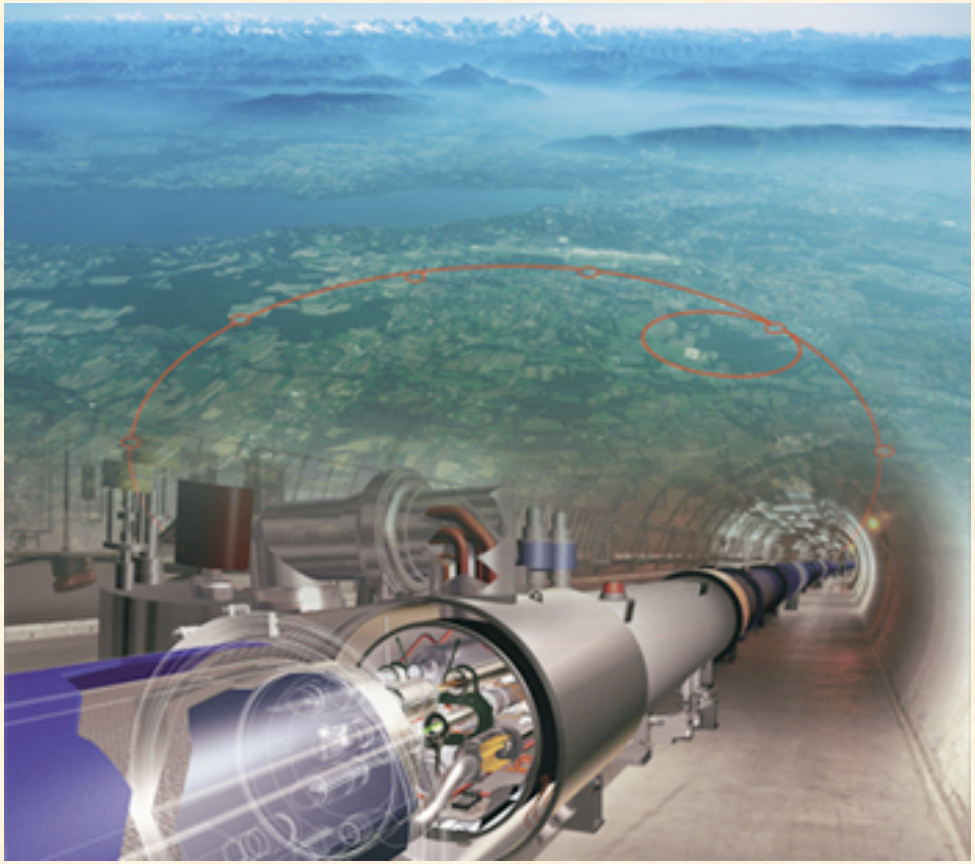
Status of the WLCG Tier-2 Centres

M.C. Vetterli
Simon Fraser University
and TRIUMF

LHCC mini-review,
CERN, February 16th 2009



TRIUMF
Simon Fraser

LCG

Communications for Tier-2s

- *Many lines of communication do indeed exist.*
- *Some examples are:*
  - *CMS has two Tier-2 coordinators: Ken Bloom (Nebraska)*
    Giuseppe Bagliesi (INFN)
    - *attend all operations meetings*
    - *feed T2 issues back to the operations group*
    - *write T2-relevant minutes*
    - *organize T2 workshops*
  - *ALICE has designated 1 Core Offline person in 3 to have privileged contact with a given T2 site manager*
    - *weekly coordination meetings*
    - *Tier-2 federations provide a single contact person*
    - *A Tier-2 coordinates with its regional Tier-1*

Communications for Tier-2s

- *ATLAS uses its cloud structure for communications*
  - *Every Tier-2 is coupled to a Tier-1*
  - *5 national clouds; others have foreign members (e.g. "Germany" includes Krakow, Prague, Switzerland; Netherlands includes Russia, Israel, Turkey)*
  - *Each cloud has a Tier-2 coordinator*
- *Regional organizations, such as:*
  - *+ France Tier-2/3 technical group:*
    - *coordinates with Tier-1 and with experiments*
    - *monthly meetings*
    - *coordinates procurement and site management*
  - *+ GRIF: Tier-2 federation of 5 labs around Paris*
  - *+ Canada: Weekly teleconferences of technical personnel (T1 & T2) to share information and prepare for upgrades, large production, etc.*
  - *+ Many others exist; e.g. in the US and the UK*

Communications for Tier-2s

- *Tier-2 Overview Board reps:*

  Michel Jouvin and Atul Gurtu were appointed in October to the OB to give the Tier-2s a voice there.

