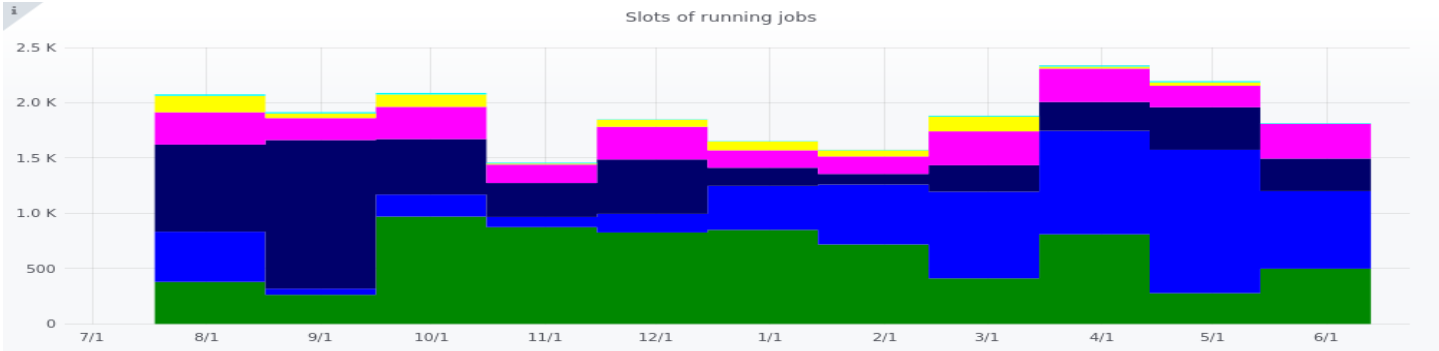
Grille ATLAS au LAPP : CPU

25k cores
LAPP=10 %
France



	min	max	avg	total
FR-CCIN2P3	0	13.78 K	10.03 K	130.36 K
FR-GRIF	0	7.87 K	4.70 K	61.09 K
FR-IN2P3-CPPM	0	2.58 K	1.66 K	21.56 K
FR-IN2P3-LAPP	0	2.34 K	1.60 K	20.85 K
FR-IN2P3-LPSC	0	1.59 K	1.12 K	14.55 K
FR-IN2P3-LPC	0	1.36 K	768	9.98 K

