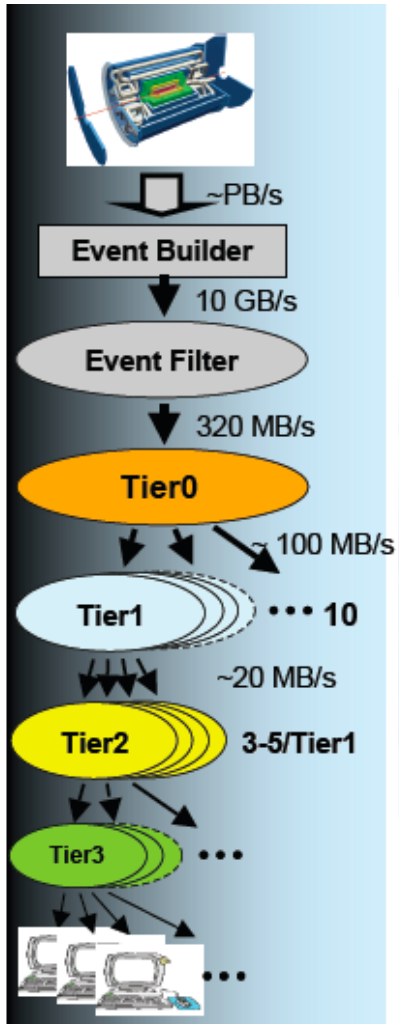
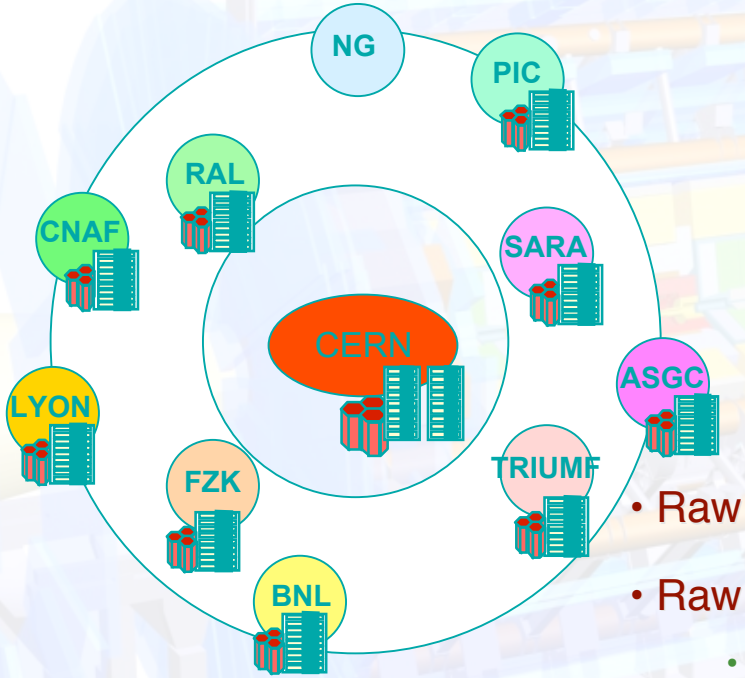
ATLAS : Computing model et utilisation de LCG

ATLAS : Grid organisation - I

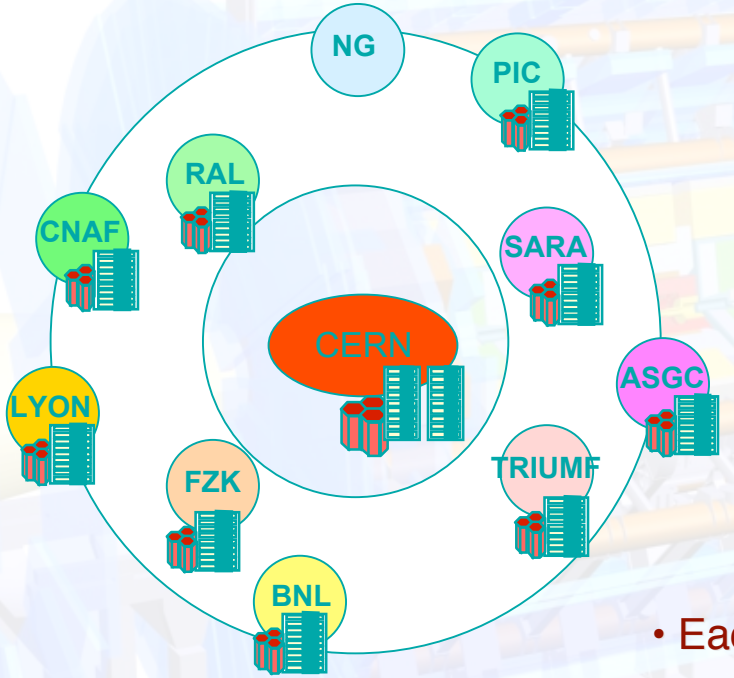




Original Processing
T0 → T1

- Raw data ➔ Mass Storage at CERN
- Raw data ➔ Tier 1 centers
  - complete dataset distributed among T1s
- ESD ➔ Tier 1 centers
  - 2 copies of ESD distributed worldwide
- AOD ➔ Each Tier 1 center
  - 1 full set per T1

ATLAS : Grid organisation - II

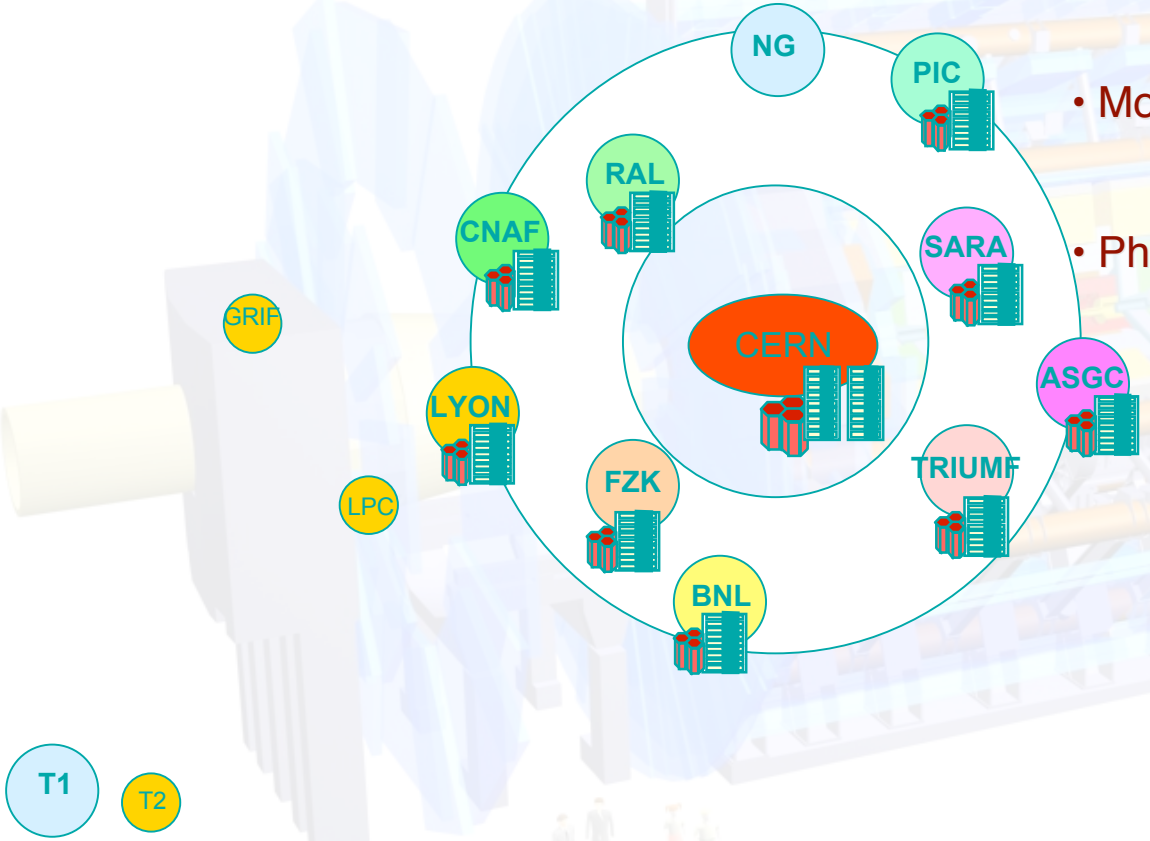


Reprocessing
T1 ↔ T1

- Each T1 reconstucts its own RAW
- Produces new ESD, AOD
- Ships :
  - ESD to one associated T1
  - AOD to all other T1s