- *Tier-2 mailing list:*

  Actually exists and is being reviewed for completeness & accuracy

- *Tier-2 GDB:*

  The October GDB was dedicated to Tier-2 issues

  + reports from experiments: role of the T2s; communications

  + talks on regional organizations

  + discussion of accounting

  + technical talks on storage, batch systems, middleware

➔ *Seems to have been a success; repeat a couple of times per year?*

Tier-2 Reliability

Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability — May 2008

Critical SAM Tests - http://sam-docs.web.cern.ch/sam-docs/docs/html/docs/MANUserManual/node22.html

Availability = % of successful tests
Reliability = Availability / Scheduled Availability
Reliability and Availability for federation - average of all sites in the federation

Colour coding: N/A | < 30% | < 60% | < 90% | >= 90%

Federation	Reli-ability	Avail-ability
FR-IN2P3-LAPP	100 %	100 %
FR-GRIF	99 %	99 %
AT-HEPHY-VIENNA-UIBK	99 %	94 %
DE-DESY-ATLAS-T2	99 %	98 %
JP-Tokyo-ATLAS-T2	98 %	97 %
FR-IN2P3-LPC	98 %	98 %
TW-FTT-T2	98 %	98 %
FR-IN2P3-CC-T2	98 %	98 %
US-SWT2	N/A	N/A
SI-SIGNET	96 %	96 %
FR-IN2P3-SUBATECH	96 %	96 %
ES-CMS-T2	95 %	93 %
CH-CHIPP-CSCS	94 %	94 %
UK-London-Tier2	94 %	73 %
UK-NorthGrid	93 %	93 %
ES-ATLAS-T2	93 %	90 %
UK-ScotGrid	92 %	75 %
PL-TIER2-WLCG	92 %	90 %
IT-ALICE-federation	91 %	87 %
IT-ATLAS-federation	91 %	87 %
IT-CMS-federation	91 %	87 %
IT-LHCb-federation	91 %	87 %
CA-EAST-T2	90 %	90 %
CZ-Prague-T2	89 %	79 %
UK-SouthGrid	88 %	85 %
CN-IHEP	85 %	84 %
RO-LCG	84 %	78 %
PT-LIP-LCG-Tier2	84 %	77 %
CA-WEST-T2	84 %	83 %
ES-LHCb-T2	83 %	83 %
BE-TIER2	83 %	82 %
RU-RDIG	82 %	81 %

Federation	Reli-ability	Avail-ability
TR-Tier2-federation	82 %	82 %
EE-NICPB	80 %	70 %
DE-FREIBURGWUPPERTAL	73 %	63 %
DE-MCAT	72 %	64 %
HU-HGCC-T2	70 %	63 %
US-NET2	N/A	N/A
US-MWT2	N/A	N/A
DE-DESY-RWTH-CMS-T2	66 %	66 %
IN-INDIACMS-TIFR	62 %	54 %
PK-CMS-T2	62 %	60 %
IN-DAE-KOLKATA-TIER2	61 %	57 %
KR-KISTI-T2	59 %	59 %
US-AGLT2	N/A	N/A
IL-HEPTier-2	43 %	43 %
AU-ATLAS	20 %	20 %
DE-GSI	N/A	N/A
FI-HIP-T2	N/A	N/A
NO-NORDGRID-T2	N/A	N/A
SE-SNIC-T2	N/A	N/A
T2_US_Caltech	N/A	N/A
T2_US_Florida	N/A	N/A
T2_US_MIT	N/A	N/A
T2_US_Nebraska	N/A	N/A
T2_US_Purdue	N/A	N/A
T2_US_UCSD	N/A	N/A
T2_US_Wisconsin	N/A	N/A
UA-	N/A	N/A
US-WT2	N/A	N/A

May '08

Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability — September 2008

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Colour coding: N/A | < 30% | < 60% | < 90% | >= 90%

Federation	Reli-ability	Avail-ability
US-SWT2	100 %	100 %
T2_US_Wisconsin	100 %	100 %
FR-GRIF	100 %	99 %
AT-HEPHY-VIENNA-UIBK	100 %	100 %
US-MWT2	100 %	100 %
FI-HIP-T2	100 %	99 %
CN-IHEP	99 %	99 %
FR-IN2P3-SUBATECH	99 %	99 %
T2_US_UCSD	99 %	99 %
US-NET2	99 %	99 %
UK-NorthGrid	98 %	98 %
T2_US_Purdue	98 %	98 %
FR-IN2P3-LPC	98 %	97 %
FR-IN2P3-CC-T2	97 %	97 %
TW-FTT-T2	97 %	97 %
JP-Tokyo-ATLAS-T2	97 %	95 %
DE-DESY-ATLAS-T2	97 %	96 %
PT-LIP-LCG-Tier2	96 %	48 %
T2_US_Florida	96 %	97 %
DE-MCAT	96 %	81 %
UK-ScotGrid	96 %	93 %
CH-CHIPP-CSCS	96 %	93 %
US-AGLT2	96 %	96 %
PL-TIER2-WLCG	95 %	94 %
HU-HGCC-T2	95 %	95 %
CA-EAST-T2	95 %	95 %
SI-SIGNET	95 %	94 %
ES-ATLAS-T2	93 %	91 %
DE-DESY-RWTH-CMS-T2	93 %	93 %
UK-SouthGrid	93 %	88 %
T2_US_MIT	92 %	93 %

