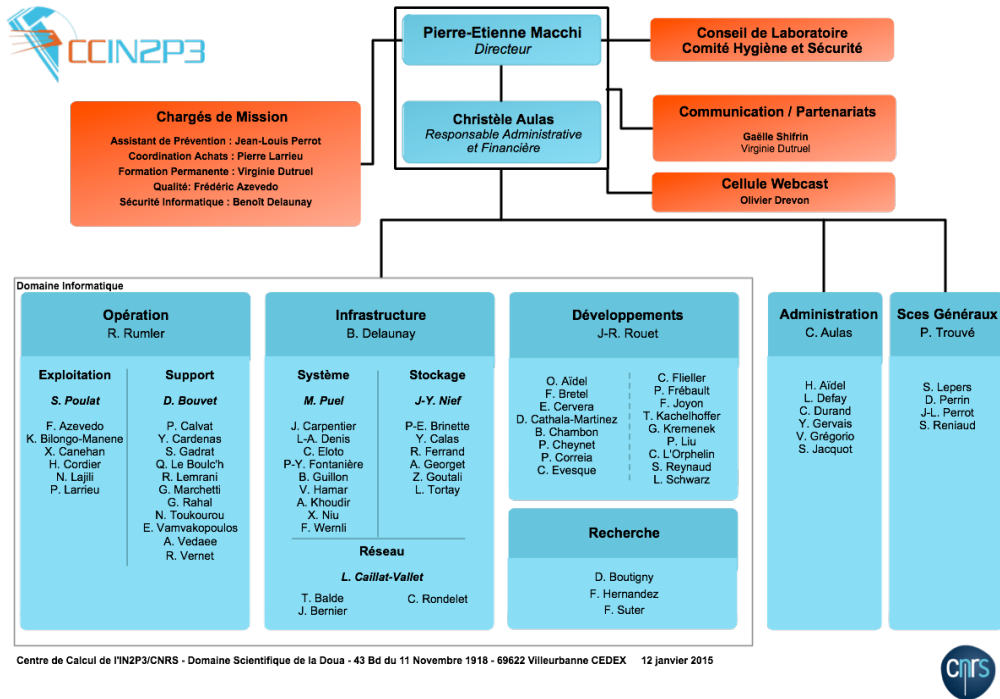**Centre de Calcul** de l'Institut National de Physique Nucléaire et de Physique des Particules

CC-IN2P3 : Status & perspectives

JFPPL Computing WS - March 2015

Organization

- ▸ Steering committee

- ▸ + 1 internal projects evaluation committee
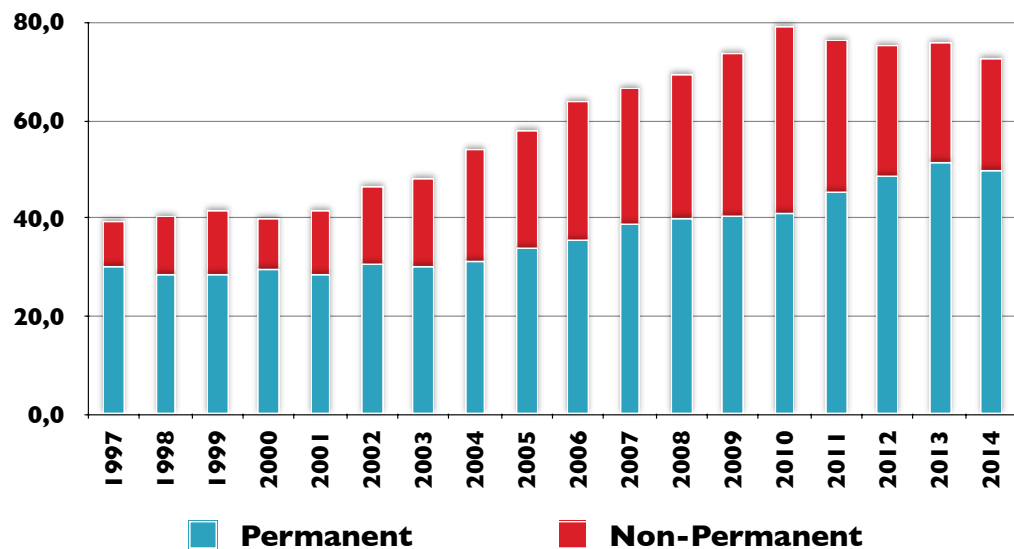
  - ▸ Goals :
    - list every transversal IT projects
    - ensure they have the necessary ressources
    - make some recommandations, if any, to the Direction
  - ▸ ~1 expert of each IT teams
  - ▸ First results
    - 15 projects evaluated
    - good feedback from project leaders
    - a better knowledge

Worked FTE

78 people : 30 % temporary contracts

I « chargé de recherche » et 77 technicians and engineers (ITA) :

- 61 BAP E : IT engineers
- 8 BAP J : administration
- 5 BAP G : facility management
- 3 BAP F : communication / mediation

▸ 3 permanent positions opened in 2014 storage, system administration, administration
▸ Temporary contracts mainly funded on EU project or various agreements

▸ Globally : less WFTE (because of some leaves : retirements…)

▸ Regulation constraints :
  ▸ strong turnover…
  ▸ less candidates…

▸ 2015 forecast :
  ▸ +1 permanent position (DBA)
  ▸ 7 contracts end : some can be renewed