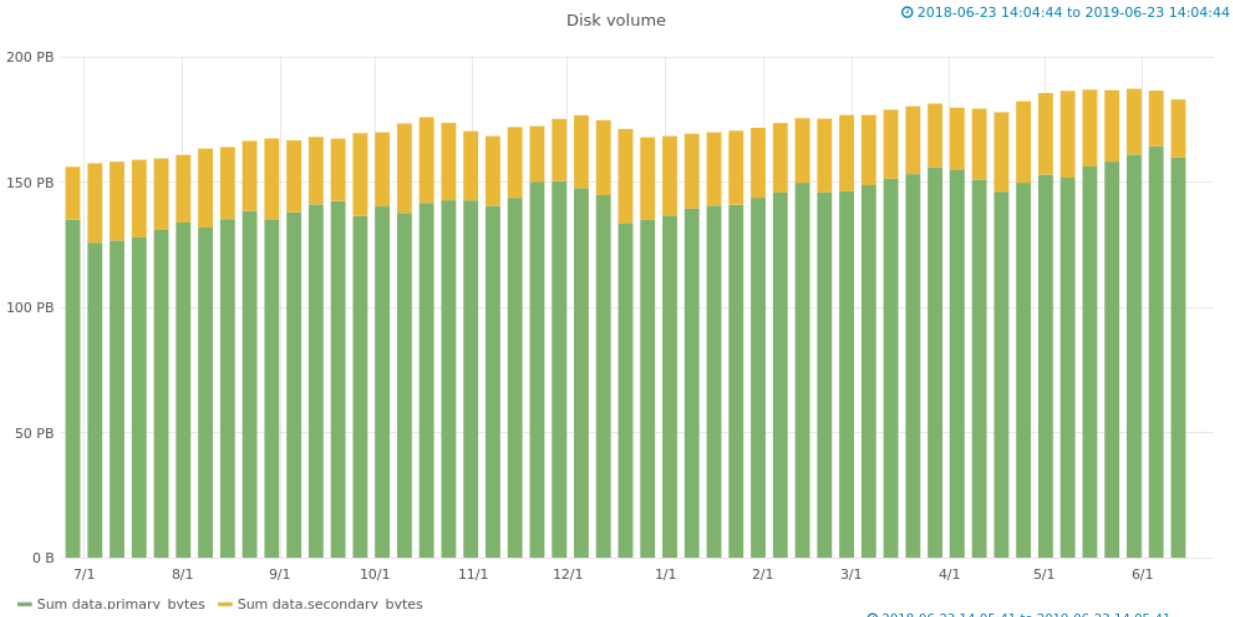
2.5k cores



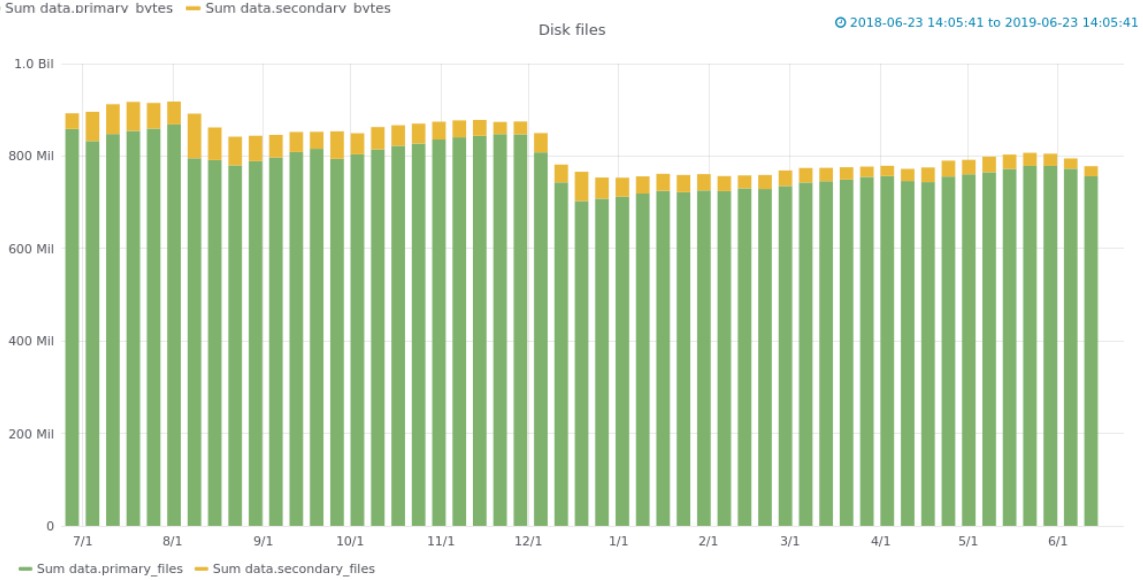
	min	max	avg	total
Group Production	0	971	530	6.891 K
MC Simulation	0	1.296 K	433	5.626 K
MC Reconstruction	0	1.344 K	374	4.868 K
Analysis	0	315	206	2.679 K
Data Processing	0	148	53	690
Others	0	14	7	94

Etat de la Grille ATLAS en 2019 : DISK

150 PB



~850 million files
Many temporary



Grille ATLAS au LAPP : Stockage

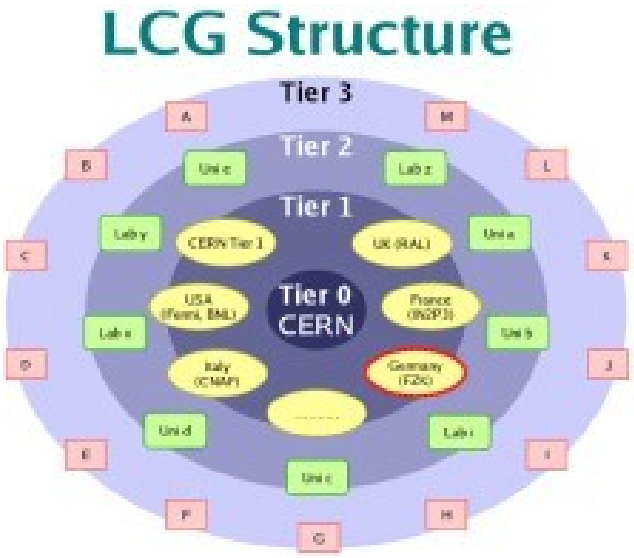
T2_DATADISK

RSE	Total (storage) ▲	Used (rucio)
MWT2_DATADISK	7800.00	7418.74
AGLT2_DATADISK	6027.41	5640.00
TOKYO-LCG2_DATADISK	5300.00	4992.25
SWT2_CPB_DATADISK	4850.00	4516.66
NET2_DATADISK	4314.00	4013.54
UKI-LT2-QMUL_DATADISK	3500.00	3239.68
UKI-NORTHGRID-MAN-HEP_DATADISK	3298.53	2497.19
UKI-SCOTGRID-GLASGOW_DATADISK	2748.78	2517.23
CA-SFU-T2_DATADISK	2550.00	2243.70
CA-WATERLOO-T2_DATADISK	2110.00	1886.32
PRAGUELCG2_DATADISK	2089.07	1769.23
IN2P3-LAPP_DATADISK	2050.00	1849.35
UKI-NORTHGRID-LANCS-HEP_DATADISK	2034.10	1743.66
INFN-NAPOLI-ATLAS_DATADISK	1968.13	1643.19
UNI-FREIBURG_DATADISK	1950.00	1737.49
DESY-HH_DATADISK	1890.00	1683.35
LRZ-LMU_DATADISK	1788.54	1601.55
DESY-ZN_DATADISK	1750.00	1543.75
GRIF-IRFU_DATADISK	1720.74	1499.86