T1

ATLAS : Grid organisation - III

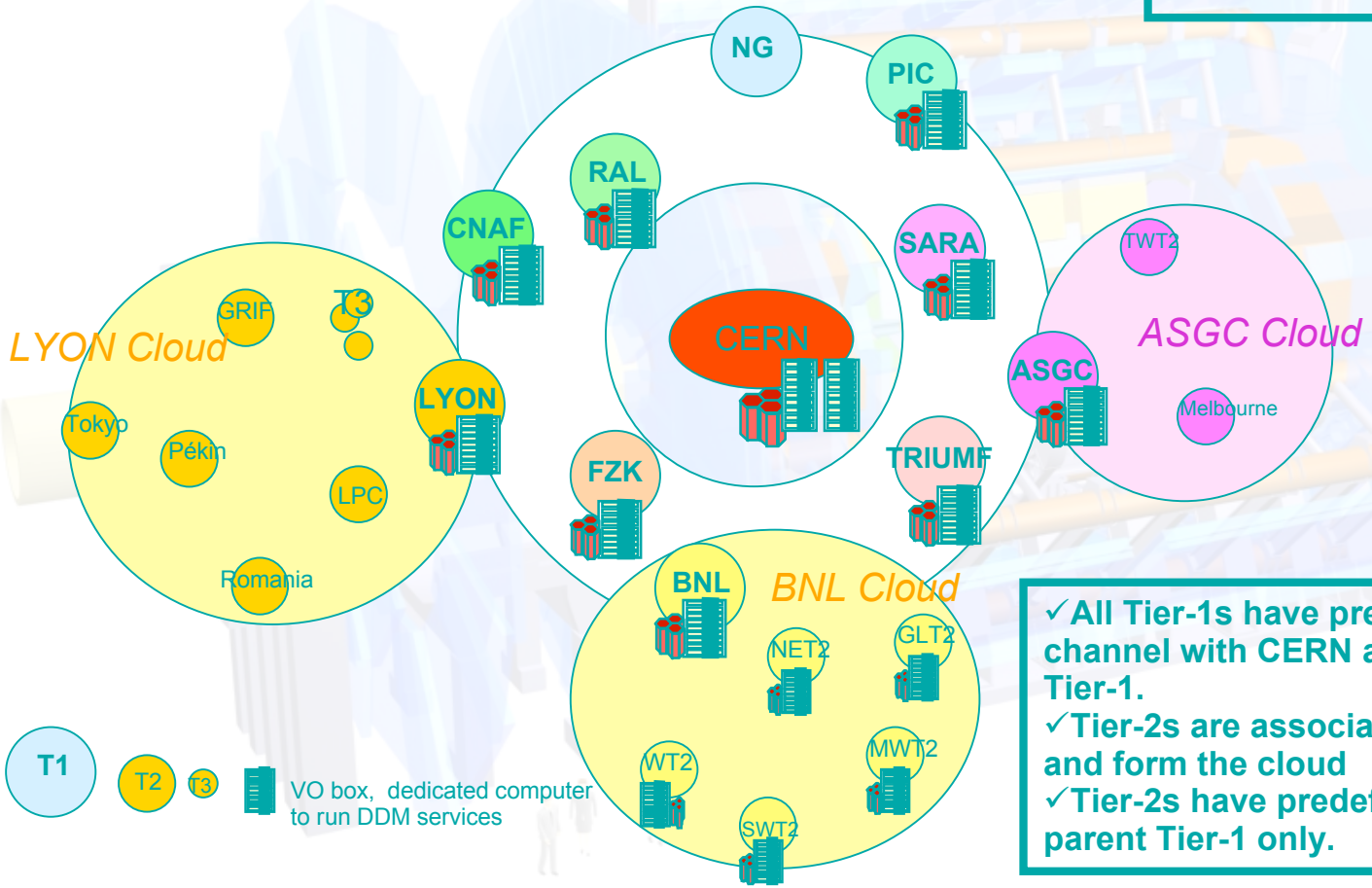


Tier-2

- Monte Carlo production (ESD,AOD)
  - Ships RAW,ESD,AOD to associated T1
- Physics Analysis
  - Gets (ESD) AOD from associated T1

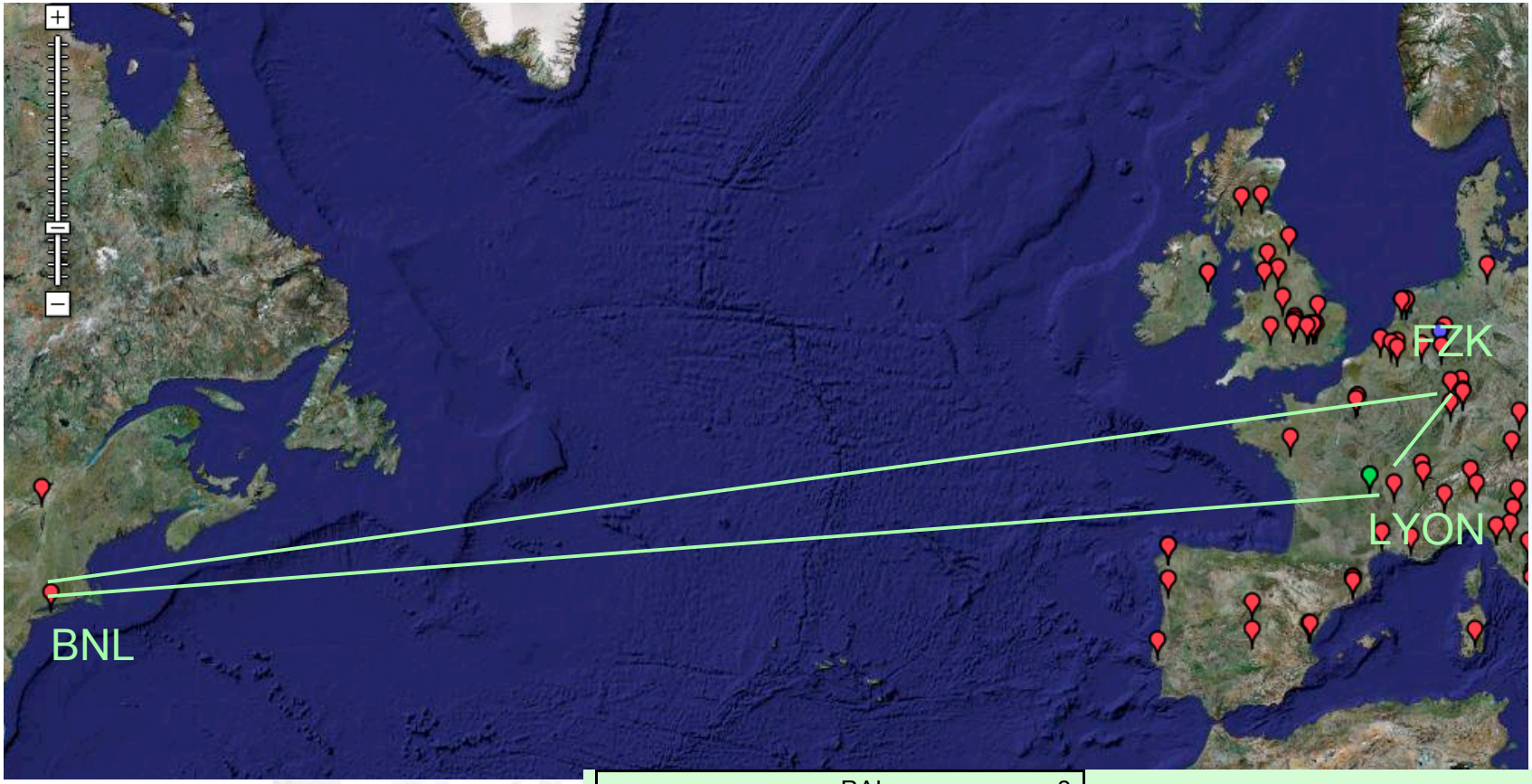
ATLAS : Grid organisation - IV

"Tier Cloud Model"



- ✓All Tier-1s have predefined (software) channel with CERN and with each other Tier-1.
- ✓Tier-2s are associated with one Tier-1 and form the cloud
- ✓Tier-2s have predefined channel with the parent Tier-1 only.

