

Getting ready for LHC data processing in France

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CC-IN2P3

LCG for LHC experiments

- Needs from experiments of:
 - Storage capacities
 - Collisions: ~10 PB/year
 - Simulation of large sets of Monte Carlo data
 - CPU
 - Processing and reprocessing
 - Monte Carlo Simulation and reconstruction
 - Analysis
 - Inter-sites large bandwidth
 - To distribute the data from the experiment to the computing sites
 - To transfer the data and simulation from site to site

LCG for LHC experiments (2008)

	CERN (T0 + AF)	All Tier-1s	All Tier-2s	Total
CPU [SpecInt2000]	25 M	56 M	61 M	142 M
Disk [PB]	7	31	19	57
Mass Storage [PB]	18	35		53

- More than 53.000 today's dual-core AMD Opteron
- Around 355 TFLOPS

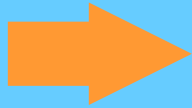
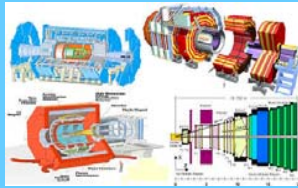
LCG System

To face the challenge → Distributed infrastructure

- Purpose of LCG:
 - Setup, develop and maintain a distributed computing environment for the storage and the analysis of the data of the four LHC experiments
- LCG Services and Applications:
 - Set of Services and application provided by EGEE (Europe and Asia Pacific) and Open Science Grid (USA)
- LCG Architecture:
 - 4-tiered model