Federation	Reli-ability	Avail-ability
IT-ALICE-federation	92 %	88 %
IT-ATLAS-federation	92 %	88 %
IT-CMS-federation	92 %	88 %
IT-LHCb-federation	92 %	88 %
CZ-Prague-T2	91 %	91 %
BE-TIER2	91 %	67 %
ES-CMS-T2	91 %	89 %
DE-FREIBURGWUPPERTAL	91 %	91 %
T2_US_Nebraska	91 %	93 %
CA-WEST-T2	90 %	87 %
KR-KISTI-T2	89 %	66 %
US-WT2	88 %	91 %
UK-London-Tier2	88 %	74 %
RO-LCG	87 %	83 %
FR-IN2P3-LAPP	86 %	82 %
ES-LHCb-T2	85 %	85 %
T2_US_Caltech	83 %	86 %
RU-RDIG	81 %	81 %
IL-HEPTier-2	78 %	56 %
EE-NICPB	67 %	68 %
TR-Tier2-federation	66 %	65 %
PK-CMS-T2	62 %	26 %
AU-ATLAS	51 %	48 %
IN-INDIACMS-TIFR	46 %	42 %
IN-DAE-KOLKATA-TIER2	1 %	1 %
DE-GSI	0 %	0 %
NO-NORDGRID-T2	N/A	0 %
SE-SNIC-T2	N/A	N/A
UA-	N/A	N/A

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September '08

Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability — January 2009

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Colour coding: N/A | < 30% | < 60% | < 90% | >= 90%

Federation	Reli-ability	Avail-ability
JP-Tokyo-ATLAS-T2	100 %	100 %
CZ-Prague-T2	99 %	98 %
T2_US_Nebraska	99 %	99 %
FR-IN2P3-SUBATECH	99 %	99 %
FR-GRIF	99 %	99 %
PL-TIER2-WLCG	99 %	83 %
SI-SIGNET	99 %	98 %
T2_US_Florida	99 %	99 %
CN-IHEP	98 %	98 %
TW-FTT-T2	98 %	98 %
UK-NorthGrid	98 %	98 %
T2_US_Purdue	98 %	98 %
UK-ScotGrid	98 %	97 %
IN-DAE-KOLKATA-TIER2	98 %	98 %
DE-DESY-ATLAS-T2	98 %	98 %
US-MWT2	98 %	98 %
US-WT2	97 %	64 %
CH-CHIPP-CSCS	97 %	97 %
DE-MCAT	97 %	97 %
CA-EAST-T2	97 %	97 %
PT-LIP-LCG-Tier2	97 %	68 %
HU-HGCC-T2	97 %	95 %
T2_US_Caltech	97 %	97 %
FR-IN2P3-CC-T2	96 %	96 %
FI-HIP-T2	96 %	96 %
US-NET2	96 %	96 %
T2_US_Wisconsin	96 %	89 %
NO-NORDGRID-T2	95 %	95 %
ES-ATLAS-T2	95 %	92 %
FR-IN2P3-IPHC	95 %	95 %
EE-NICPB	95 %	95 %

Federation	Reli-ability	Avail-ability
UK-SouthGrid	94 %	84 %
FR-IN2P3-LPC	94 %	94 %
FR-IN2P3-LAPP	94 %	94 %
RU-RDIG	93 %	92 %
DE-DESY-RWTH-CMS-T2	93 %	93 %
CA-WEST-T2	92 %	89 %
AT-HEPHY-VIENNA-UIBK	92 %	91 %
RO-LCG	91 %	86 %
US-AGLT2	90 %	90 %
UK-London-Tier2	90 %	89 %
KR-KNU-T2	89 %	89 %
PK-CMS-T2	88 %	82 %
T2_US_UCSD	88 %	88 %
DE-FREIBURGWUPPERTAL	88 %	83 %
AU-ATLAS	87 %	87 %
US-SWT2	86 %	86 %
ES-LHCb-T2	86 %	86 %
ES-CMS-T2	83 %	78 %
IN-INDIACMS-TIFR	79 %	79 %
T2_US_MIT	77 %	77 %
BE-TIER2	77 %	77 %
IT-ALICE-federation	76 %	70 %
IT-ATLAS-federation	76 %	70 %
IT-CMS-federation	76 %	70 %
IT-LHCb-federation	76 %	70 %
TR-Tier2-federation	58 %	54 %
IL-HEPTier-2	45 %	33 %
SE-SNIC-T2	44 %	45 %
KR-KISTI-T2	25 %	14 %
DE-GSI	0 %	0 %
UA-Tier2-Federation	N/A	N/A