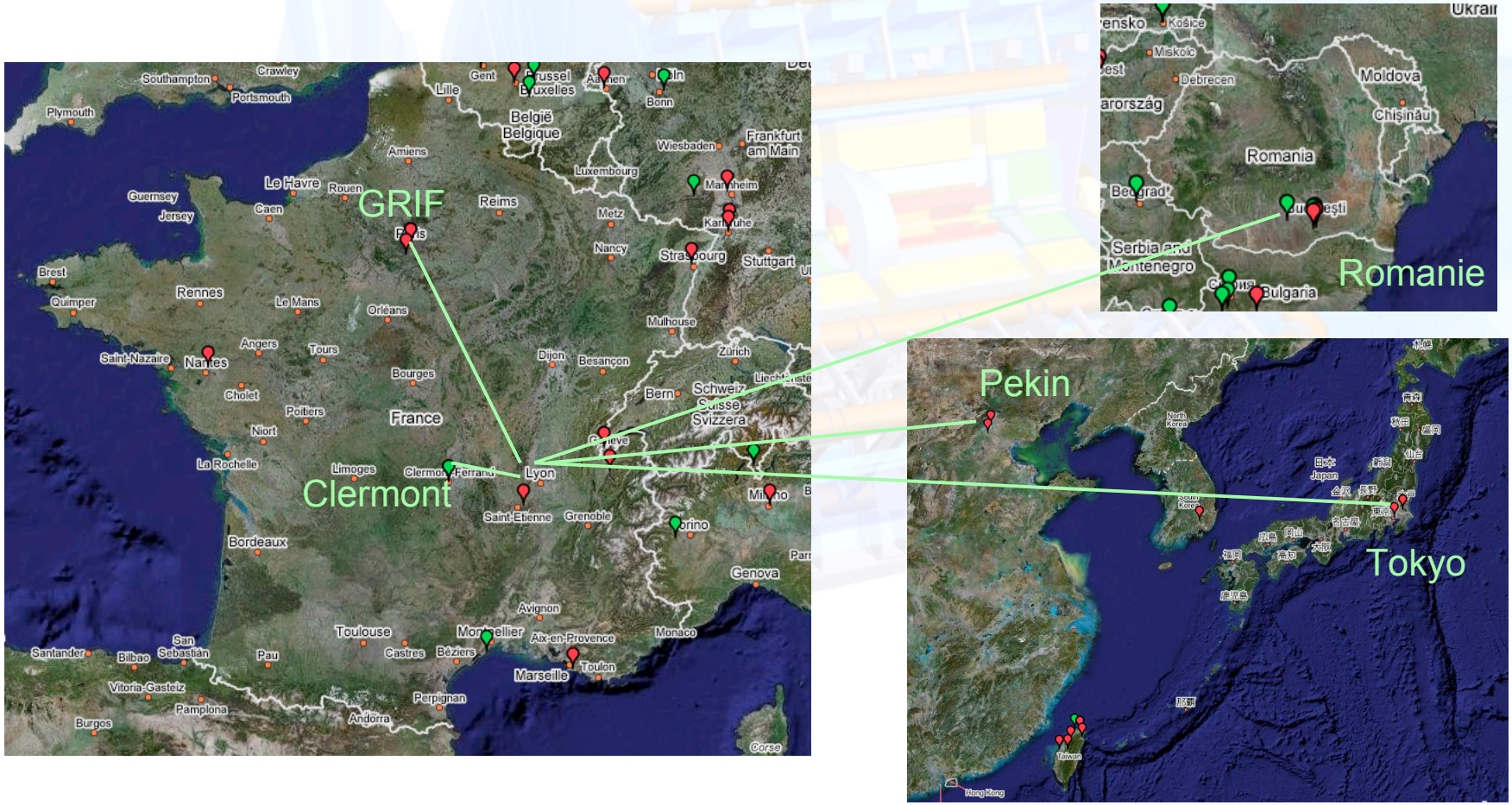
T1 de Lyon associé à BNL & FZK



		RAL	2
SARA	13	Triumf	4.3
		ASGC	6.7
BNL	23	IN2P3	13
		FZK	10
CNAF	10	RAL	10
PIC	4.5	NDGF	4.5
		Sum	101

Tier-1 associations
And relative sizes

Tier-2 associés à Lyon



DDM : Data Distribution Management

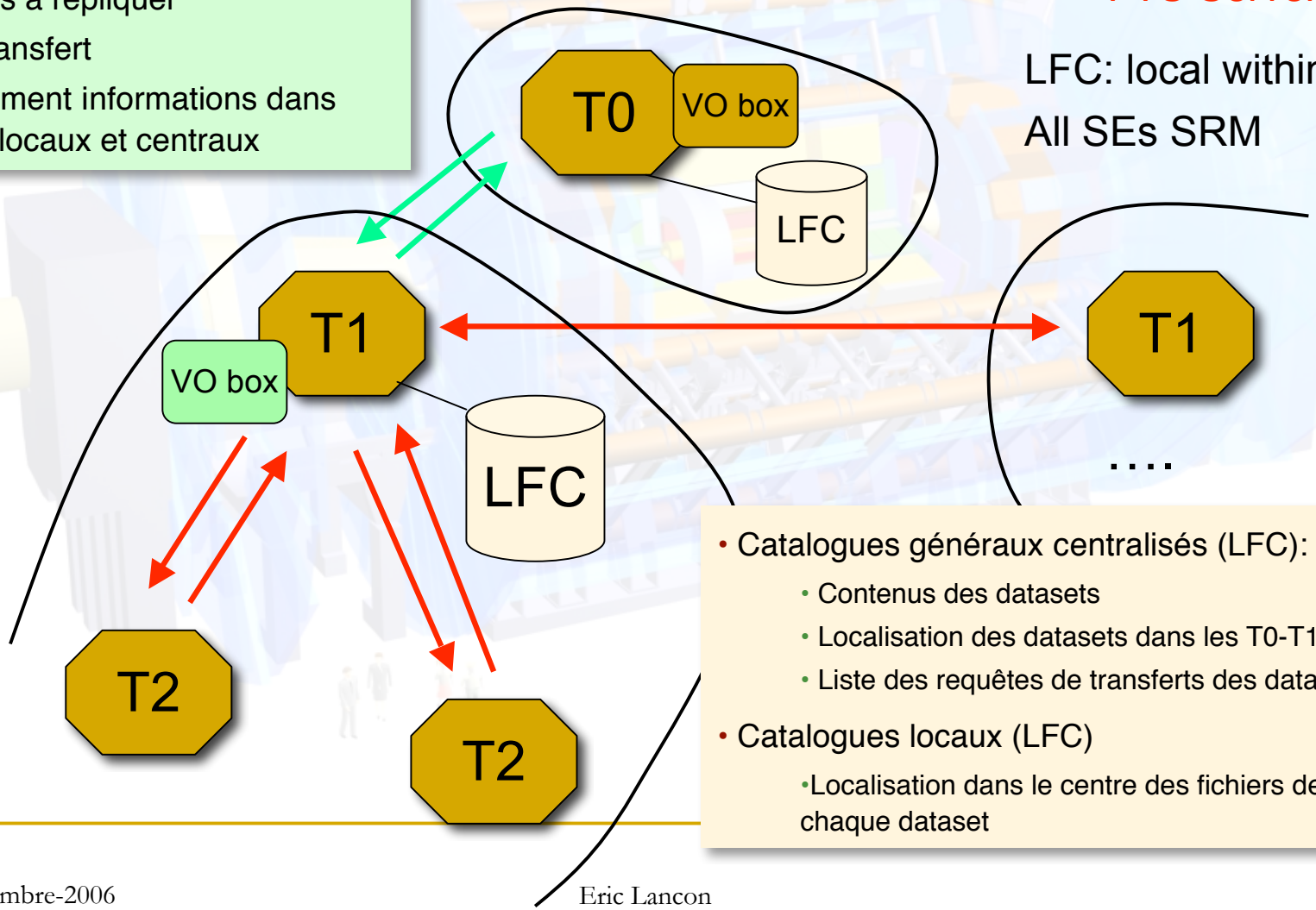
- Demande au catalogue central : liste des datasets a répliquer
- Gestion transfert
- Enregistrement informations dans catalogues locaux et centraux