LCG Architecture

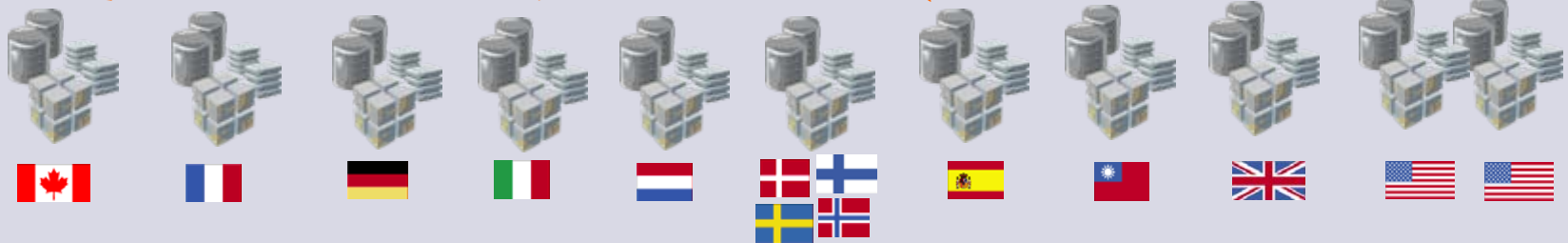
Tier-0



Trigger and Data Acquisition System



Tier-1



General Purpose /Academic /Research Network



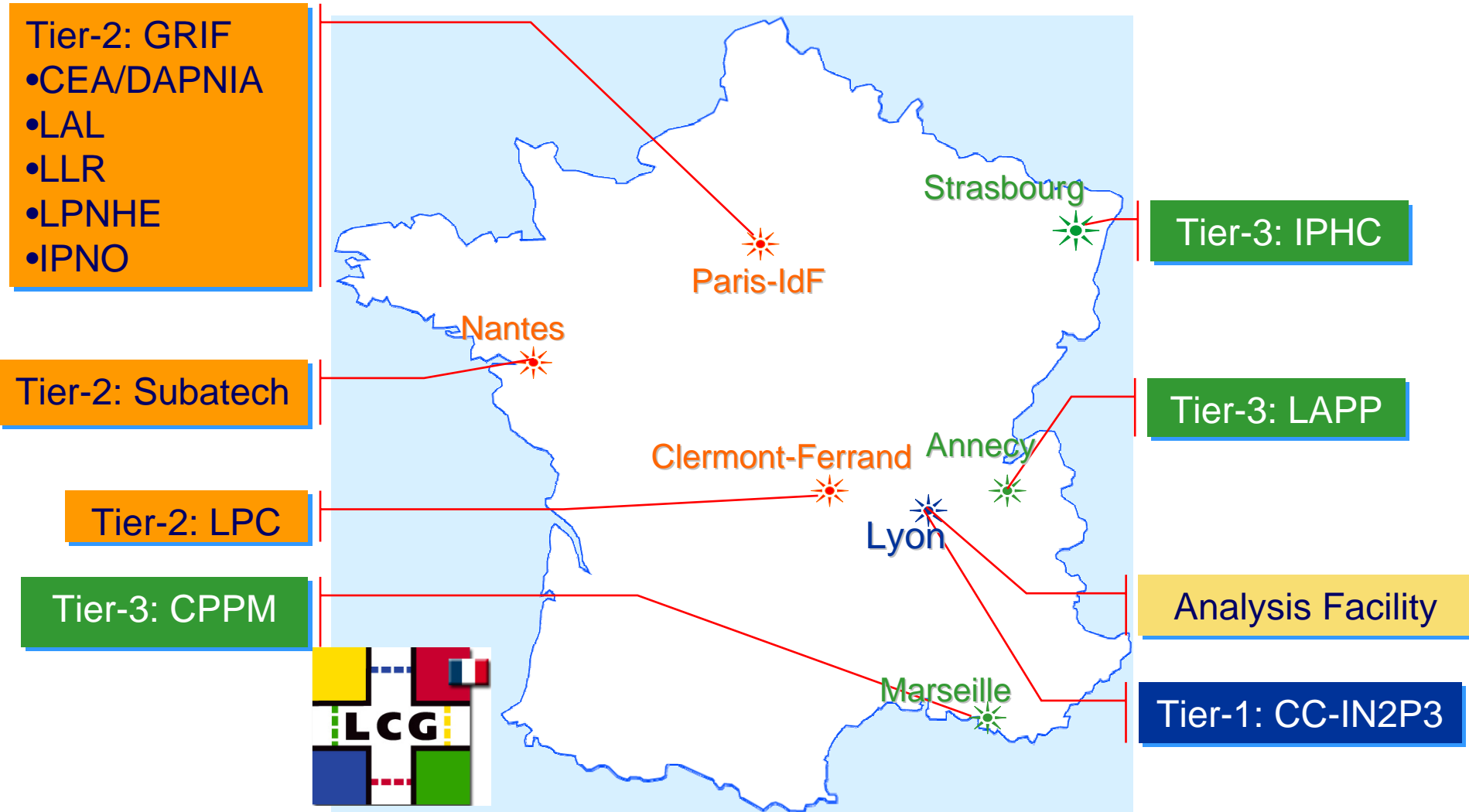
Tier-2



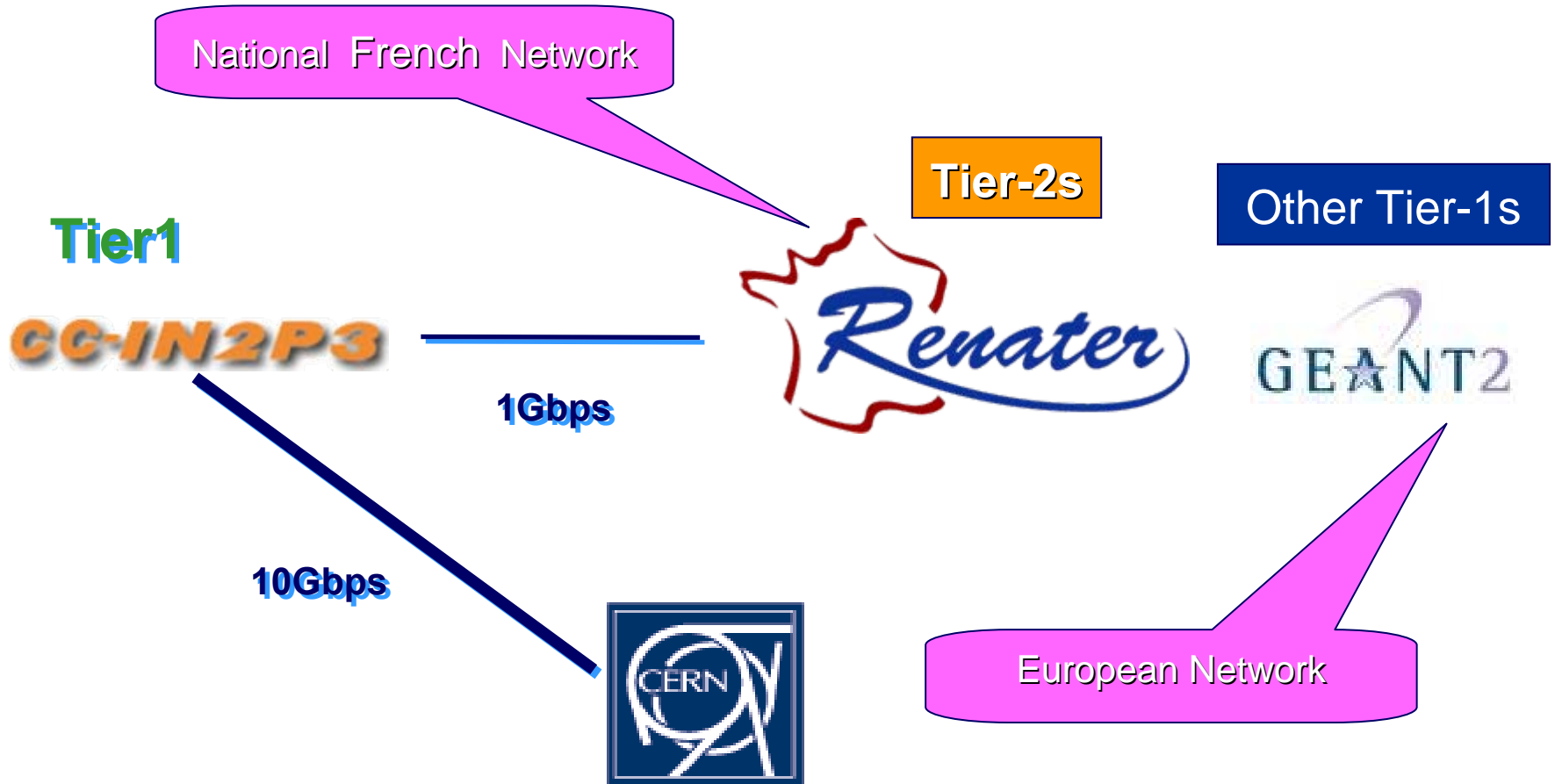
LCG France

- In the case of LCG France
 - Setup, develop and maintain an LCG Tier-1 and an Analysis Facility at CC-IN2P3 (Lyon)
 - Promote and coordinate the integration of Tier-2/Tier-3 French (and non French) sites into the LCG collaboration
 - Schedule
 - Started in July 2004
 - Two phases
 - 2004-2008: development and ramp-up
 - 2009-....: cruise phase
 - Equipment budget for Tier-1 and Analysis Facility
 - 2005-2008: 16,4 M€ Equipment budget for Tier-1 and Analysis Facility
- PROS: previous experience with large collaborations

Participating Institutes



Actual Network Backbone



Actual Network Backbone: RENATER



Connexion à l'Internet mondial

SFINX
Global Internet eXchange, accès aux autres prestataires de service Internet en France

GEANT2 www.geant2.net
Connexion vers les réseaux de la Recherche en Europe, et les réseaux de la Recherche des pays méditerranéens

de la zone Asie Pacifique

de l'Amérique du sud

de l'Amérique centrale

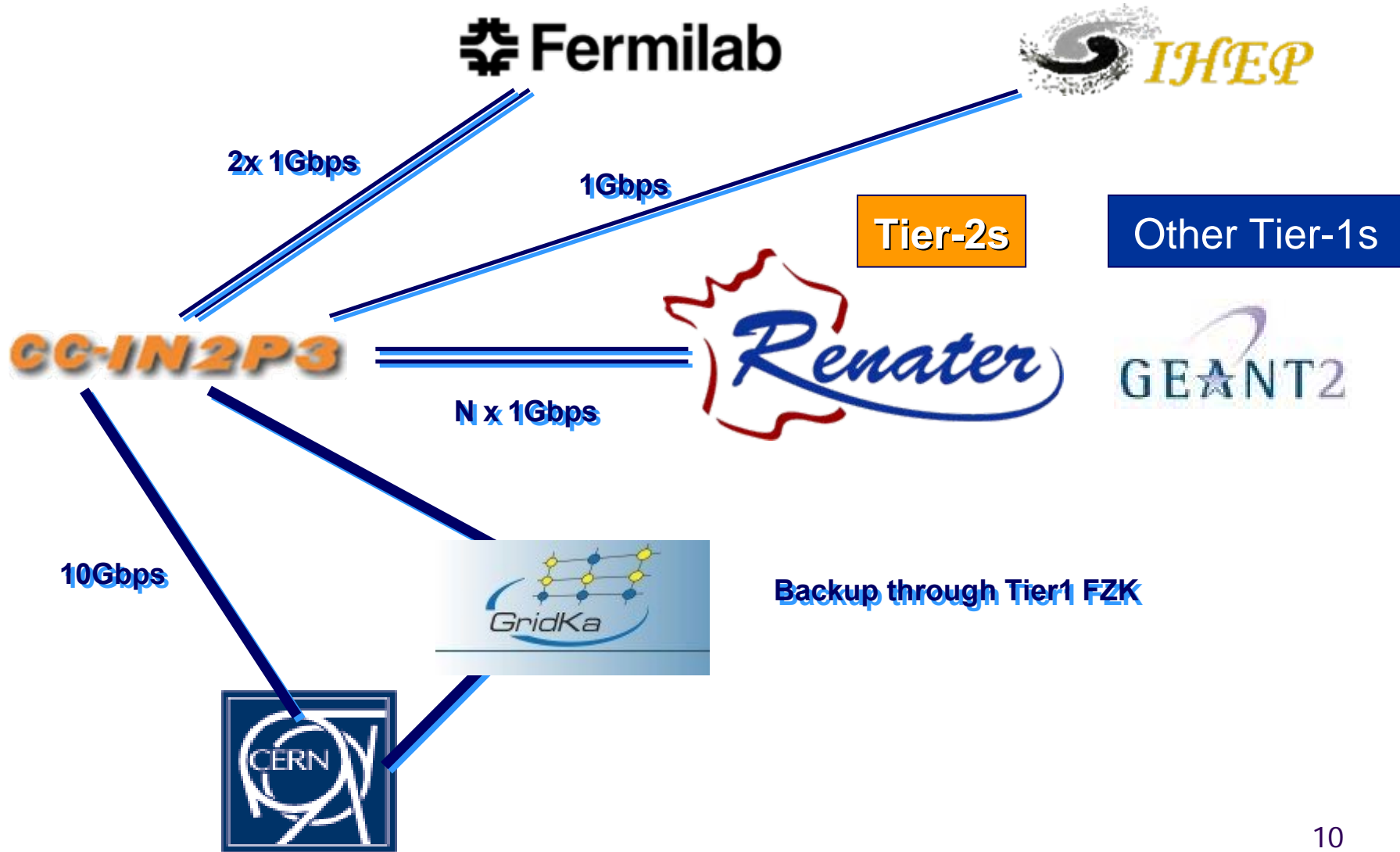
U.S.A.