Budget
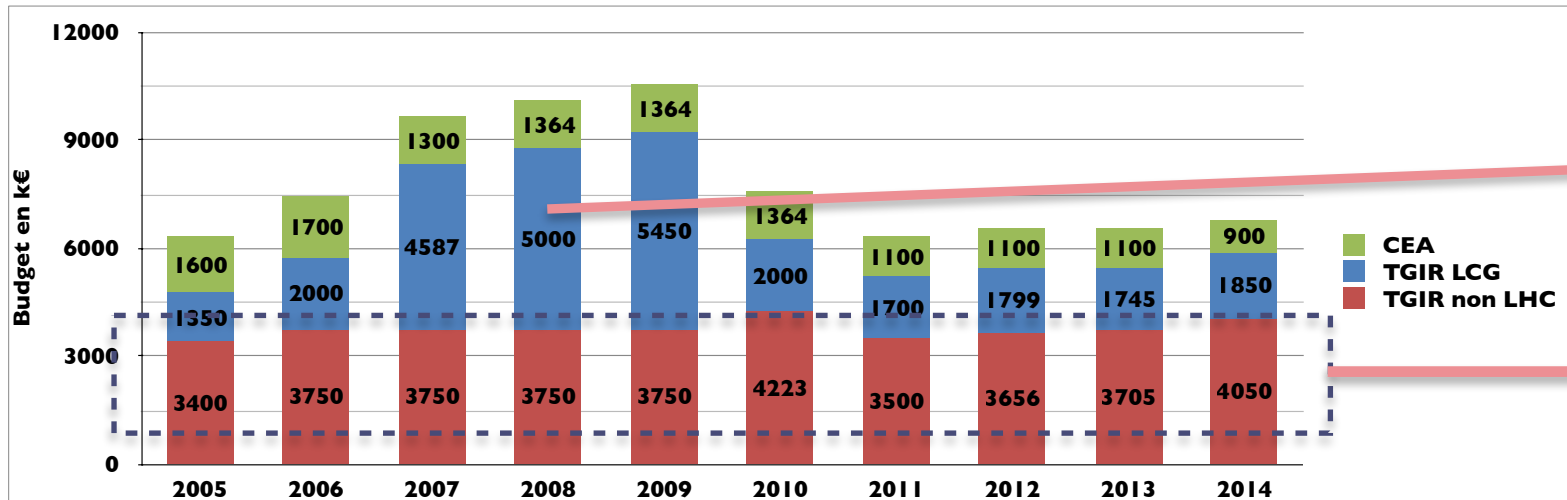
Strong investments corresponding with the LHC startup :
impact on capacity maintaining 3 to 5years later

non LCG budget more or less stable :
but running costs in increase (electricity: x3,3 in 8 years)

less investments for others

▸ From 2011 to 2013 : more or less constant
  • no capacity growth, only renewal

▸ In 2014 : + 550 k€
  • a 900 k€ increase coming from the CNRS allocation (TGIR/IR)
  • but lower funding coming from CEA = -200 k€

▸ Other incomes (ANR, european projects…) : ~ 383 k€
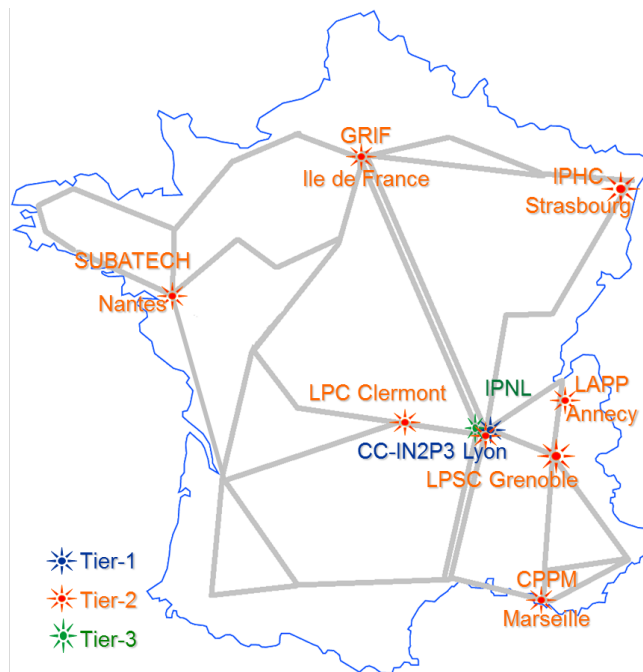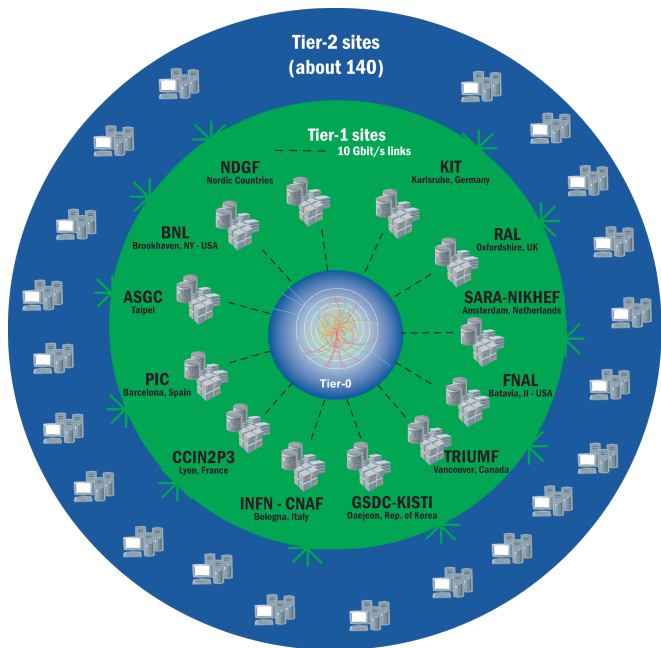
Half of the budget is dedicated to IT investments at CC-IN2P3