January '09

Tier-2 Reliability

- *41 of 62 sites are now green; 8 more are >80%*
- *Average is now ≈90%*
- *All but 1 site are reporting; in particular the situation in the US has been resolved.*
- *Still some "one-off" issues such as a few sites with green reliability, but yellow availability (i.e. significant declared downtime).*
- *Tier-2 specific tests exist:*
  - *CMS has Tier-2 commissioning*
  - *ATLAS has Tier-2 specific functional tests*

Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability — January 2009

Critical SAM Tests - http://lcg-dashboard.cern.ch/lcg-dashboard/docs/html/docs/MANUserManual/node22.html

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JP-Tokyo-ATLAS-T2	100 %	100 %
CZ-Prague-T2	99 %	98 %
T2_US_Nebraska	99 %	99 %
FR-IN2P3-SUBATECH	99 %	99 %
FR-GRIF	99 %	99 %
PL-TIER2-WLCG	99 %	83 %
SI-SIGNET	99 %	98 %
T2_US_Florida	99 %	99 %
CN-IHEP	98 %	98 %
TW-FTT-T2	98 %	98 %
UK-NorthGrid	98 %	98 %
T2_US_Purdue	98 %	98 %
UK-ScotGrid	98 %	97 %
IN-DAE-KOLKATA-TIER2	98 %	98 %
DE-DESY-ATLAS-T2	98 %	98 %
US-MWT2	98 %	98 %
US-WT2	97 %	64 %
CH-CHIPP-CSCS	97 %	97 %
DE-MCAT	97 %	97 %
CA-EAST-T2	97 %	97 %
PT-LIP-LCG-Tier2	97 %	68 %
HU-HGCC-T2	97 %	95 %
T2_US_Caltech	97 %	97 %
FR-IN2P3-CC-T2	96 %	96 %
FI-HIP-T2	96 %	96 %
US-NET2	96 %	96 %
T2_US_Wisconsin	96 %	89 %
NO-NORDGRID-T2	95 %	95 %
ES-ATLAS-T2	95 %	92 %
FR-IN2P3-IPHC	95 %	95 %
EE-NICPB	95 %	95 %

Federation	Reliability	Availability
UK-SouthGrid	94 %	84 %
FR-IN2P3-LPC	94 %	94 %
FR-IN2P3-LAPP	94 %	94 %
RU-RDIG	93 %	92 %
DE-DESY-RWTH-CMS-T2	93 %	93 %
CA-WEST-T2	92 %	89 %
AT-HEPHY-VIENNA-UIBK	92 %	91 %
RO-LCG	91 %	86 %
US-AGLT2	90 %	90 %
UK-London-Tier2	90 %	89 %
KR-KNU-T2	89 %	89 %
PK-CMS-T2	88 %	82 %
T2_US_UCSD	88 %	88 %
DE-FREIBURGWUPPERTAL	88 %	83 %
AU-ATLAS	87 %	87 %
US-SWT2	86 %	86 %
ES-LHCb-T2	86 %	86 %
ES-CMS-T2	83 %	78 %
IN-INDIACMS-TIFR	79 %	79 %
T2_US_MIT	77 %	77 %
BE-TIER2	77 %	77 %
IT-ALICE-federation	76 %	70 %
IT-ATLAS-federation	76 %	70 %
IT-CMS-federation	76 %	70 %
IT-LHCb-federation	76 %	70 %
TR-Tier2-federation	58 %	54 %
IL-HEPTier-2	45 %	33 %
SE-SNIC-T2	44 %	45 %
KR-KISTI-T2	25 %	14 %
DE-GSI	0 %	0 %
UA-Tier2-Federation	N/A	N/A

WLCG - Tier-2 Accounting Summary — January 2009

Efficiency factor for Tier-2 sites - utilisation 60% of pledge as specified in TDR — **CPU usage in month (KSI2K-Hrs)**