Connexion vers les DOM-TOM

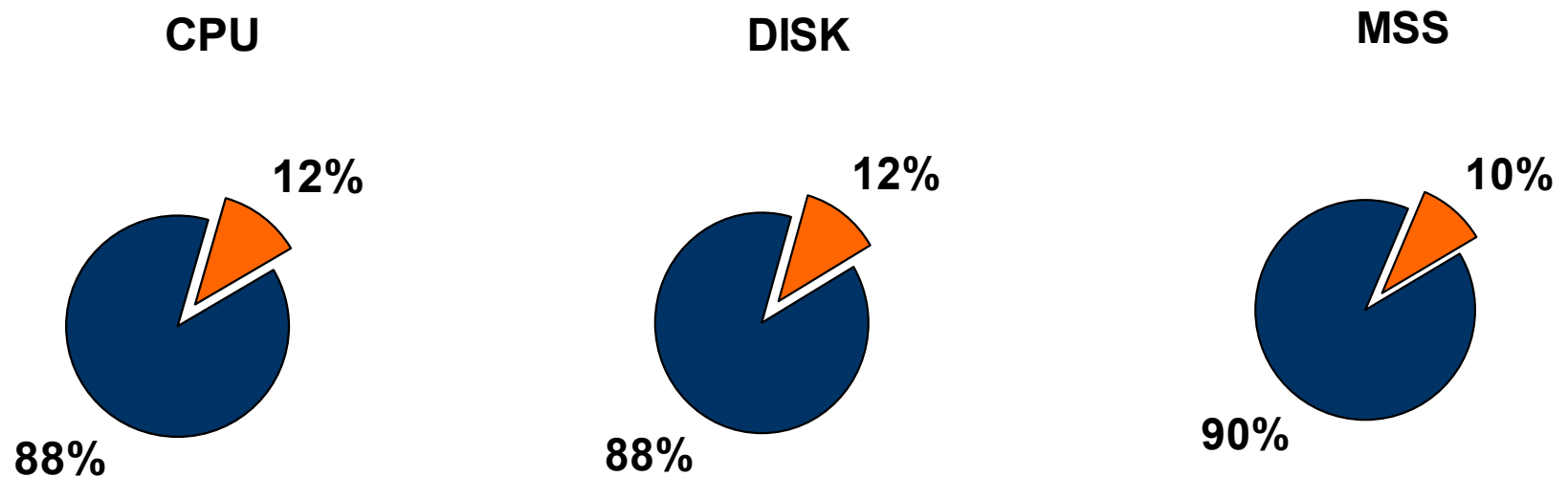
- Réseau en Ile de France
- 2,5 Gbit/s
- Liaisons projets de recherche
- Liaison projets à venir
- NR
- NRI

Future Network Backbone (end 2006)



Tier 1: Computing Resources

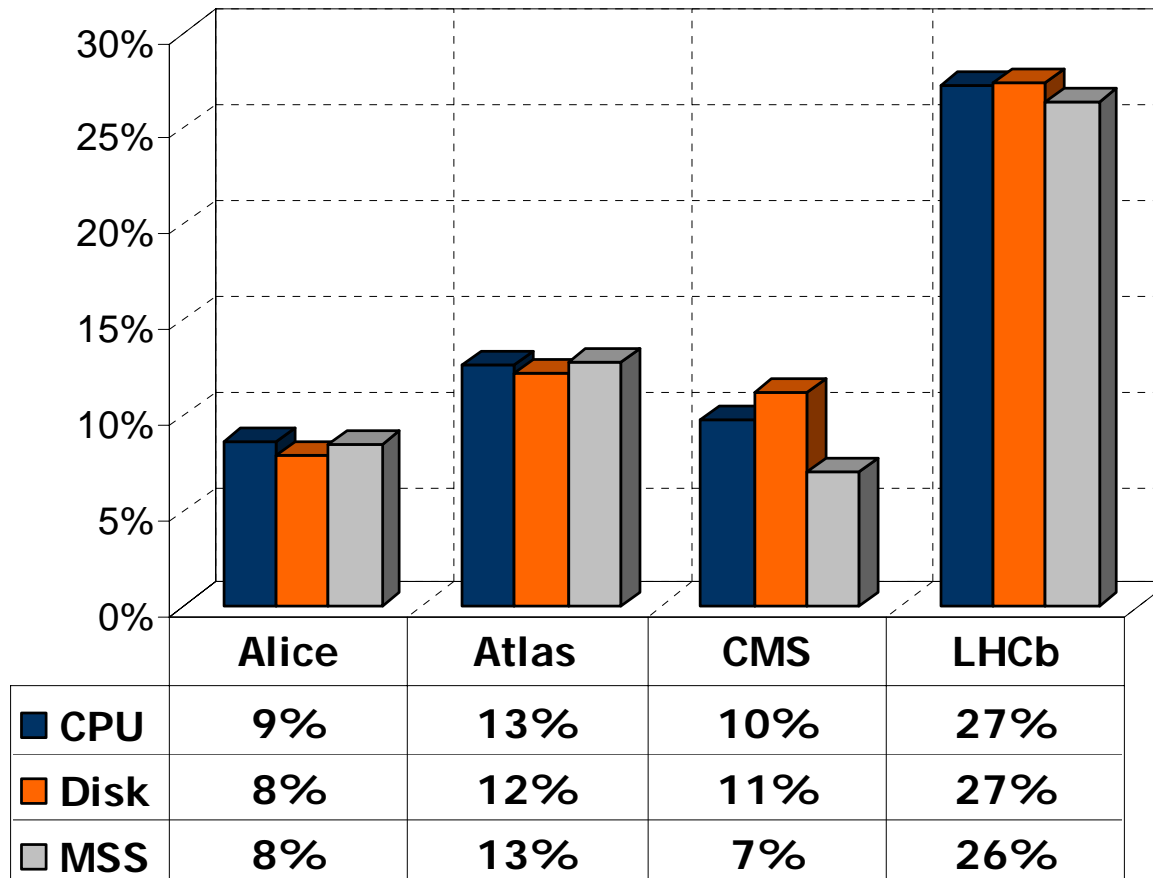
Lyon Tier-1 contribution versus all Tier-1s



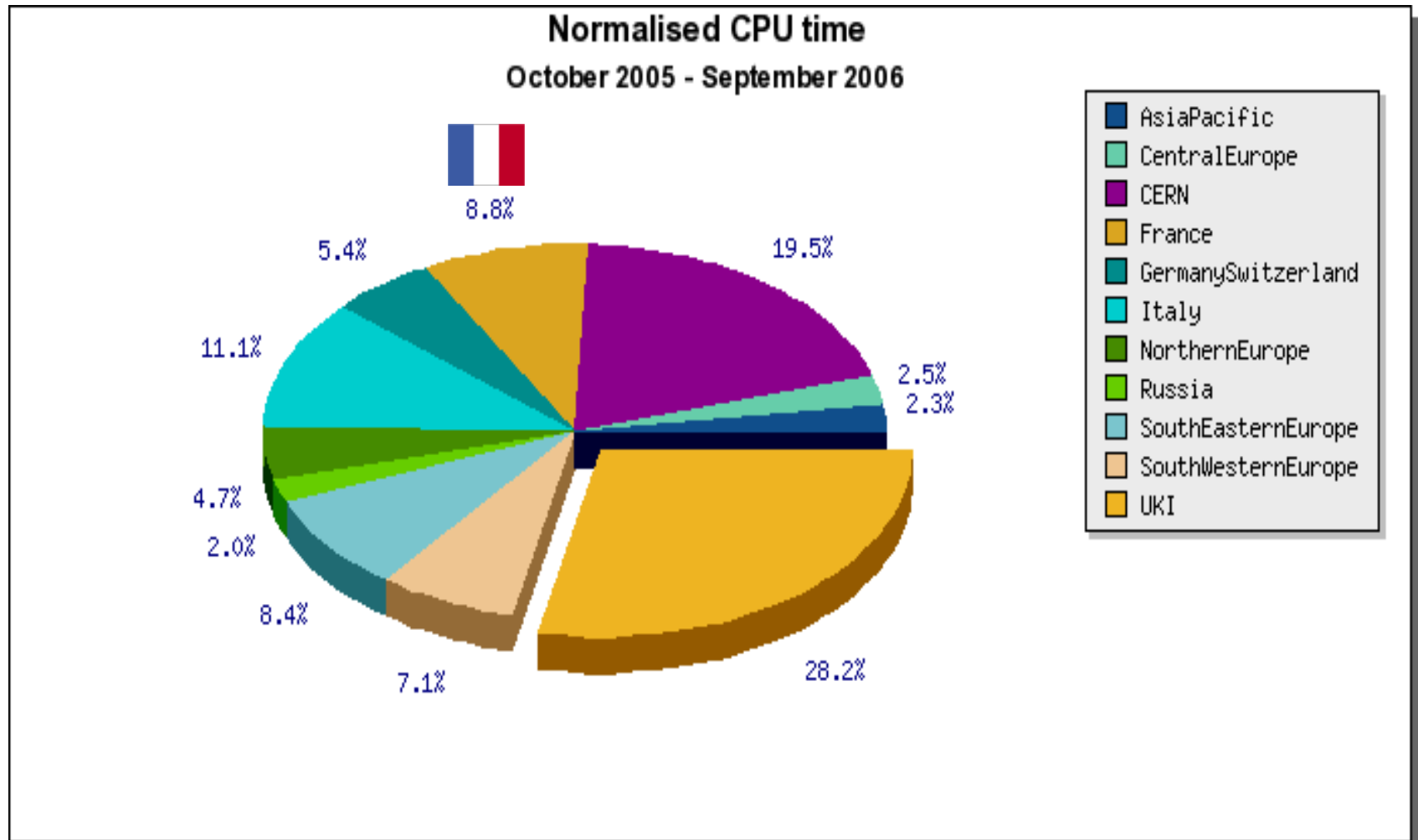
	CPU [SpecInt2000]	Disk [PB]	MSS [PB]
	6.7 M	3.7	3.5