A quarter of the budget goes into electricity
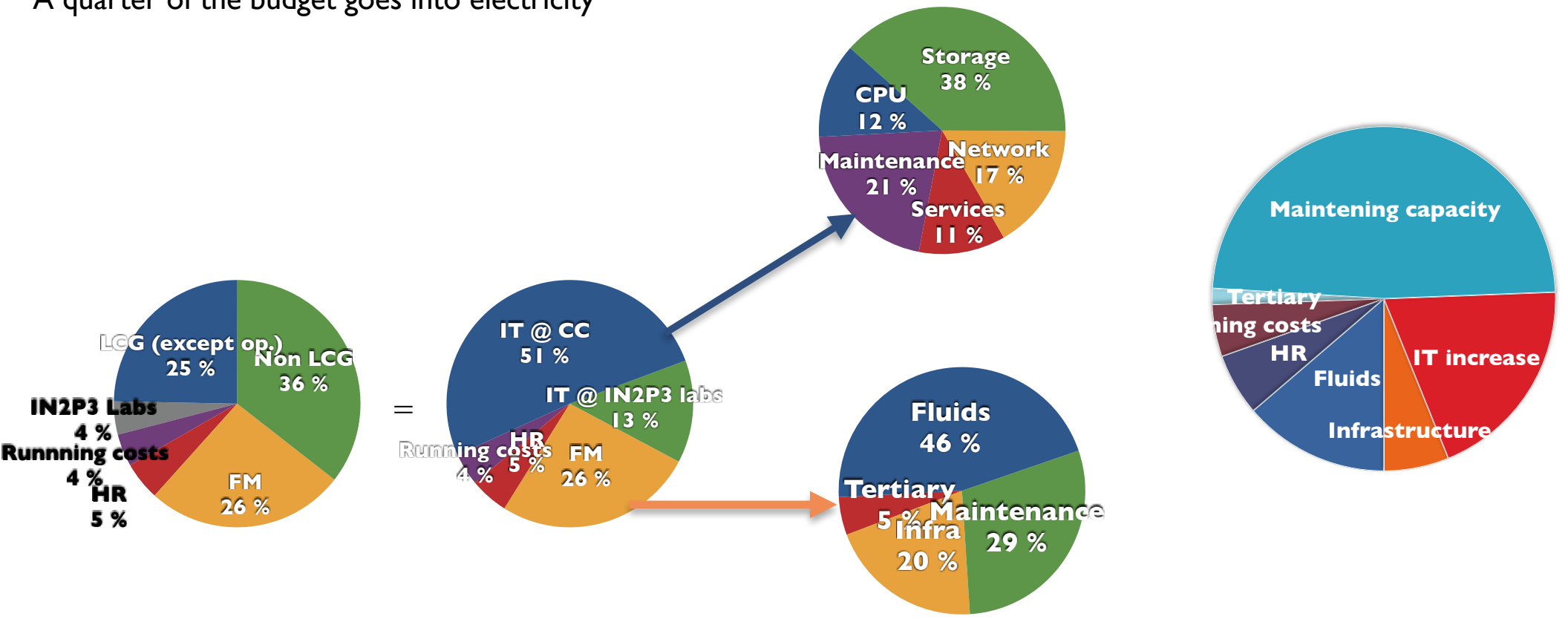
LHC Computing Grid

Role	Site	ALICE	ATLAS	CMS	LHCb
Tier-1	IN2P3-CC	✓	✓	✓	✓
Tier-2	IN2P3-CC-T2 (AF)		✓		✓
	IN2P3-CPPM		✓		✓
	GRIF	✓	✓	✓	✓
	IN2P3-LPC	✓	✓		✓
	IN2P3-IPHC	✓		✓	
	IN2P3-LAPP		✓		✓
	IN2P3-LPSC	✓	✓		
	IN2P3-SUBATECH	✓			
Tier-3	IN2P3-IPNL	✓		✓	

LCG-France :