Federation - Accounting Name	2008 CPU Pledge (KSI2K)	pledge inc. efficiency (KSI2K-Hrs)	Site(s)	ALICE	ATLAS	CMS	LHCb	Total	used as % of pledge	
Australia, University of Melbourne			Australia-ATLAS		133,126			133,126		
			Australia-UNIMELB-LCG2							
AU-ATLAS	**150**	**66,960**			133,126			133,126	199%	←
Austria, Austrian Tier-2 Federation			HEPHY-UIBK		14,828			14,828		
			Hephy-Vienna			27,851		27,851		
AT-HEPHY-VIENNA-UIBK	**540**	**241,056**			14,828	27,851		42,679	18%	←
Belgium, Belgian Tier-2 Federation			BEgrid-ULB-VUB			77,039		77,039		
			BelGrid-UCL			50,798		50,798		
BE-TIER2	**1,050**	**468,720**				127,837		127,837	27%	←
Canada-East Federation			TORONTO-LCG2		87,524			87,524		
CA-EAST-T2	**200**	**89,280**			87,524			87,524	98%	←
Canada-West Federation			ALBERTA-LCG2		47,745			47,745		
			SFU-LCG2		42,575			42,575		
			VICTORIA-LCG2		83,672			83,672		
CA-WEST-T2	**300**	**133,920**			173,992			173,992	130%	←
China, IHEP, Beijing			BEIJING-LCG2		41,741	85,628		127,369		
CN-IHEP	**400**	**178,560**			41,741	85,628		127,369	71%	←
Czech Rep., FZU AS, Prague			praguelcg2	34,460	54,886			89,346		
			prague_cesnet_lcg2	4	4			8		
CZ-Prague-T2	**164**	**73,210**		34,464	54,890			89,354	122%	←
Estonia, NICPB, Tallinn			T2_Estonia			232,532		232,532		
EE-NICPB	**150**	**66,960**				232,532		232,532	347%	←
Finland, NDGF/HIP Tier2			CSC			7,488		7,488		
FI-HIP-T2	**564**	**251,770**				7,488		7,488	3%	←
France, CC-IN2P3 AF			IN2P3-CC-T2	283	390,576	198,868	530,336	1,120,063		
FR-IN2P3-CC-T2	**1,500**	**669,600**		283	390,576	198,868	530,336	1,120,063	167%	←
France, IPHC, Strasbourg			IN2P3-IRES	9		176,957		176,966		
FR-IN2P3-IPHC	**320**	**142,848**		9		176,957		176,966	124%	←
France, GRIF, Paris			GRIF	47,385	595,131	224,445	447,222	1,314,183		
FR-GRIF	**1,642**	**732,989**		47,385	595,131	224,445	447,222	1,314,183	179%	←
France, LAPP, Annecy			IN2P3-LAPP		30,390		147,084	177,474		
FR-IN2P3-LAPP	**600**	**267,840**			30,390		147,084	177,474	66%	←
France, LPC, Clermont-Ferrand			IN2P3-LPC	54,965	59,952		33,660	148,577		
FR-IN2P3-LPC	**800**	**357,120**		54,965	59,952		33,660	148,577	42%	←
France, SUBATECH, Nantes			IN2P3-SUBATECH	73,262				73,262		
FR-IN2P3-SUBATECH	**312**	**139,277**		73,262				73,262	53%	←
Germany, GSI, Darmstadt			GSI-LCG2	64				64		
DE-GSI	**660**	**294,624**		64				64	0%	
Germany, ATLAS Federation FR/W			UNI-FREIBURG		117,018			117,018		
			wuppertalprod		20,693			20,693		
DE-FREIBURGWUPPERTAL	**584**	**260,698**			137,711			137,711	53%	

Tier-2 Installed Resources

- *But how much of this is a problem of under-use rather than under-contribution?*