FTS Server T0

FTS Server T1

LFC: local within 'cloud'

All SEs SRM



- Catalogues généraux centralisés (LFC):
  - Contenus des datasets
  - Localisation des datasets dans les T0-T1-T2
  - Liste des requêtes de transferts des datasets
- Catalogues locaux (LFC)
  - Localisation dans le centre des fichiers de chaque dataset

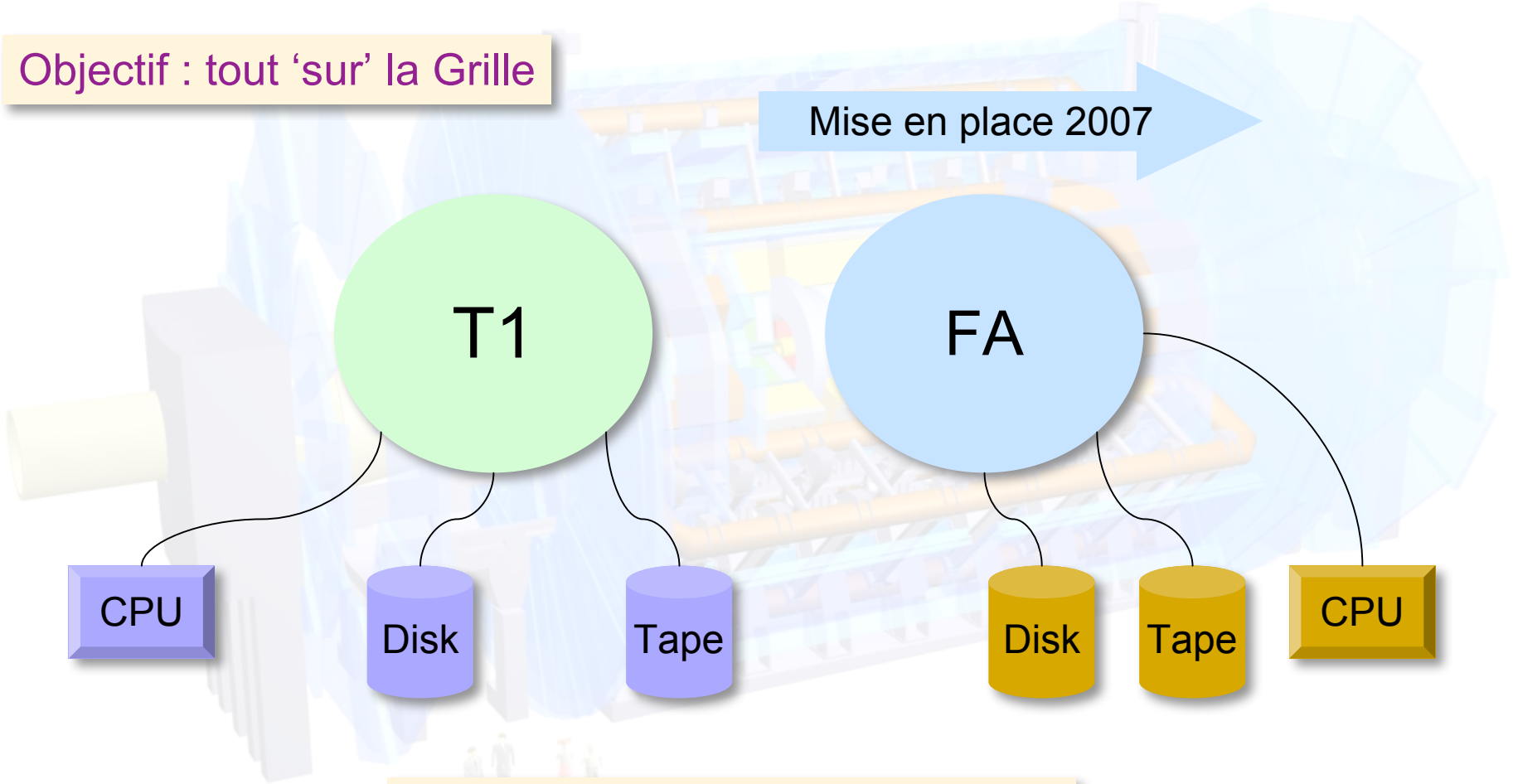
Ressources pour 2007-2010

- Eté 2006 : Révision du planning du LHC
  - 7-7 TeV data en 2008
- Révision des besoins des expériences
  - Toutes les expériences utilisent les mêmes hypothèses (Luminosité, efficacité machine, etc…)
- ATLAS en profite pour réviser ses estimations

- ESD size
  - 0.5 MB → > 1 MB
- Simulation time
  - 100 KSI2k → 400 KSI2k
- Rapport MC/Data
  - 20% → 30%