TIER-1: Computing Resources

Lyon T1 contribution per LHC experiment



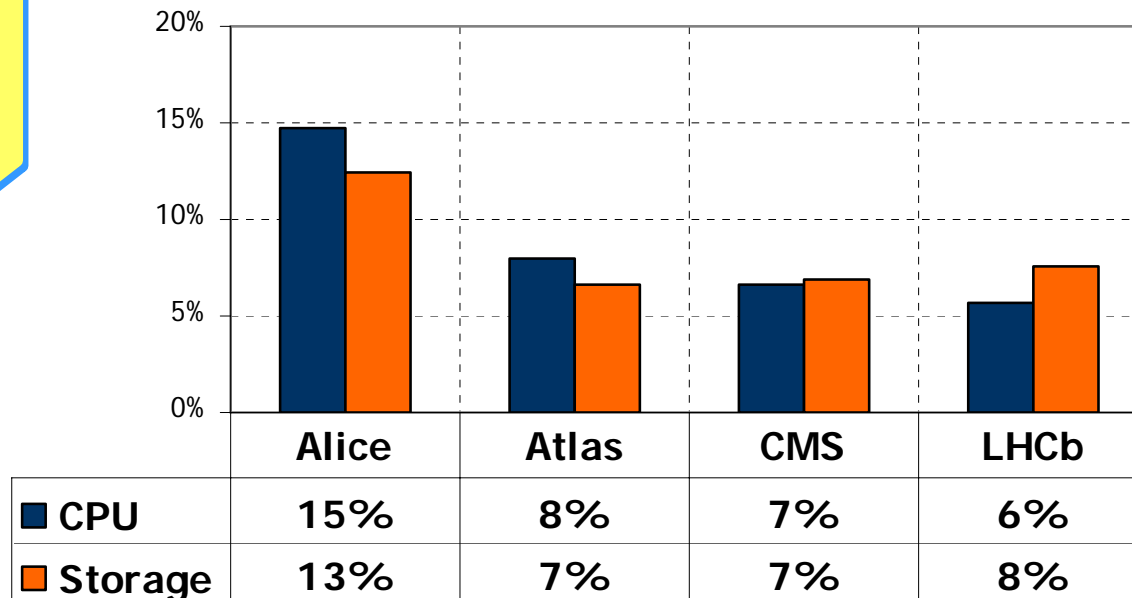
CPU Contribution



TIER-2s: Computing Resources

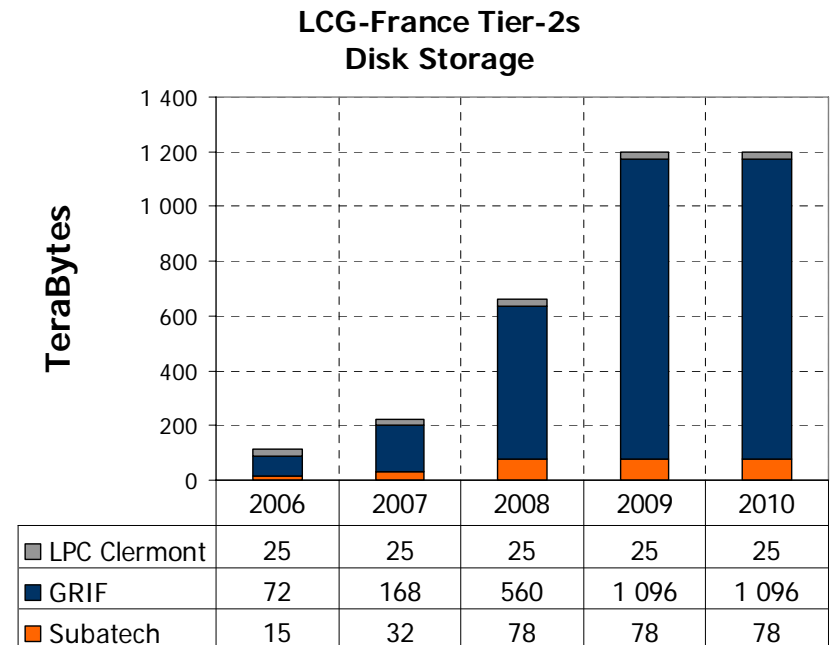
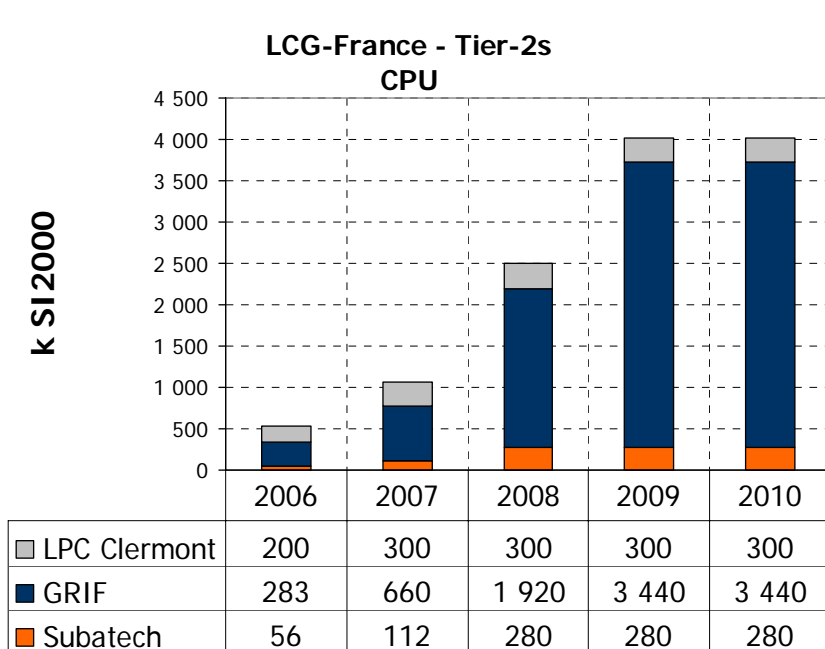
Estimated number of Tier-2 sites:
Alice: 17
Atlas: 30
CMS: 29
LHCb: 12

LCG-France Tier-2 Sites Contribution (% of Offered Resources by All Tier-2 Sites in 2008)