  ➔ *a task force was set up to extract installed capacities from the Glue schema*

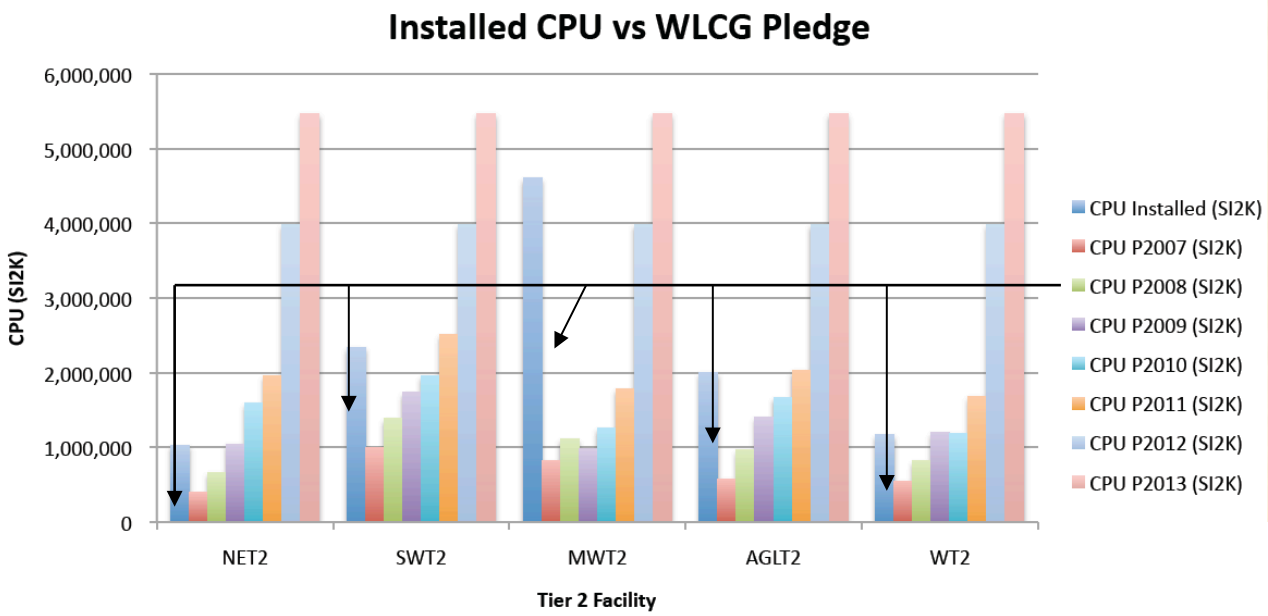
- *Monthly APEL reports still undergo significant modifications from first draft.*

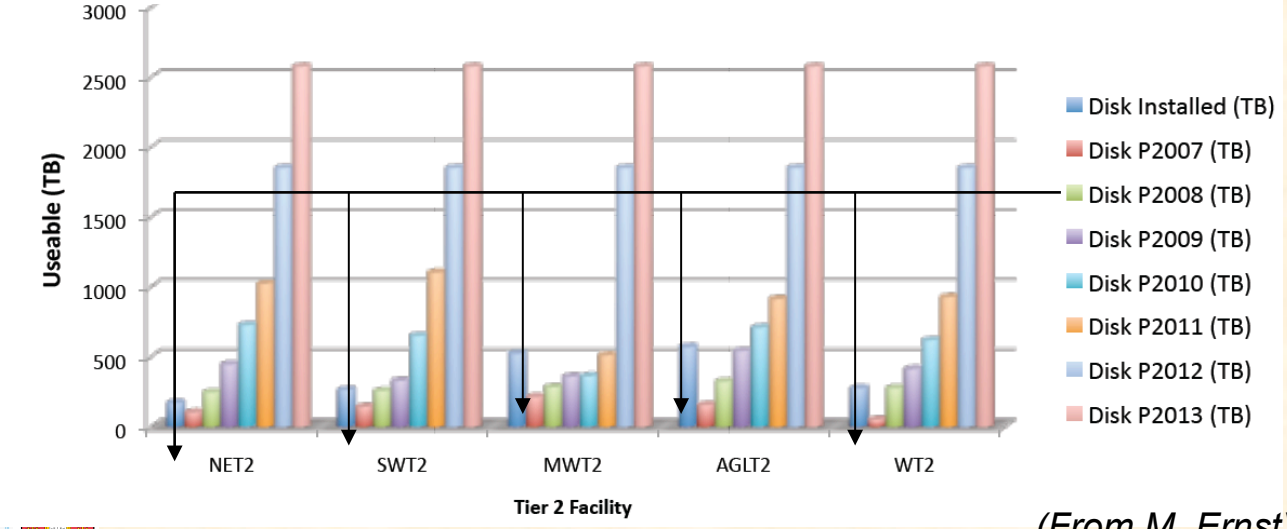
  ➔ *Good because communication with T2s better*

  ➔ *Bad because APEL accounting still has problems*

- *However, the task force's work is nearing completion; the MB has approved the document outlining the solution (actually it is solutions: EGEE vs OSG, CPU vs storage)*

Installed vs Pledged Capacities at U.S. Tier-2s





NET2 North East Tier-2 Center at **Boston** University and **Harvard** University

SWT2 Southwest Tier-2 Center at University at **Texas – Arlington** and **Oklahoma** University