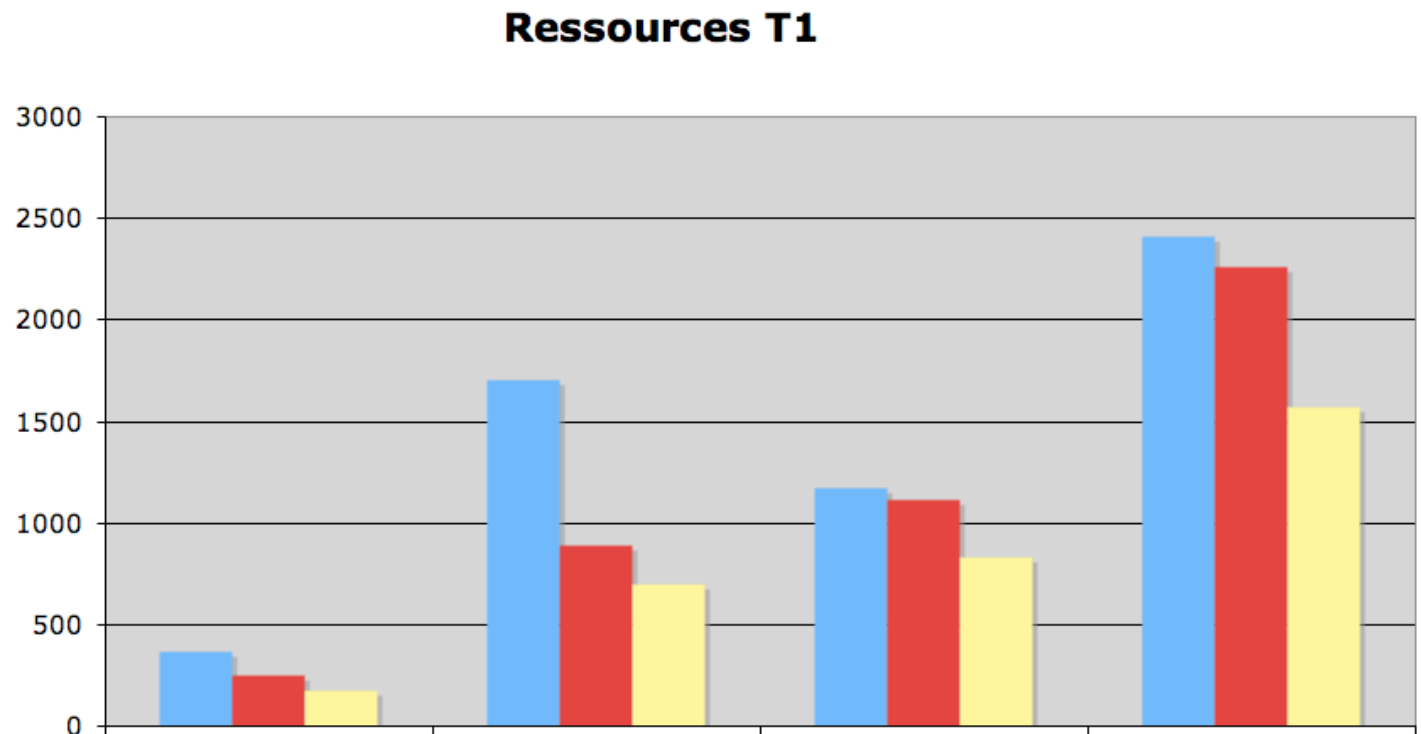
ATLAS a LYON

Objectif : tout 'sur' la Grille



Un Tier-1 & une Ferme d'Analyse

T1-Lyon fonction du temps

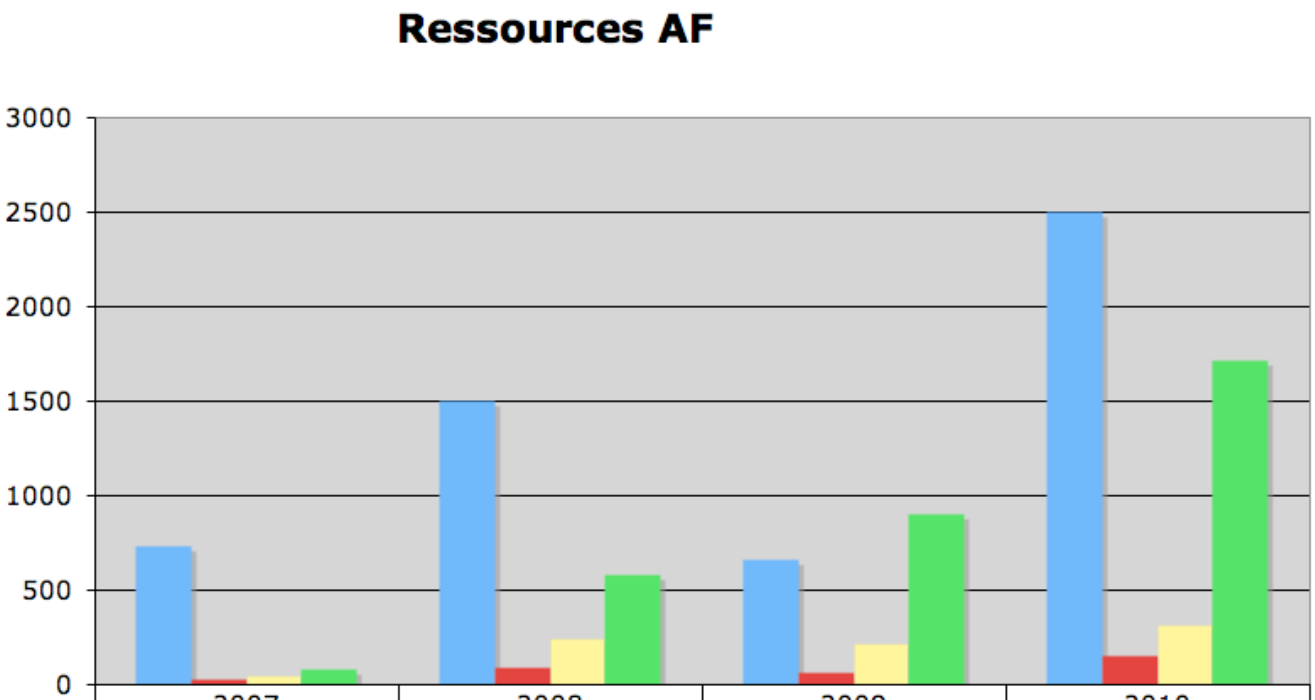


	2007	2008	2009	2010
CPU (KSi2k)	362	1704	1174	2411
Disk (TB)	246	887	1111	2257
Tape (TB)	176	701	827	1567

Utilisation 2006 :
- 30 TB disk
- ~150 KSI2k (40% demandes)

11% des besoins d'ATLAS
(taille de la contribution Francaise a l'experience)

FA fonction du temps



	2007	2008	2009	2010
CPU total (KSI2k)	735	1503	662	2497
Disk (TB)	25	93	65	150
Tape (TB)	46	240	214	314
CPU (KSi2k) for MC	78	583	899	1718

Réalisations en 2006

- Tests de transferts :
  - T0 → T1
  - T1 → T1, T2
    - Reprocessing pas encore testé
- Production MC :
  - Au Tier-1
    - Tant qu'il n'y a pas de données réelles
  - Aux Tier-2 du nuage
    - Données produites transférées et enregistrées a Lyon