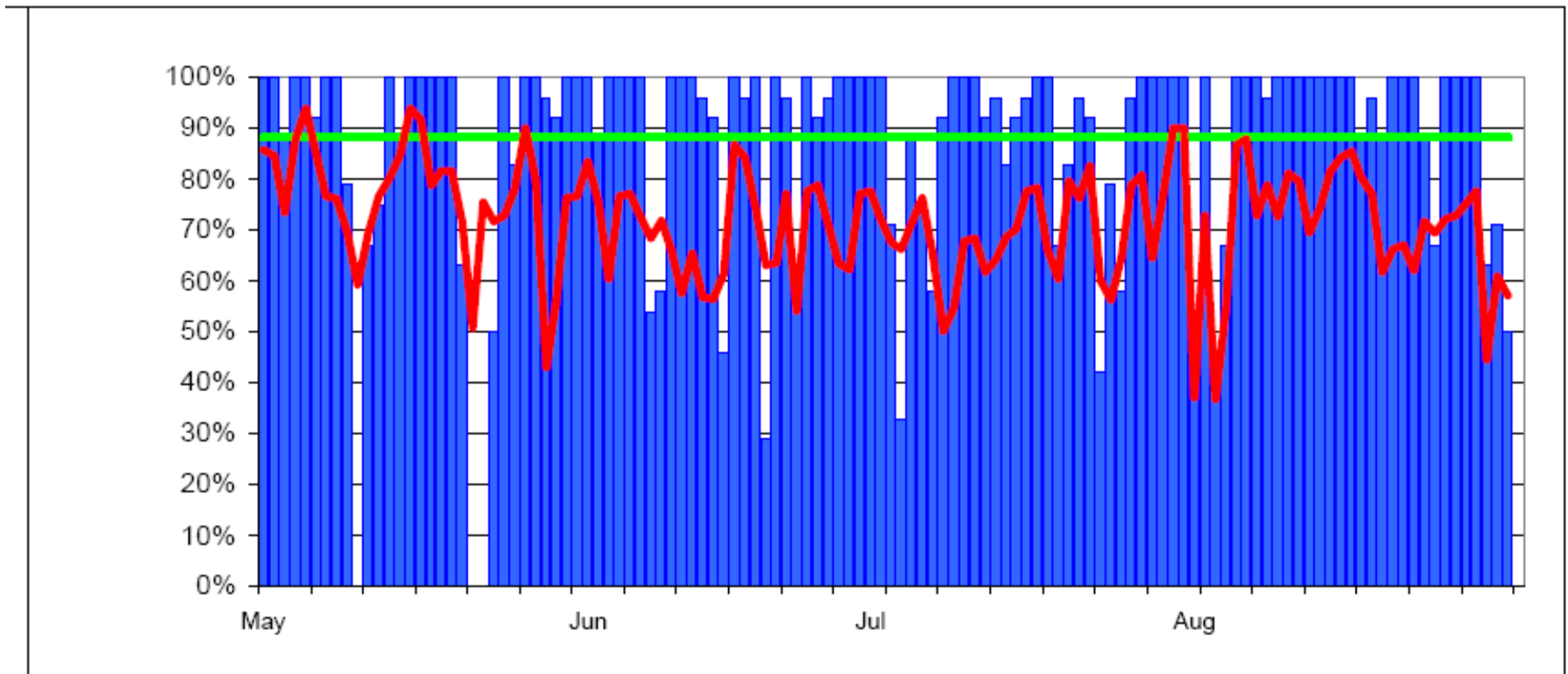
TIER-2: Evolution of the Resources

- Planned Capacity from 2006 to 2010



Tuning the Infrastructure

- Keeping the site available 7/7, 24h/day



IN2P3-CC

average **87%**

- From LCG report 2006.....

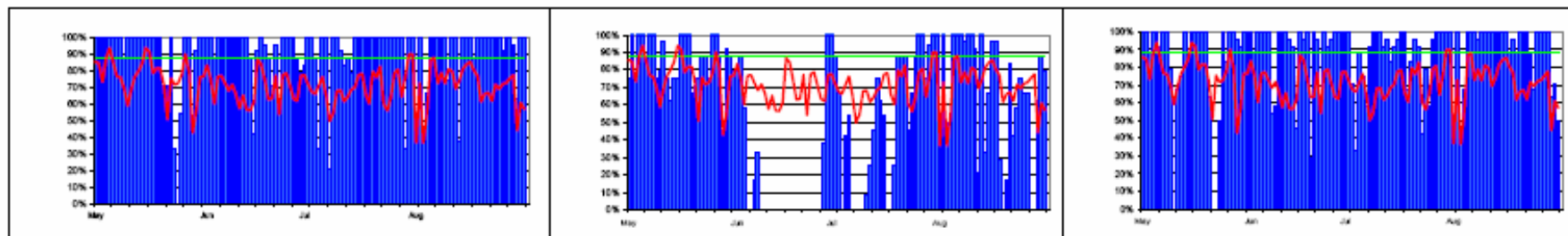


Availability of WLCG Tier-1 Sites + CERN

2006

Data from SAM monitoring. Site availability and reliability as agreed in WLCG MB on 11 July 2006 (scheduled interruptions are excluded when calculating reliability)

average (all sites) 72% target (90% of MoU) 88% site average colour coding: < 90% of target ≥ 90% of target ≥ target
sites meeting target 2 Average of 8 best sites 75% (89% of target)