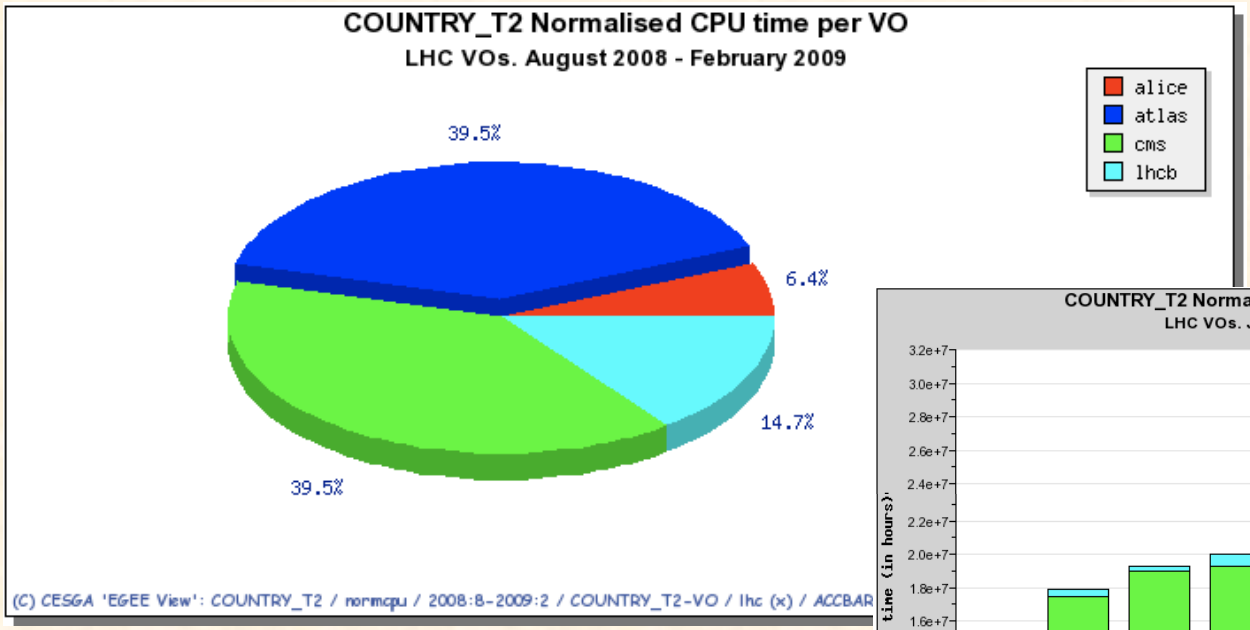
MWT2 Midwest Tier-2 Center at University of Chicago and Indiana University

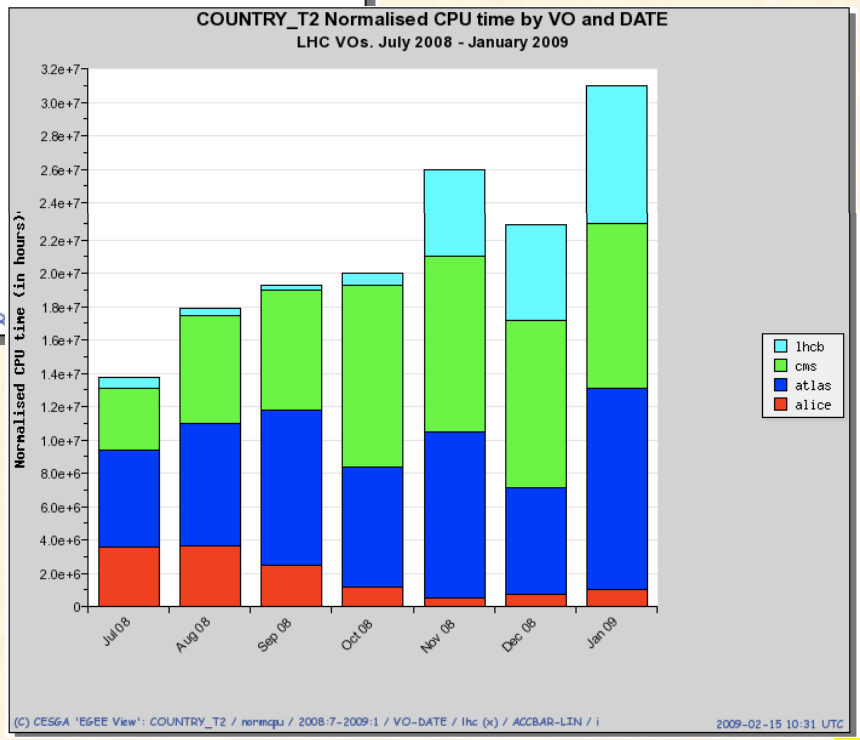
AGLT2 ATLAS Great Lakes Tier-2 Center at **University of Michigan** and **Michigan State** University

WT2 Western Tier-2 Center at **SLAC**

(From M. Ernst)

How are the Tier-2s being used?