BAD OK

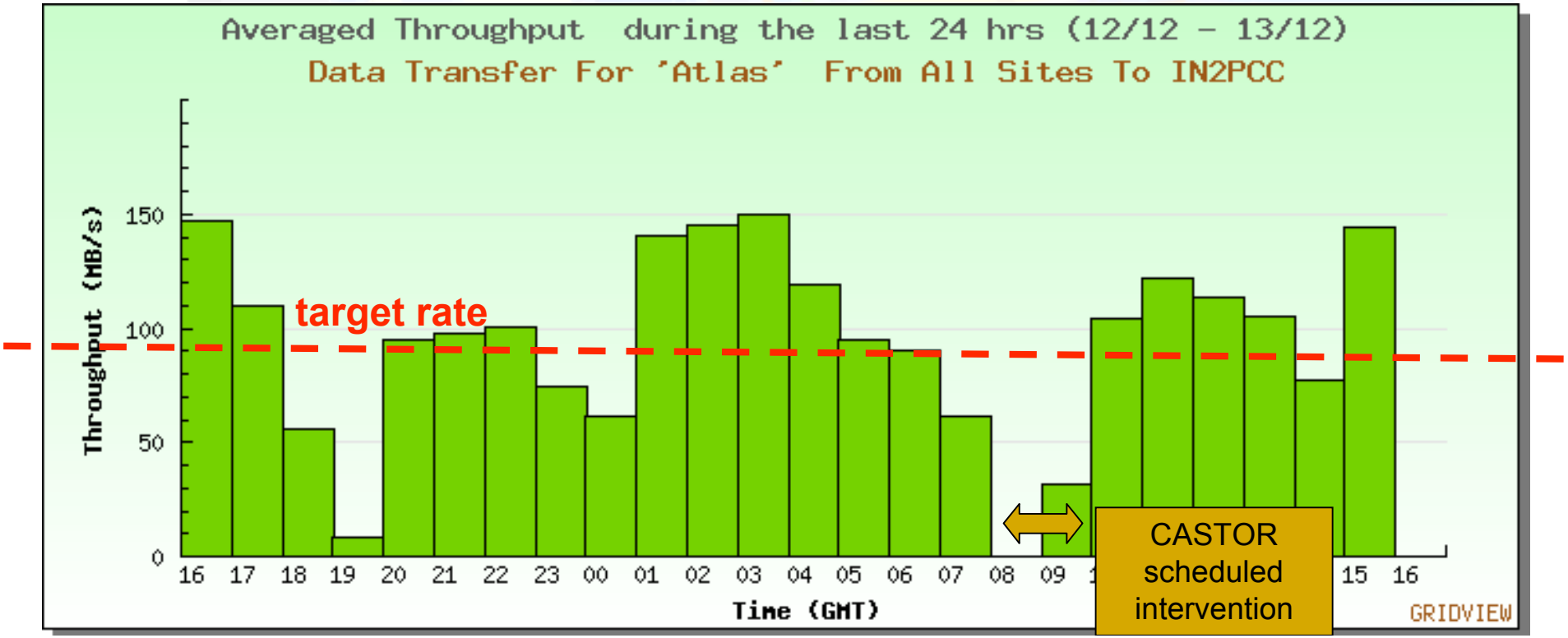
DDM Functional Test 2006. Summary Table

Tier-1	Tier-2s	Sept 06	Oct 06	Nov 06
ASGC	IPAS, Uni Melbourne	Failed within the cloud	Failed for Melbourne	T1-T1 not testd
BNL	GLT2, NET2,MWT2,SET2, WT2	done	done	2+GB & DPM
CNAF	LNF,Milano,Napoli,Roma1	65% failure rate	done	
FZK	CSCS, CYF, DESY-ZN, DESY-HH, FZU, *WUP*	Failed from T2 to FZK	dCache problem	T1-T1 not testd
LYON	BEIIJING, CPPM, LAPP, LPC, LPHNE, SACLAY, TOKYO	done	done, FTS conn =< 6	
NG		not tested	not tested	not tested
PIC	IFAE, IFIC, UAM	Failed within the cloud	done	
RAL	CAM, EDINBOURGH, GLASGOW, LANCS, MANC, QMUL	Failed within the cloud	Failed for Edinbrg.	done
SARA	*IHEP*, ITEP, SINP	Failed	IHEP not tested	IHEP in progress
TRIUMF	ALBERTA, TORONTO, UniMontreal, SFU, UVIC	Failed within the cloud	Failed	T1-T1 not testd

New DQ2 release (0.2.12)

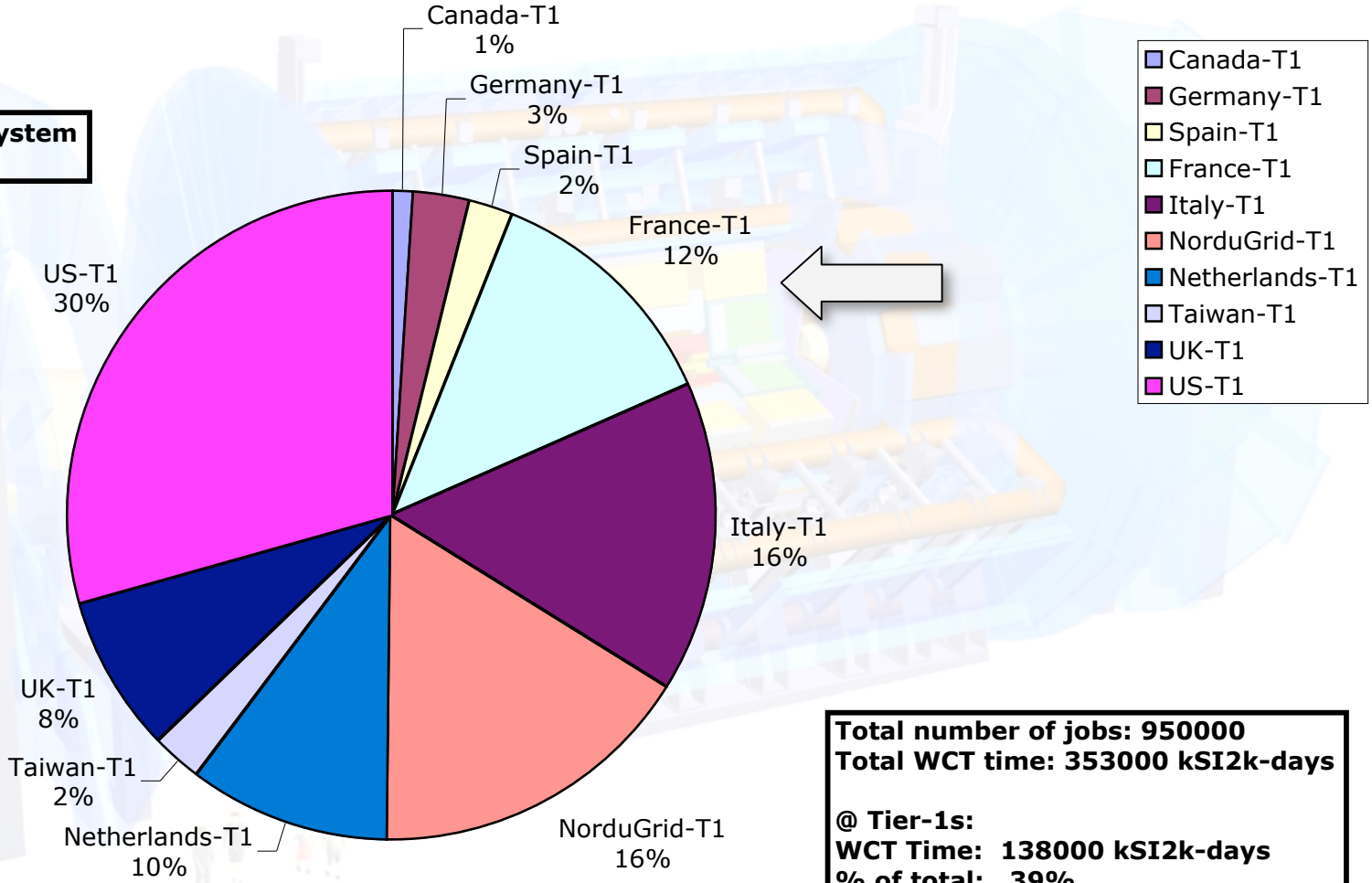
Multi-VO tests

- … running **now** to LYON, then FZK
  - **Goal: to have >1 experiment** exporting data from the Tier-0 to the Tier-1 at the same time
    - forcing sites to handle slightly **different data flows simultaneously**



ATLAS Production at Tier-1s (Jan-Oct 2006) (Wall Clock Time)