MoU between IN2P3 and the Tiers sites for 2013-2016 :
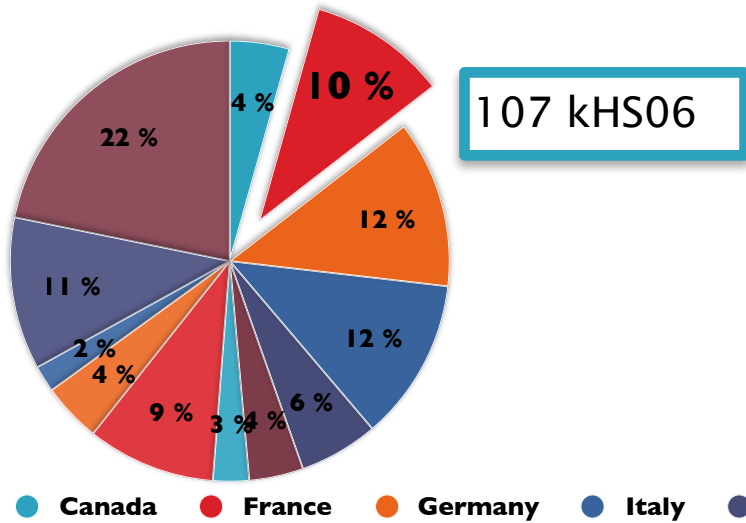   to keep the french contribution to WLCG at least at ~10%
    to keep the 100% of the T1 and its growth (~10 to 20%)
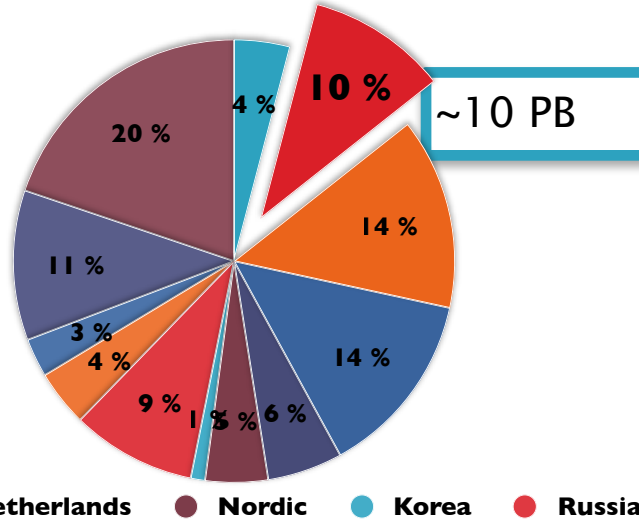   maintain the T2-T3s by funding them to up 70% of the needed money

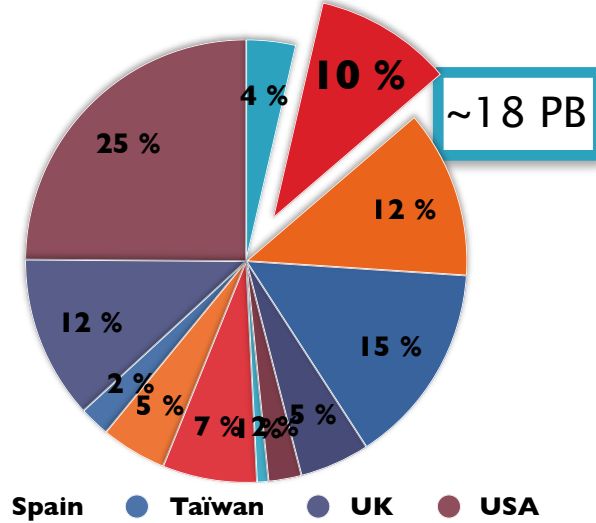With annual budget forecast : ~1 800 €

CC-IN2P3 within WLCG

2015 T1 Pledged CPU Capcacity

107 kHS06

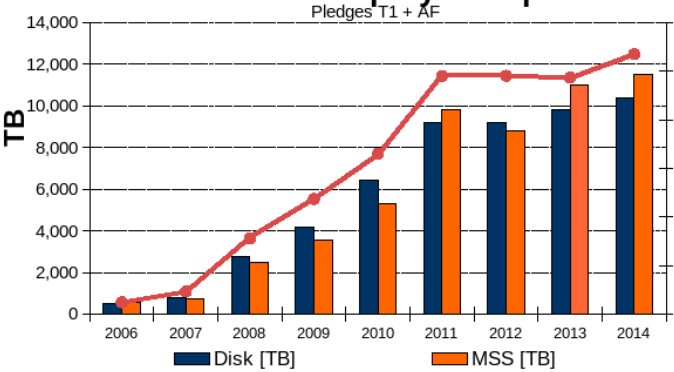4 % 10 % 22 % 11 % 2 % 4 % 9 % 3 % 4 % 6 % 12 % 12 %

2015 T1 Pledged Disk Capacity

~10 PB

4 % 10 % 20 % 11 % 3 % 4 % 9 % 1 % 5 % 6 % 14 % 14 %

2015 T1 Pledged Tape Capacity

~18 PB

4 % 10 % 25 % 12 % 2 % 5 % 7 % 1 % 2 % 5 % 12 % 15 %

● **Canada** ● **France** ● **Germany** ● **Italy** ● **Netherlands** ● **Nordic** ● **Korea** ● **Russia** ● **Spain** ● **Taïwan** ● **UK** ● **USA**

Resource Deployment plan

Pledges T1 + AF

Disk [TB] — MSS [TB]

Evolution Ressources LCG-France
Sites T2-T3 hors CC-IN2P3

Disk [TB] — CPU [HEP-SPEC06]
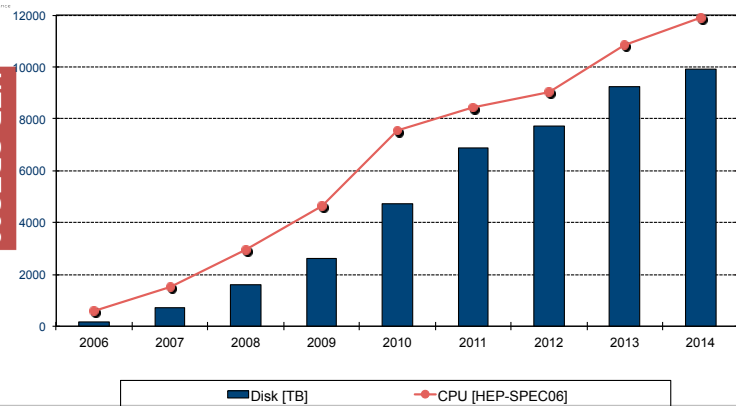
% of 2014 pledges	CPU	Disk	Tapes
French T1 / ∑ T1	10,15	10,29	10,11
French T1+T2s / ∑ T1+T2s	9,61	10,3	10,11