- 13th T2 in storage size worldwide
- Higher priority than CPU

→ Know-how in large storage management with T2 site team

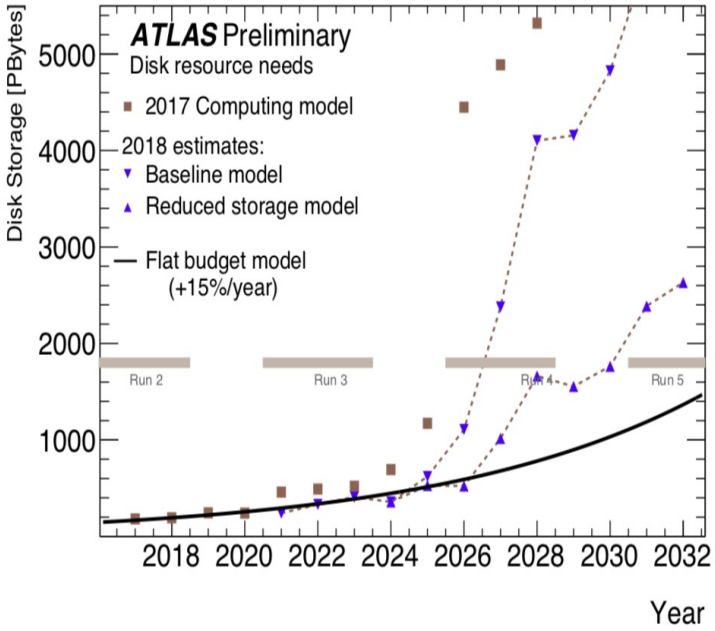
→ Strong point in academic environment



Grille ATLAS au LAPP : Dissemination

- Short term : CPU + Grid storage know-how on operation and deployment benefit to other LAPP Vos
  - CTA
  - LSST (multi-core)
  - ILC
- Longer term (2019-2022):
  - Adapt LHC Compute know-how to other communities (Astroparticles and nuclear) : ESCAPE
    - Current tools (Validation jobs, data transfer and management
    - Datalake organisation for storage

Grille ATLAS au LAPP : Projet R&D



- Computing resource constraint :
  - Flat budget for infrastructure
    - Increase benefits only cost reduction
  - Keep or reduce site admin manpower
    - Automatise operations
    - Improve error diagnostic
- HL-LHC : Bigger step than usual
  - R&D program launched to implement disruptive tools
    - Replace complex Grid Storage by (X)cache in some sites (‘diskless’)
    - Optimise file redundancy among Grid storages of same datalake
    - Simpler and more reliable tools to access data

    → DOMA (LHC Grid Computing) and ESCAPE (LHC+Astro) projects
  - Ideas/strategy from Computing industry permanently evaluated

Grille ATLAS au LAPP : Current R&D

- Federated storage with LPSC : FR-ALPES with storage database @ MUST
  - Learn how to operate and deploy distributed storage
  - Optimisation of manpower
  - Monitor the performance for remote access with very close site
  - Benefit from ATLAS tools at all steps (HammerCloud, Info system, monitoring)

    → Local datalake :*Existing*

    → *Talk @ CHEP2019*
- Integrate european datalake prototype using FR-ALPES
  - ESCAPE demonstrator
  - HL-LHC and possibly CTA : *Under way*
- Caching mechanism for remote access
  - Under validation/debugging within DOMA before deployment for ESCAPE
  - *To be done*