From ATLAS Production System

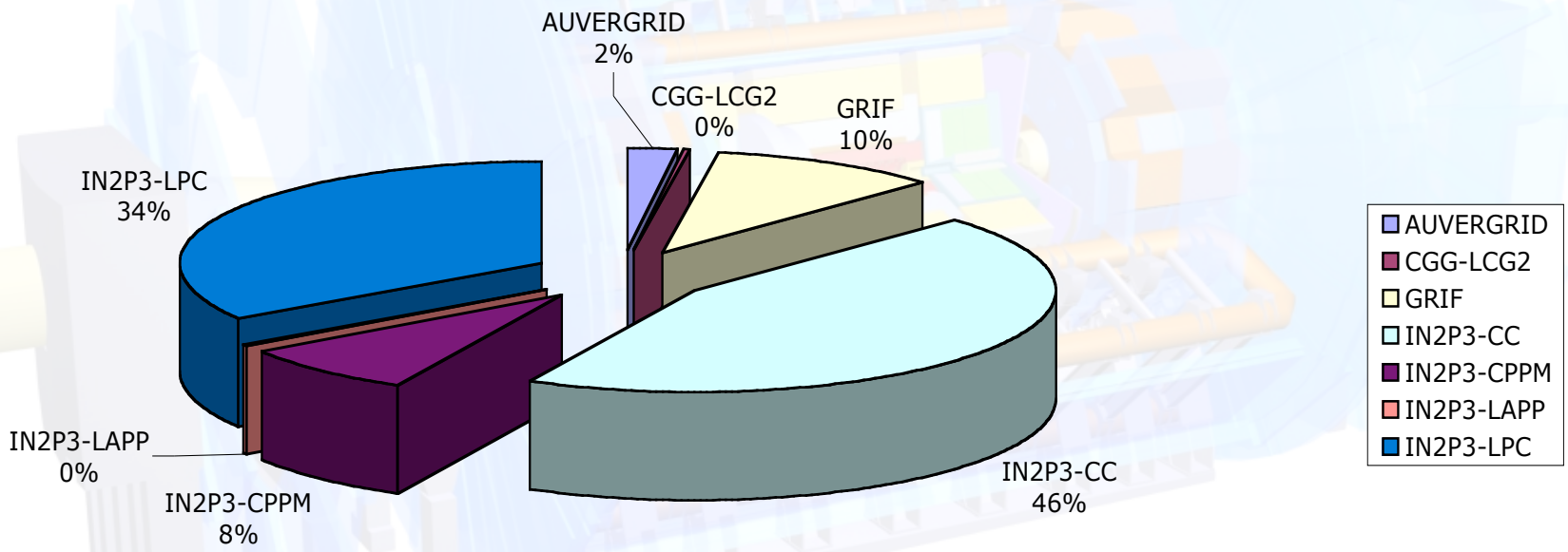


Total number of jobs: 950000
Total WCT time: 353000 kSI2k-days

@ Tier-1s:
WCT Time: 138000 kSI2k-days
% of total: 39%

ATLAS Production in WLCG France Region (Jan-Nov 2006)