LHCOPN
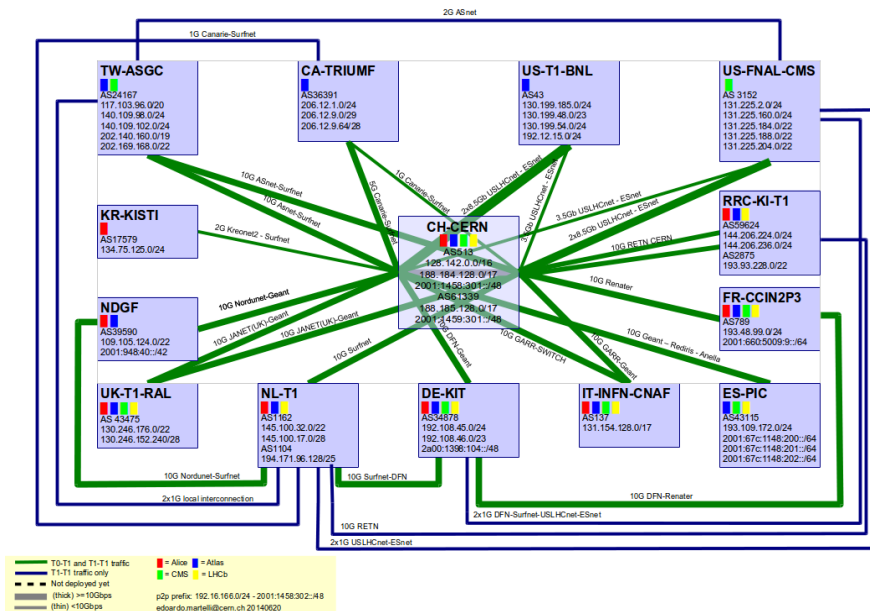
Sites LHCONE Déc. 2012
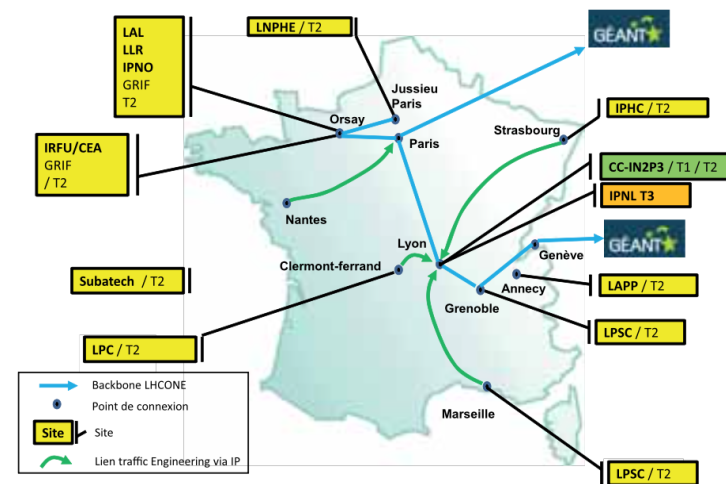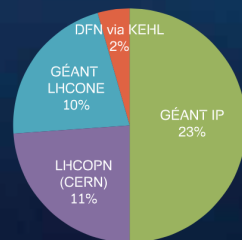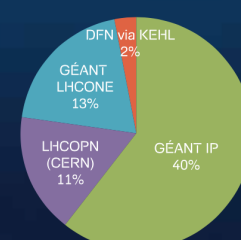
2013 Renater report status:

LCG is 46 % of total french trafic

Répartition du trafic enseignement supérieur recherche entrant sur le réseau RENATER
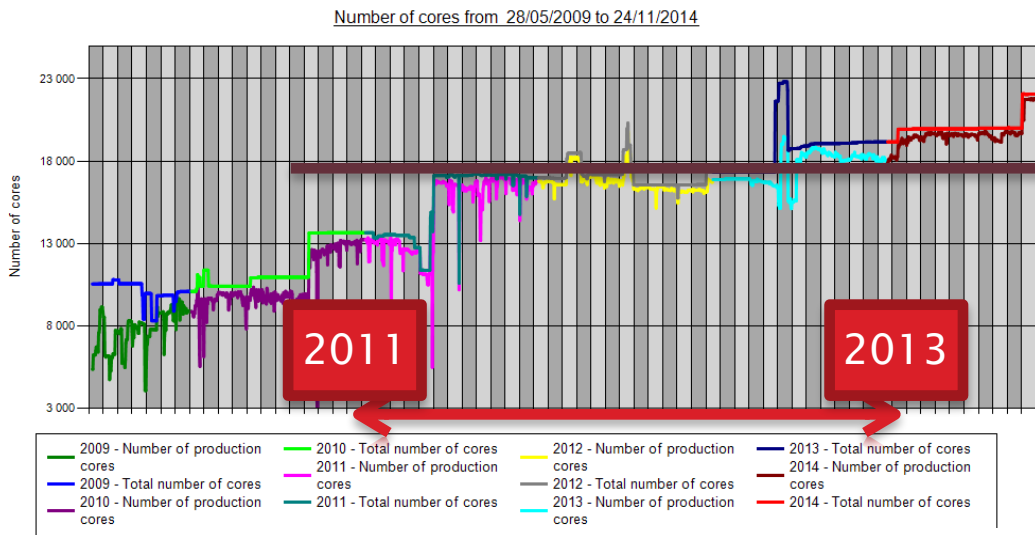
Répartition du trafic enseignement supérieur recherche sortant du réseau RENATER