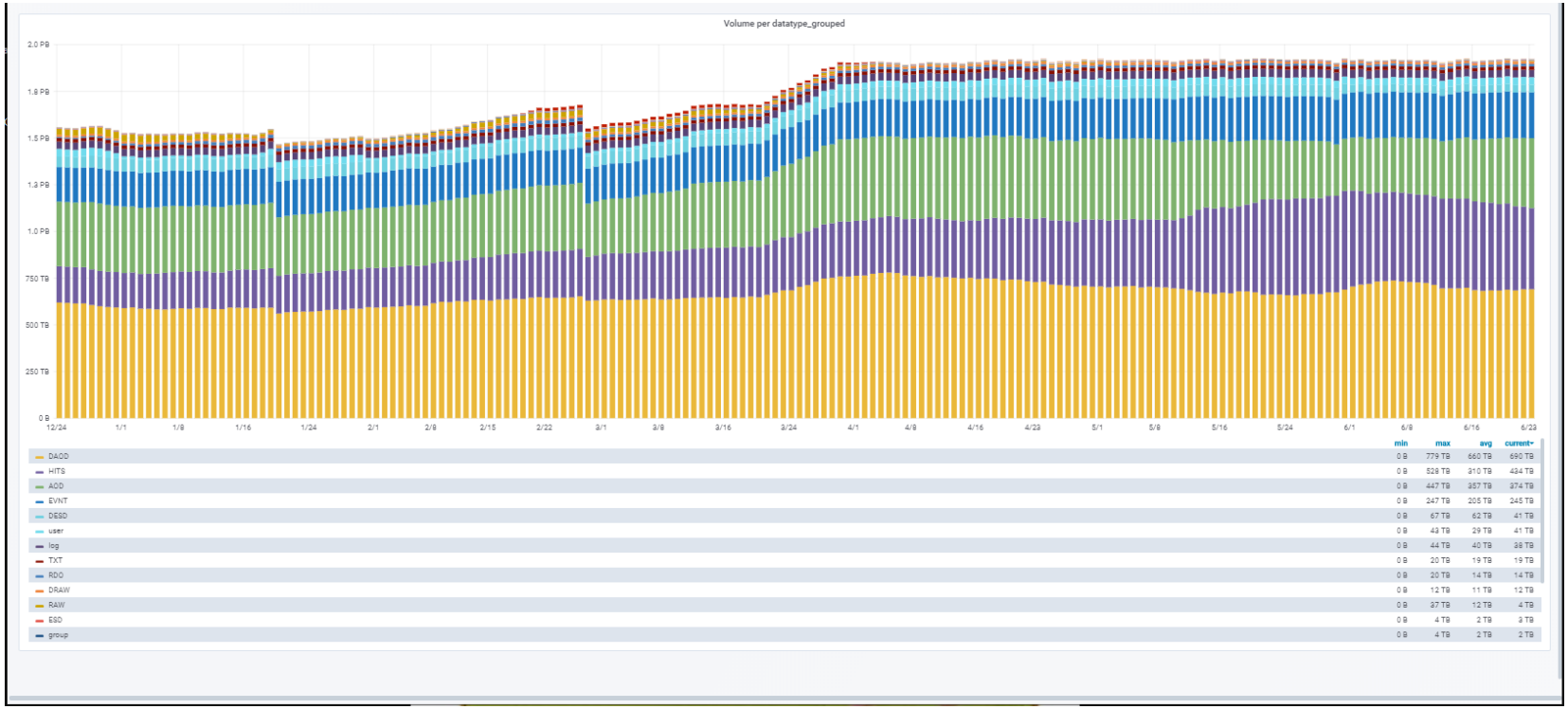
Grille ATLAS au LAPP : Conclusion

- MUST has provided reliable resources to ATLAS Grid
- Major infrastructure for ‘mesocentre’ funded by USMB, LCG-France (IR) et LAPP
  - Emphasis on storage/data management
  - Know-how benefited to other Grid experiments (CTA, LSST, ILC,...)
- Regular progress in Grid technology and LAPP organisation enabled to manage increased resources for ATLAS with same manpower
  - Main technical issue : External network reliability and bandwidth
- Future MUST in ATLAS
  - Continue to provide reliable service
  - Perfect testbench as medium size for Computing R&D for HL-LHC and CTA

    → MUST visibility much bigger that its share in size

Everything possible thanks to the comitment of the MUST team

Backup


Volume per datatype_grouped
2.0 PB
1.8 PB
1.5 PB
1.3 PB
1.0 PB
750 TB
500 TB
250 TB
0 B
12/24
1/1
1/8
1/16
1/24
2/1
2/8
2/15
2/22
3/1
3/9
3/16
3/24
4/1
4/9
4/16
4/23
5/1
5/9
5/16
5/24
6/1
6/9
6/16
6/23
min
max
avg
current
DAOD 0 B 779 TB 560 TB 690 TB
HITS 0 B 528 TB 310 TB 484 TB
AOD 0 B 447 TB 357 TB 374 TB
EVNT 0 B 247 TB 205 TB 245 TB
DESD 0 B 67 TB 62 TB 41 TB
user 0 B 43 TB 29 TB 41 TB
log 0 B 44 TB 40 TB 38 TB
TXT 0 B 20 TB 19 TB 19 TB
RDO 0 B 20 TB 14 TB 14 TB
DRAW 0 B 12 TB 11 TB 12 TB
RAW 0 B 37 TB 12 TB 4 TB
ESD 0 B 4 TB 2 TB 3 TB
group 0 B 4 TB 2 TB 2 TB