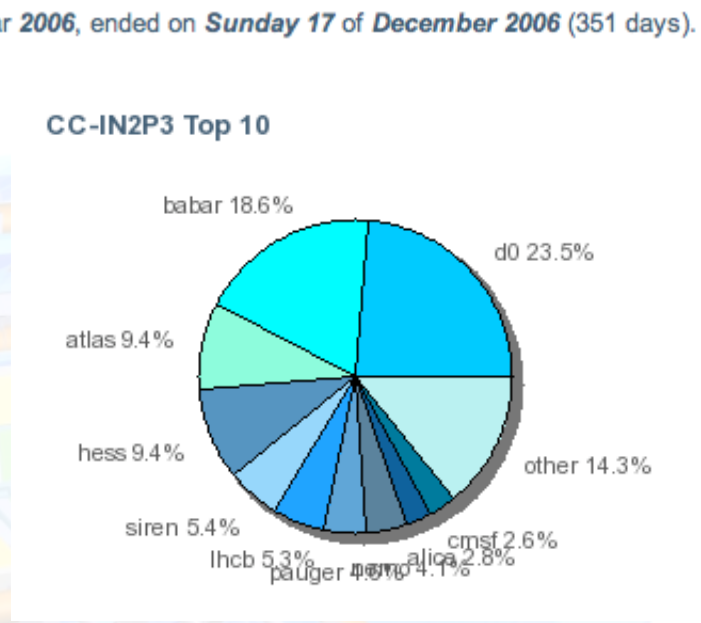
Source: Grid Operations Center

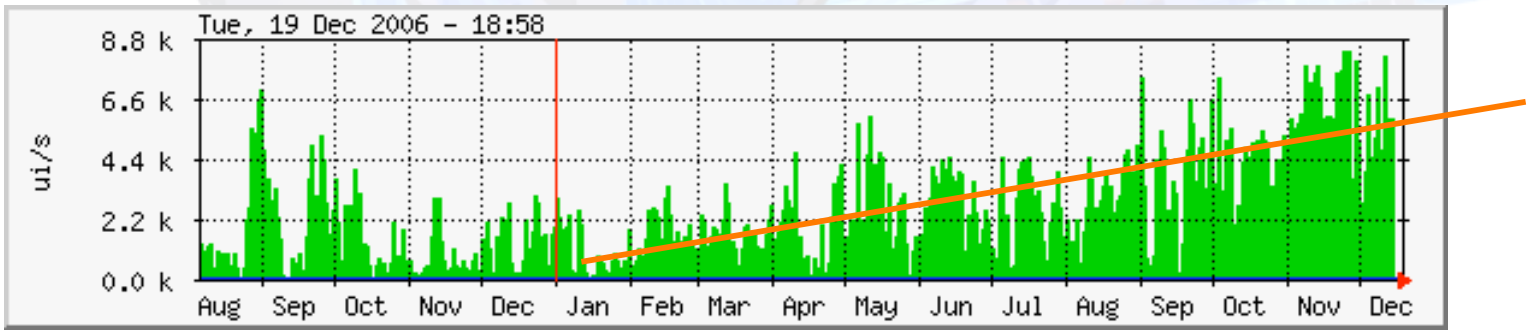


Total: ~87000 kSI2k-days
CPU power: ~ 264 kSI2k

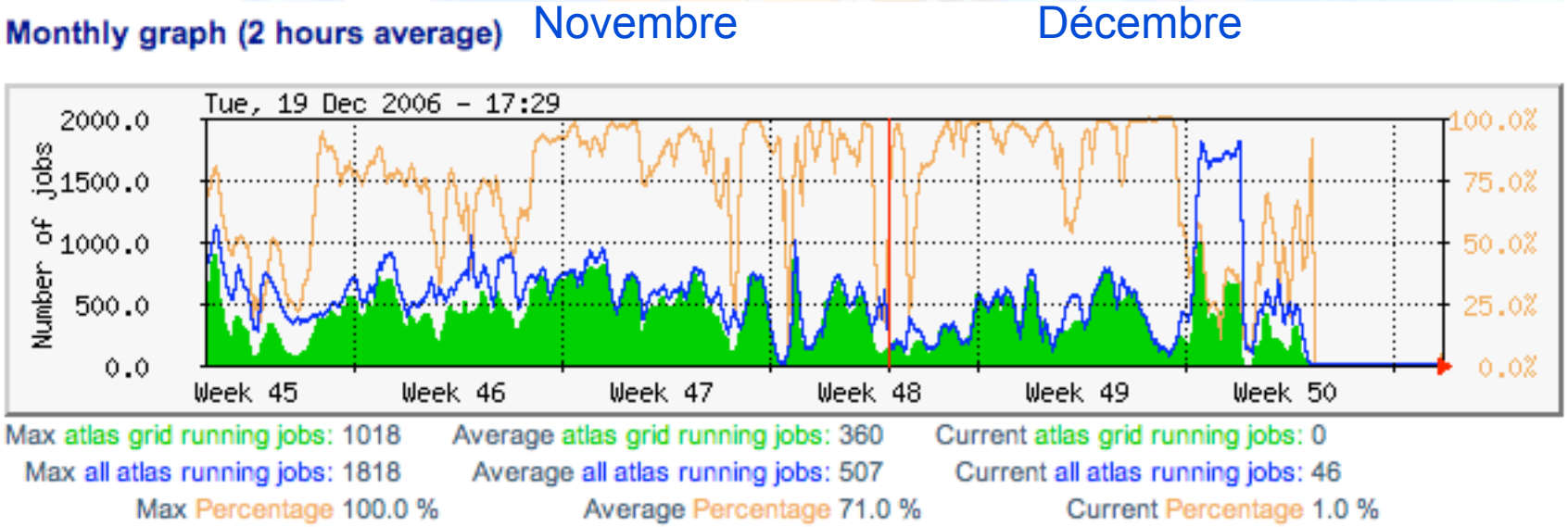
ATLAS a LYON

- Troisième consommateur de CPU du centre
- Détails…





Grid vs non-Grid

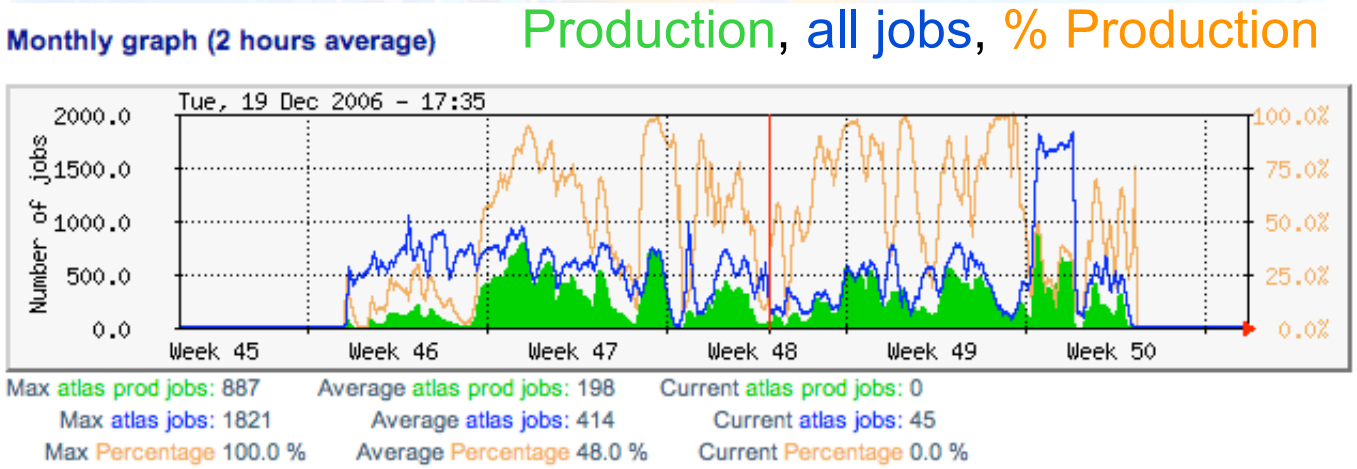


Jobs Grid, all jobs, % Grid

71% des jobs ATLAS sont des jobs Grille

Production MC a LYON

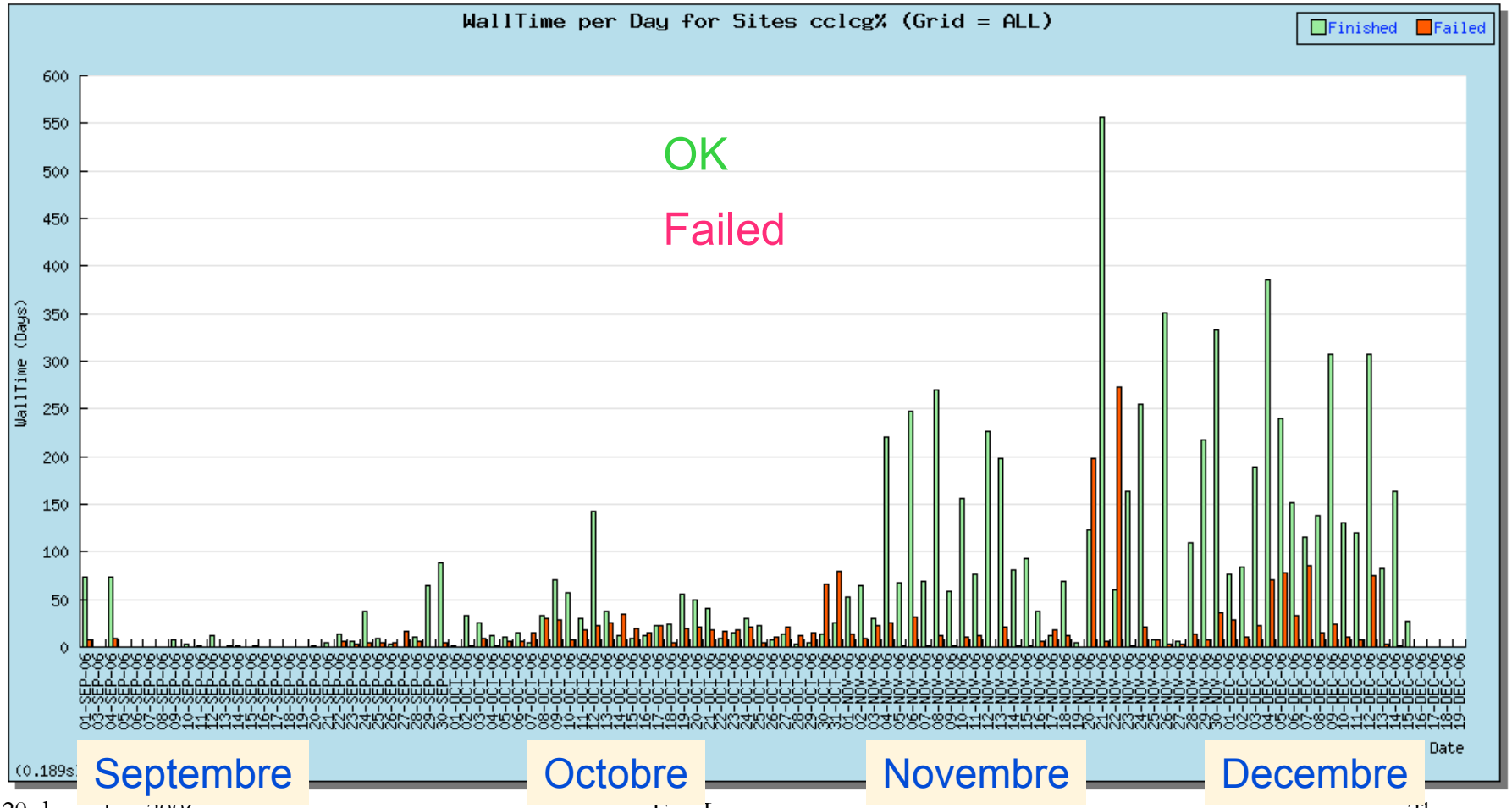
- Objectif : 80% des ressources allouées pour production MC
  - VOMS…



- Efficacité globale : 50%
  - 30% input failed (pas de CPU consommé)
    - Problèmes FTS, SRM, sites input non disponibles…
  - 20% output failed (CPU consommé)
    - Crash (peu), pb enregistrements, SRM, etc…
  - Architecture fragile, manque d'outils de diagnostiques

Solutions

- Equipe ATLAS-France Production & DDM
- Executeur installé sur le nuage français
- Monitoring, diagnostiques, monitoring…
- Contacts étroits avec CC et ATLAS



2007

- Validation de l'analyse distribuée
  - Sur la Ferme d'Analyse et les Tier-2
  - Vers la grille OSG (BNL)
  - Etat embryonnaire
- Tests de reprocessing
- Très forte montée en puissance malgré le changement du planning du LHC
- Passage a SL4
- 64 bits?
  - Gain de 30% en temps, mémoire x2…

64 bits

Simulation

channel	Ratio of kSI2K wrt 32/32 32/64	64/64	channel	Ratio of seconds wrt 32/32 32/64	64/64
susy	1,28	1,18	susy	0,72	0,66
Zee			Zee		
Ztautau	1,26	1,16	Ztautau	0,7	0,65
H4l	1,32	1,12	H4l	0,72	0,61
MB	1,28	1,2	MB	0,69	0,66
jets	1,07	0,94	jets	0,56	0,49

Workshop - Dec 2006 Andrea Di Simone - INFN/CNAF and CERN/ATC 13

	Memory usage (MB) 32/64	64/64	Ratio
Load modules	180,38	576,67	3,2
Initialize	243,69	377,9	1,55
G4	208,45	275,56	1,32
Total	632,52	1230,12	1,94

- Reconstruction on SLC4
  - SLC4/32-bit mode essentially same functionality as SLC3
  - ID only feedback (Calo takes too much memory)
    - ~30% performance gain
    - Almost x2 memory increase

ATLAS Software & Computing Week - 13 Dec 2006 6

Move to SLC4 and 64 bits

- Without significant improvement in memory usage we will be unable to take advantage of 64-bits in production
  - High priority

Besoins pour 2007

- Un environnement de travail stable au CC
  - afs, hpss, BQS, srm, …
  - Opérations de maintenances coordonnées
- 2GB de mémoire virtuelle par job
  - Sous utilisation du CC…
- Prise en compte des VOMS
  - Rôles et groupes
- DDM :
  - SRM v2.2
  - FTS 2.0
  - Multi-VO tests + large-scale throughput tests

ATLAS Tier-1 Data Flow (2008)