Capacities and usages

CPU capacity
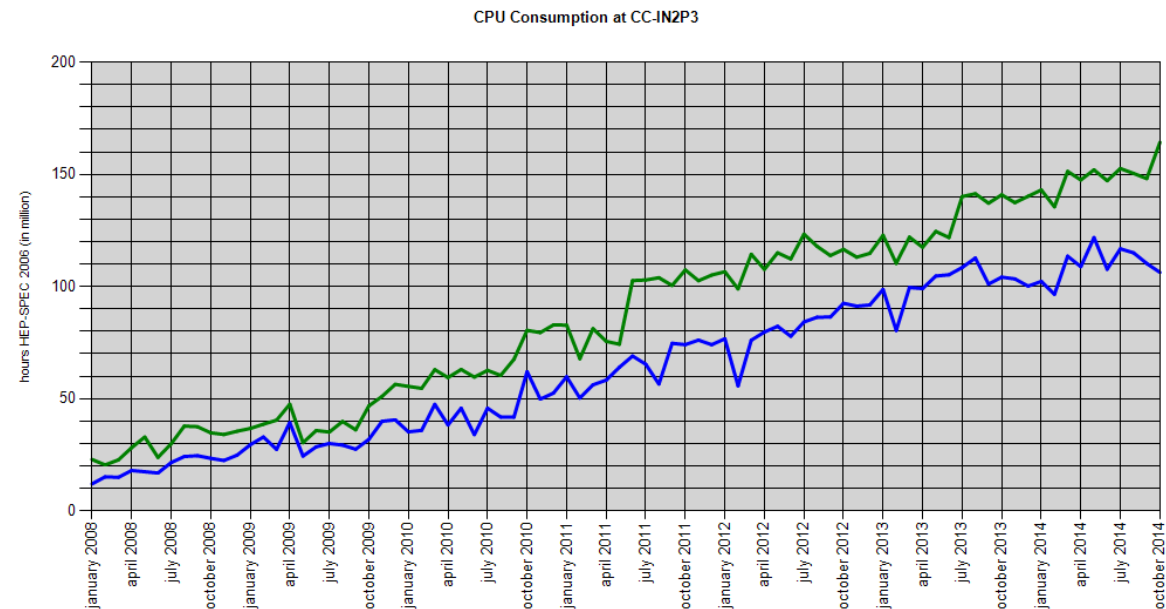
Number of cores from 28/05/2009 to 24/11/2014

2011-13 : core number is constant

2014 : 20 000 cores for a global power of 208 866 HEPSpec06

Available power is growing :

- newer servers bought to maintain capacity
- OS is more efficient

CPU Consumption at CC-IN2P3

Storage capacities and global consumption

Disk storage

Standard performance disk > **12 PB**
High performance disk (for GPFS) = **1,6 PB**

Tapes

Storage used on magnetic tape : **25 PB** out of **340 PB** nominal capacity
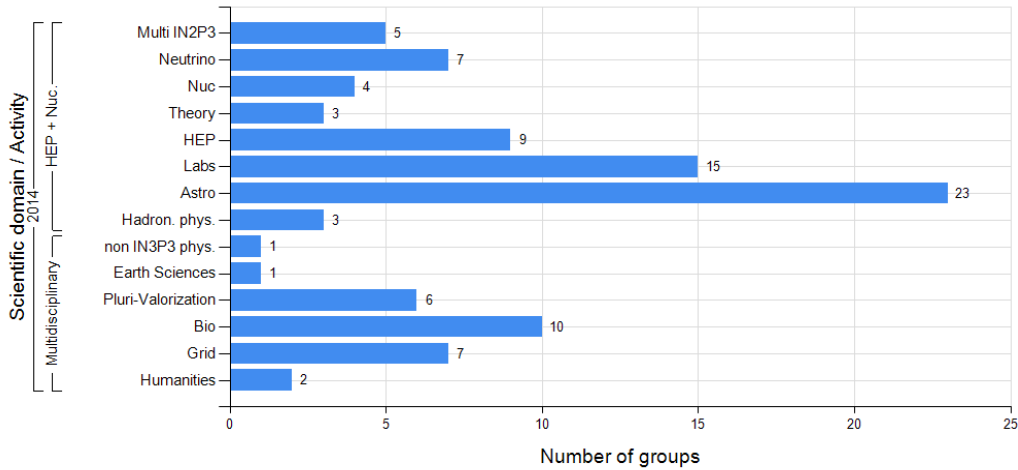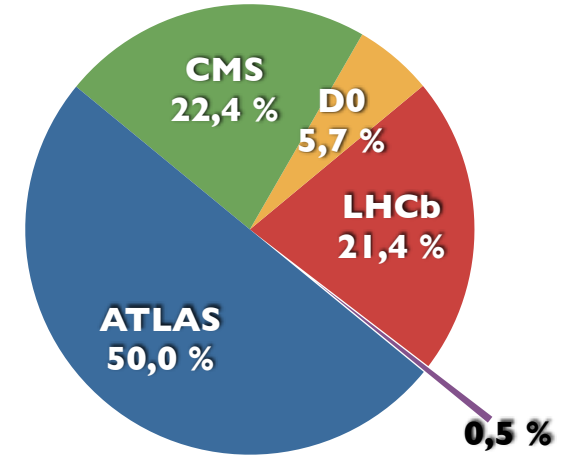
Backup (TSM)