CERN-PROD

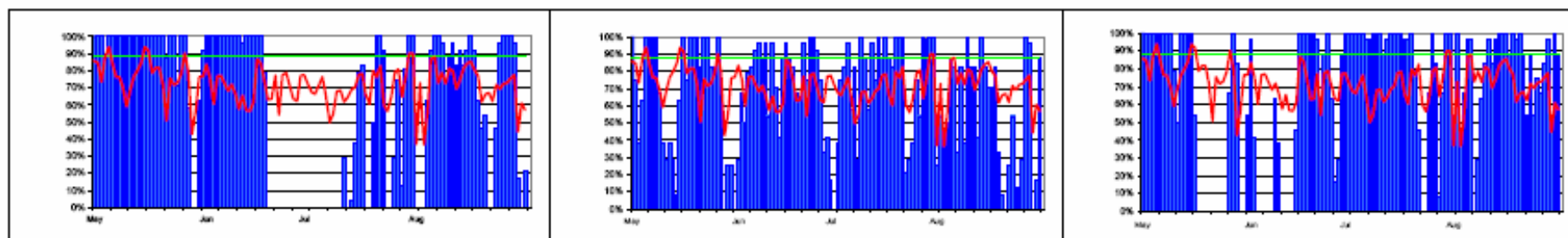
average 90%

FZK-LCG2

average 68%

IN2P3-CC

average 87%



INFN-T1

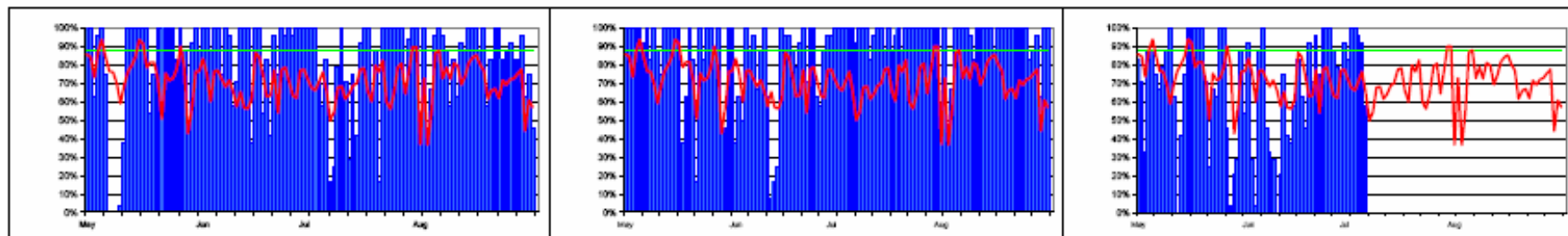
average 82%

RAL-LCG2

average 67%

SARA-MATRIX

average 88%



TRIUMF-LCG2

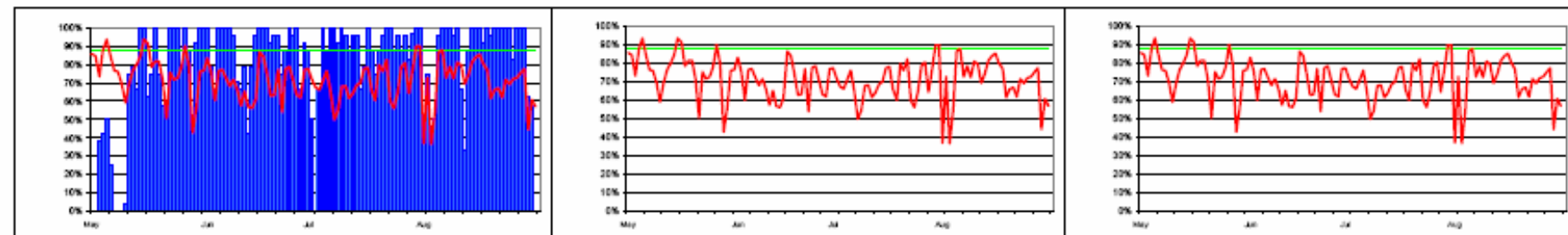
average 82%

Taiwan-LCG2

average 88%

USCMS-FNAL-WC1

average 37%

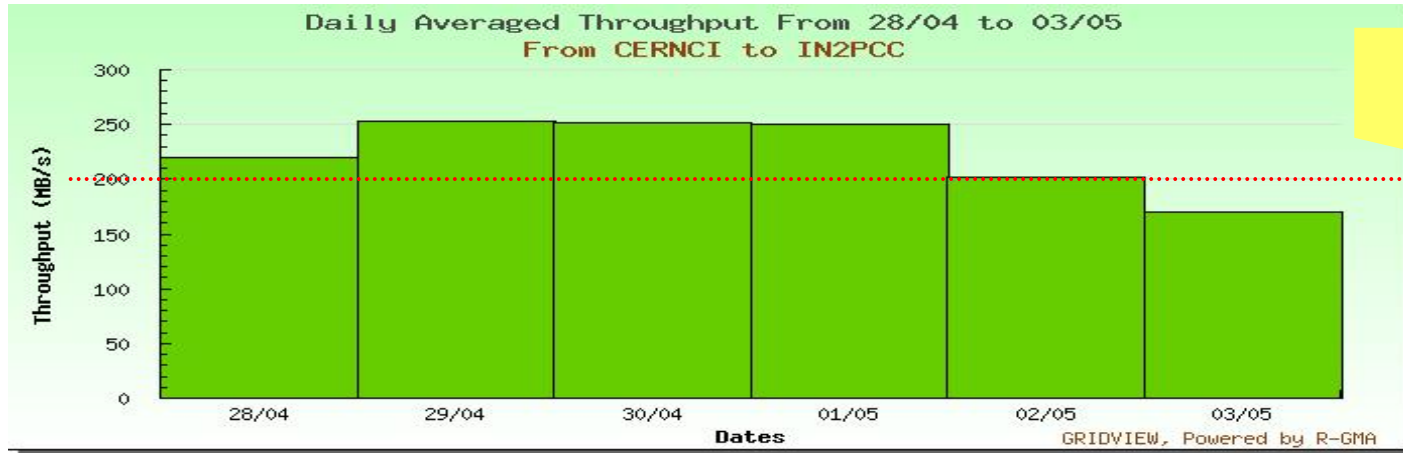


Tuning the Infrastructure (cont'd)

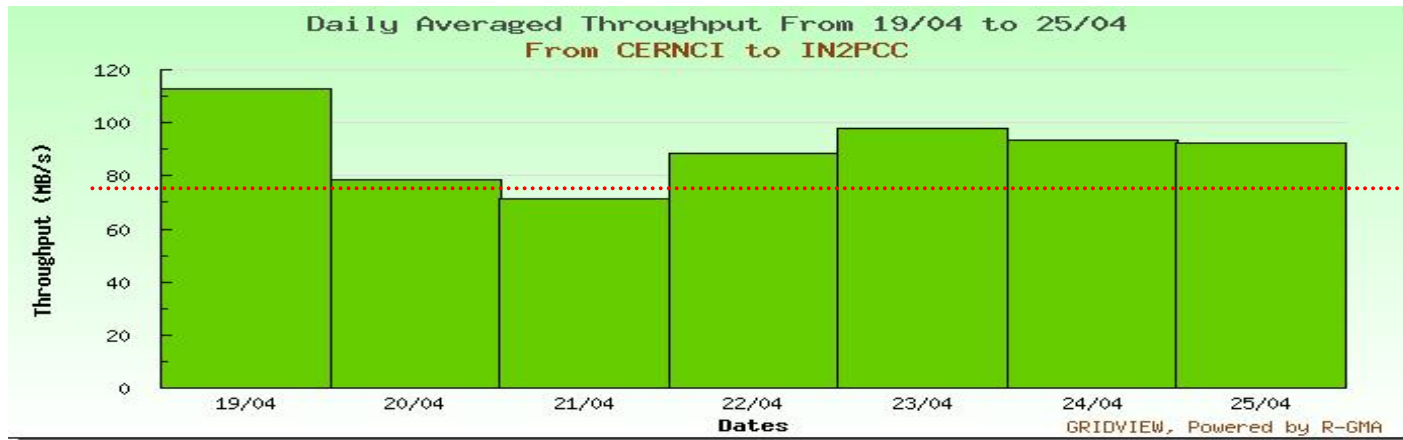
- Being part of the **Service Challenges** to exercise and adapt the setup and tune the performances
 - **Global Challenges SC3/4..**
- Participating to experiments driven tests to exercise the reliability of the models of data distribution and processing.
 - **Data transfer functional tests**
 - **Tests of data reprocessing**

Services Challenges : April 2006

CERN → CC-IN2P3 (DISK)



CERN → CC-IN2P3 (MSS)

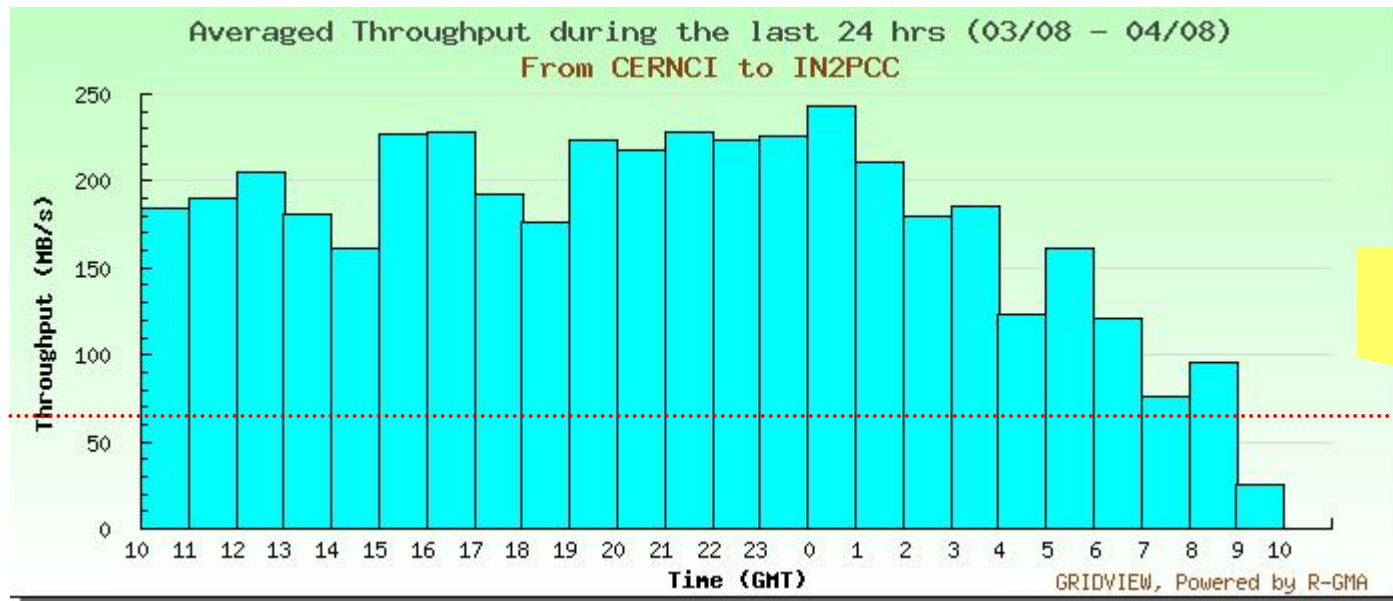


Services Challenges: June 2006

- Since 19 June: SC4
- Data transfers from T0 to T1s and T2s
- Goal:
 - Stable transfers over large periods of time
 - Keep transfers at the rates expected for data distribution

Services Challenges : August 2006

CMS data transfer

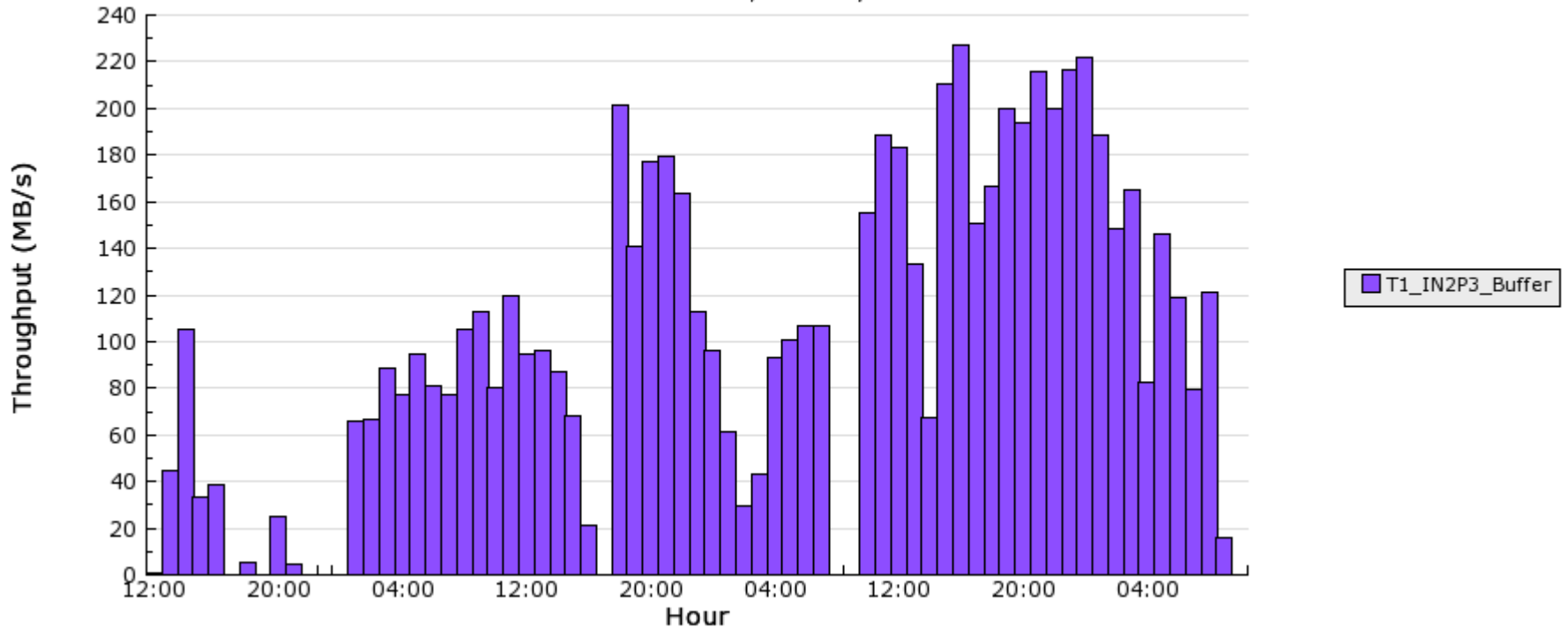


Services Challenges : August 2006

CMS data transfer

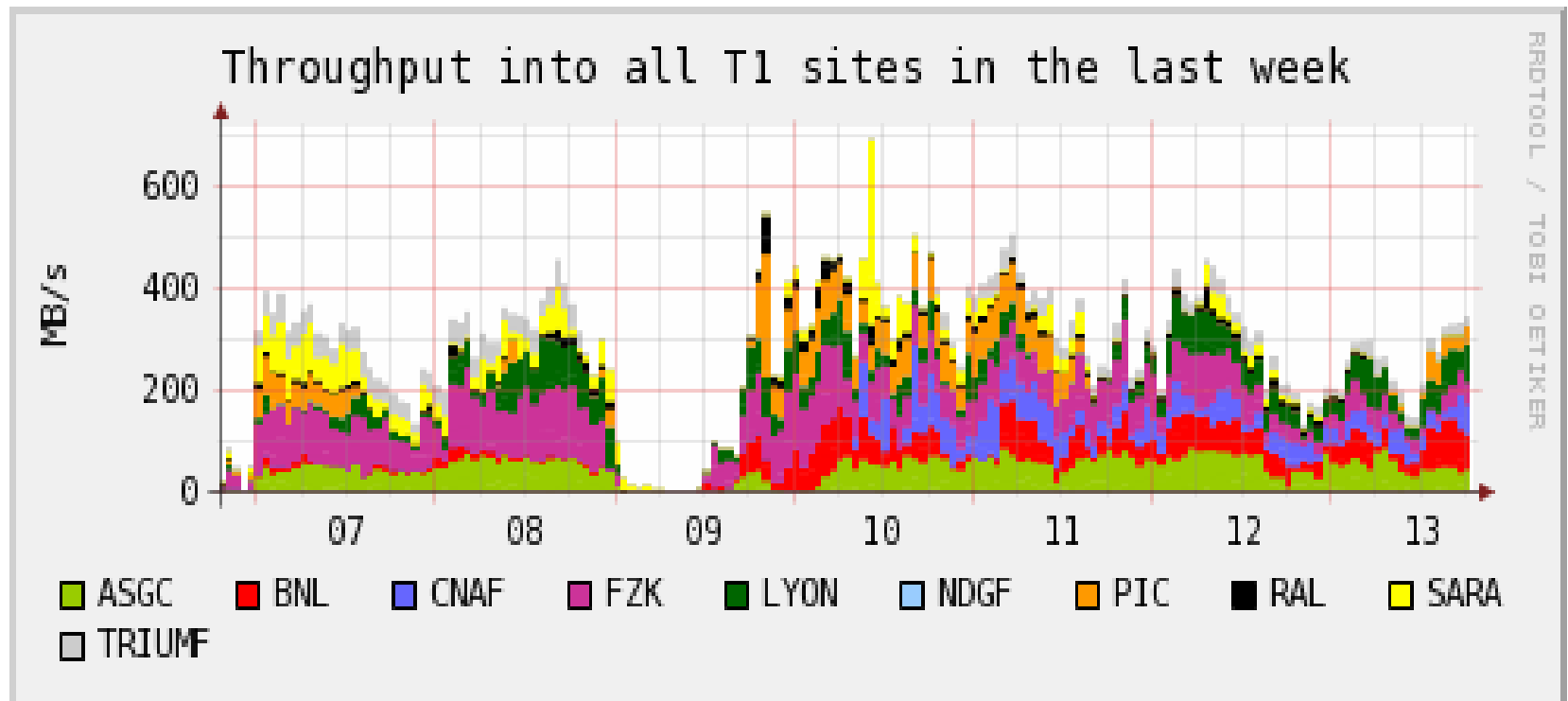
PhEDEx Dev Data Transfers By Destinations matching 'IN2P3'