Stored volume : about **5,5 Po**

2015	Allocation
CPU (HS06.h)	1 947 949 840
MSS (To)	24 957
dCache (To)	8 586
iRods (To)	524
GPFS (To)	1 673
xRootd (To)	2 545

Number of groups by scientific domain and activity in 2014

Top HEP

CMS 22,4 %
D0 5,7 %
LHCb 21,4 %
ATLAS 50,0 %
0,5 %

- **Particle Physics**
- **Hadron Physics**
- **Theory**
- **Labs**
- **IN2P3 Multidisciplinary & openings**
- **Nuclear Physics**
- **Astroparticles + Neutrino**

59,3 %
10,4 %
1,7 %
0,4 %
21,5 %
0,3 %
6,4 %
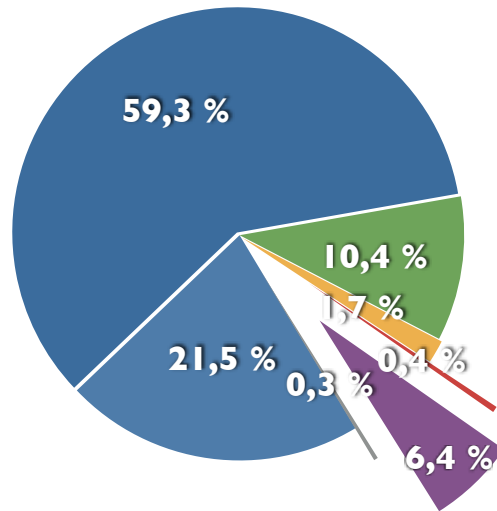
Top 10 Astroparticle + Neutrino sharing

CRAL Planck, 1 %
GLAST 16 %
km3net 2 %
HESS 15,3 %
Auger 3,3 %
Antares 15,1 %
AMS 13 %
CTA 13 %
dchooz 6 %
Virgo 1 %
12,7 %
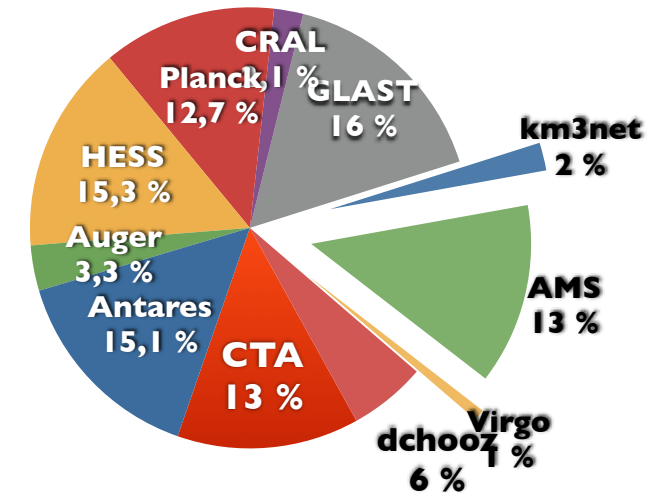
Perspectives
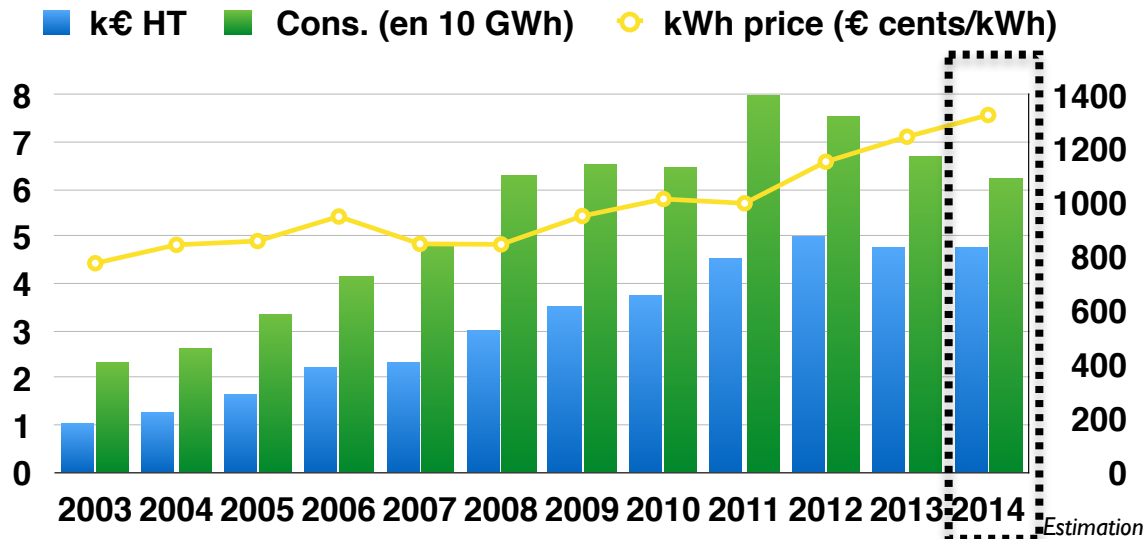
Average consumed power by month is decreasing :