Last 72 Hours at 2006-08-04 10:12, last entry 2006-08-04 10:00 GMT



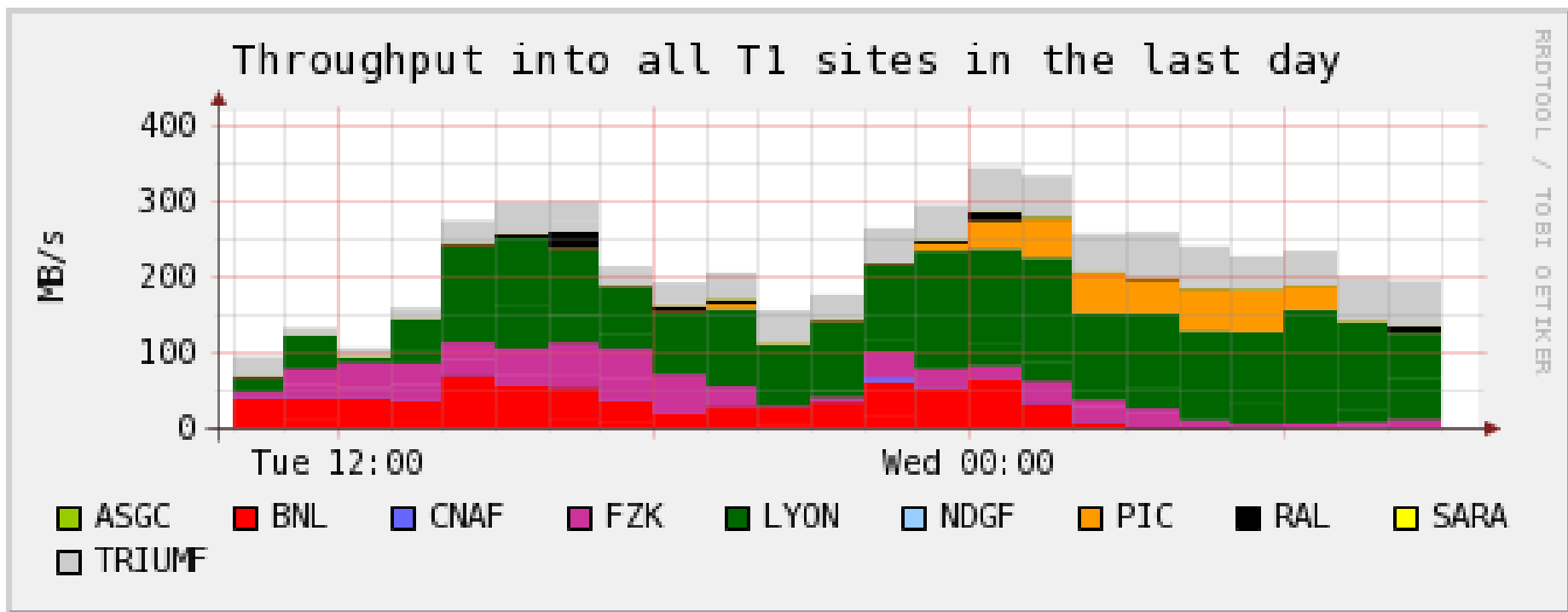
Services Challenges ATLAS (SC4) T0→T1

- ATLAS Data Transfers : continuous transfer to all T1 sites
- ~2 PB transferred so far



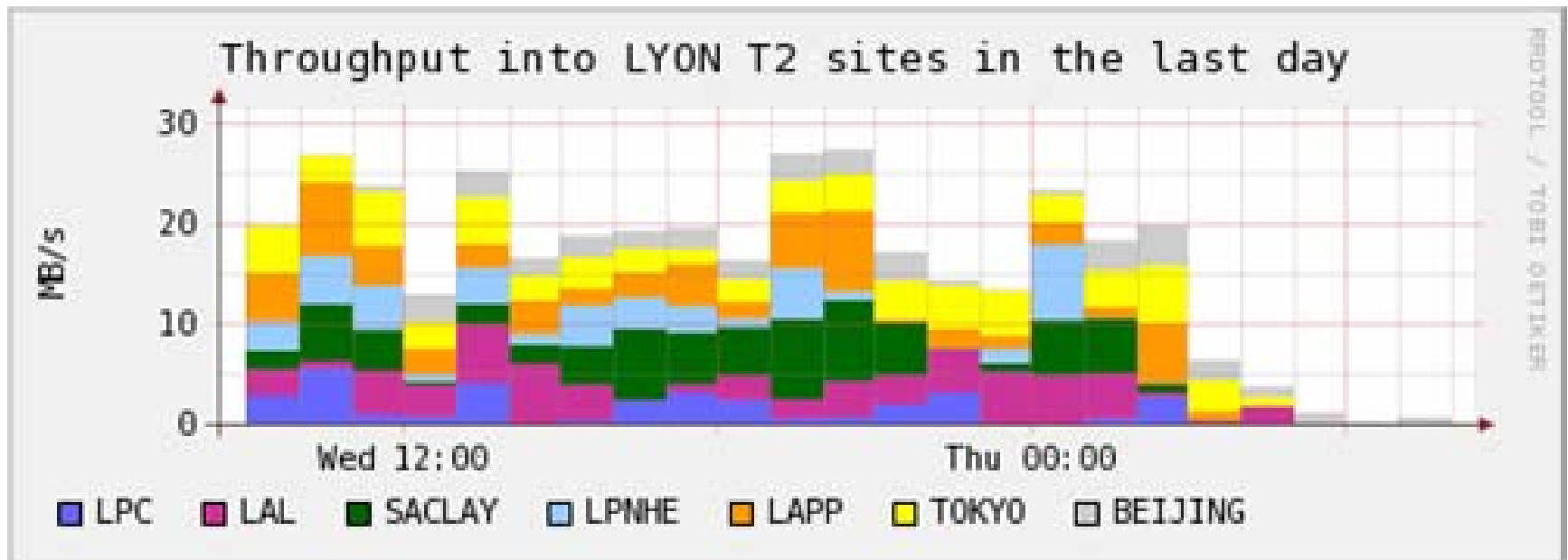
Services Challenges (SC4) T0→T1

- For Lyon T1:



SC4 ATLAS T1—>T2

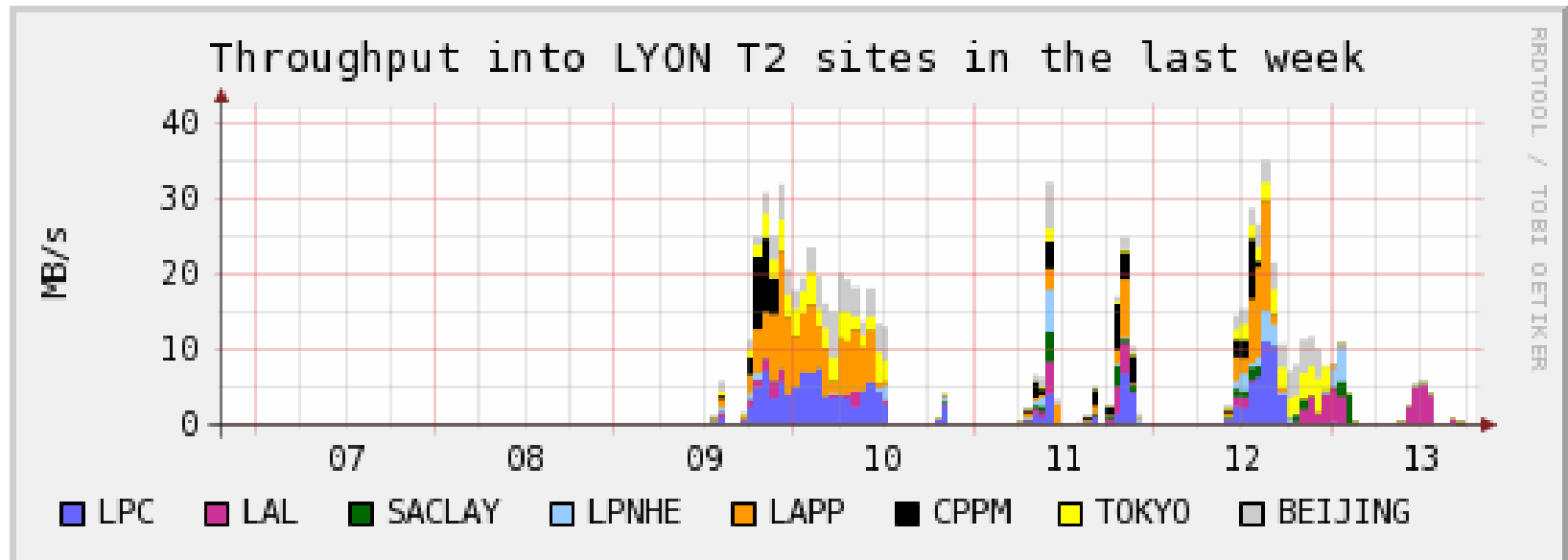
- ATLAS: continuous transfer from T1 to T2 sites initiated by the Tier 1



- Transfers to 7 Sites, T2 and non T2 simultaneously
- Some problem of limitations in the bandwidth for simultaneous transfers

SC4 ATLAS T1—>T2

- ATLAS: transfers from T1 to T2 sites



- Transfers to 8 sites including CHINA and JAPAN
- Eager to see **ROUMANIA** join.....

For Information

- LCG-France web site
 - <http://lcg.in2p3.fr>