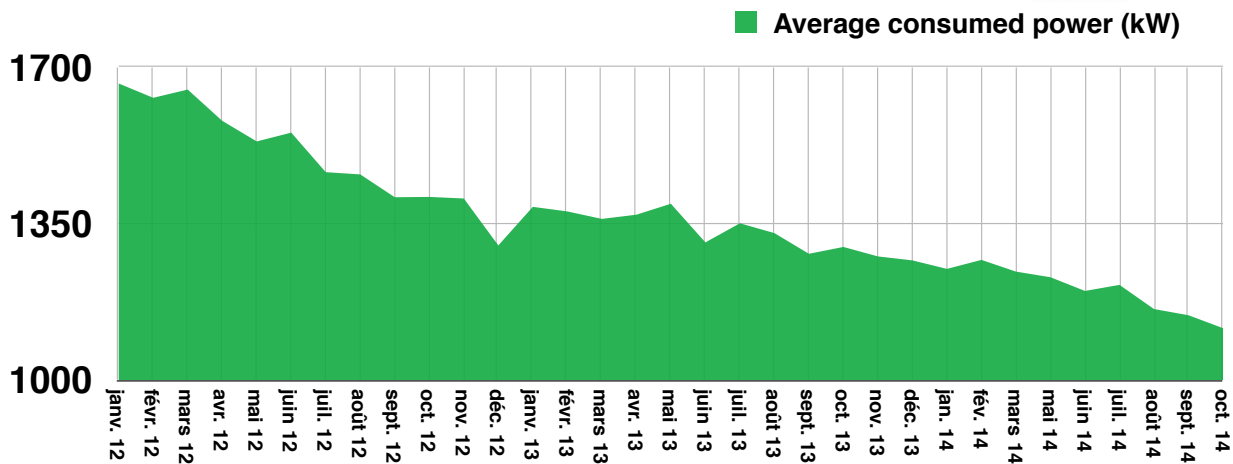- hardware renewal
- energetic optimisation (setpoints tuning)
- VIL 2 : best PUE

But the global bill is more or less constant :

- kWh price increases
- threshold effects of the EDF contracts

Base infrastructure designed to fit the final configuration (wires, pipes…)

Everything else is modular (transformers, UPS, chillers, etc.) and can be installed later as a function of the needs

Best PUE : ~ 1.47

Capacity : 80 racks
 28 installed - 52 left

1 rack = 730 TB or 20,5 kHS06 (2014)

2*250 m2 to use

Investment for 80 racks : from 1.5 to 2 M€ (Tier II) :
 wires, pipes, transformers, chillers without racks and servers

Estimated needs of future (and on-going) experiments

LSST (Large Synoptic Survey Telescope) :
- reprocessing of half of the data
- CC will host all the processed data

MOA Signed !

EUCLID : CC-IN2P3 will be one of the 8 "Sciences Data Centers" of this European space mission and should provide 30% of the resources (CPU and storage)

FTP Submitted

CTA : CC-IN2P3 may be led to operate for it, also by 2030, at least a 25% of 88 kHS06 for CPU, 207 PB for disk and 507 PB for tapes.

LHC : ~+25% per year indicates that at the end of the LHC Run 3 a **T1** capacity of

En 2024	CPU kHS06	Disque Po	MSS Po
LHC	1 000	80	150
x2014	5	6	6

In 2030	CPU kHS06	Disk PB	MSS PB
LSST	2 400	100	266
EUCLID	67	150	52
CTA	22	52	127
Σ	2 489	302	445
x2014	12	22	18

Cumulated capacities by year for the 4 experiments
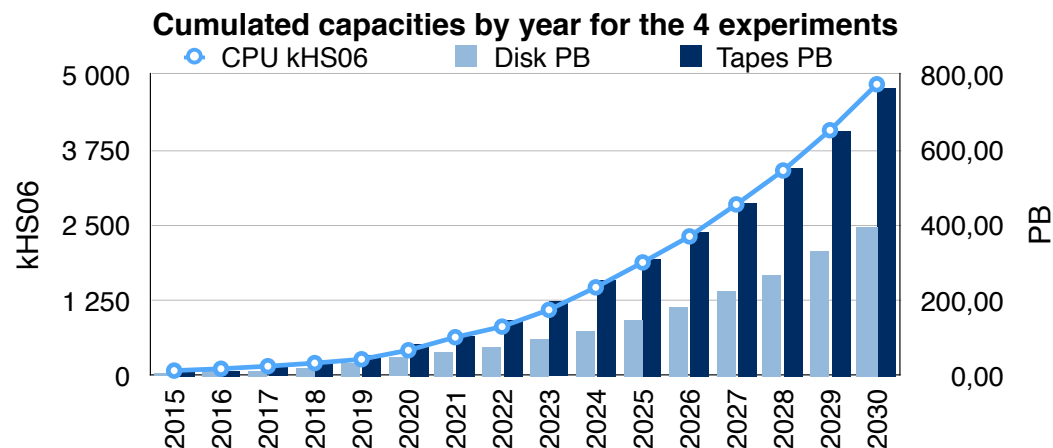
> Not only a infrastructure challenge. Stronger collaboration with experiments, with similar T1s, new softwares, interfaces between data scientists & computer scientists …

‣ IN2P3 computing budget 2015 is constant over 2014 : 6 200 k€
  - it should permit to face the experiments needs (as far as we know them today) and to continue infrastructure upgrades

‣ New projects begin
  ‣ Indigo-Datacloud, EGI-Engage, EU-T0, CPER

‣ Human resources

  - 2015 should be « calm » year : not much leaves expected (except projects) but some concern for the future
    - 2016 : new cycle of retirements, end of the on-going CEA agreement
    - 2016+ : very strong concerns about CNRS budget

Many things to do …