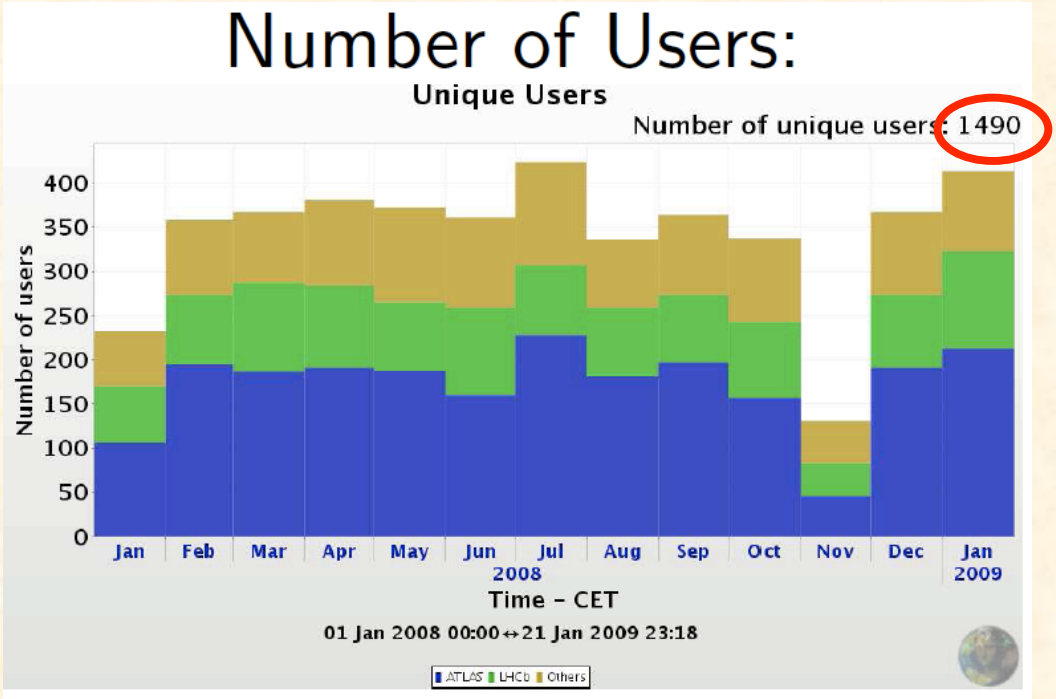


From APEL accounting page for the last 6 months

Tier-2s in Production

From APEL accounting portal for Aug.'08 to Jan.'09; #s in MSI2k

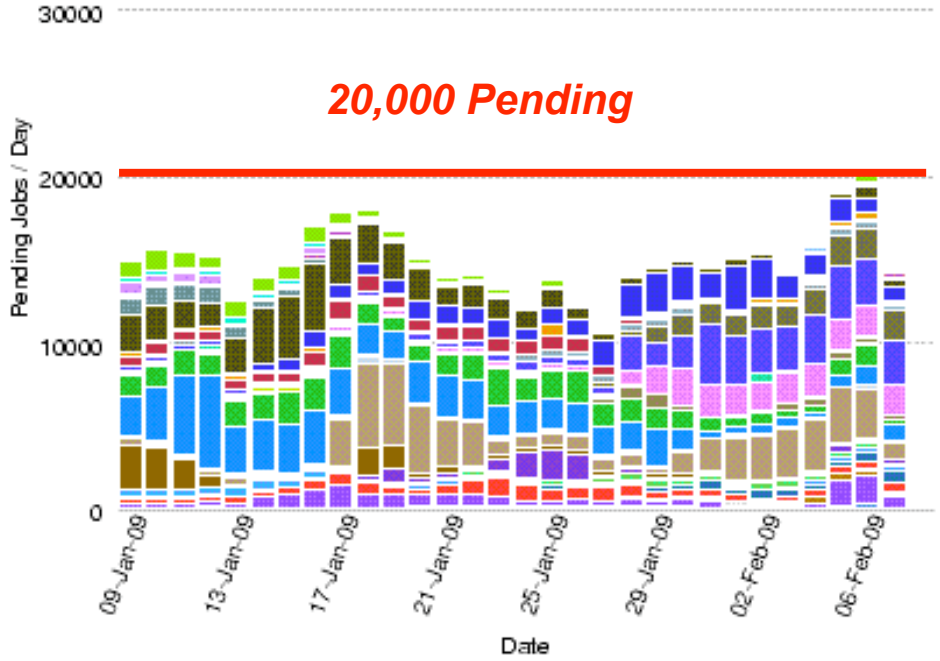
	Alice	ATLAS	CMS	LHCb	Total	
Tier-1s	6.24	32.03	30.73	2.50	71.50	34.3%
Tier-2s	9.61	52.23	55.04	20.14	137.02	65.7%
Total	15.85	84.26	85.77	22.64	208.52	

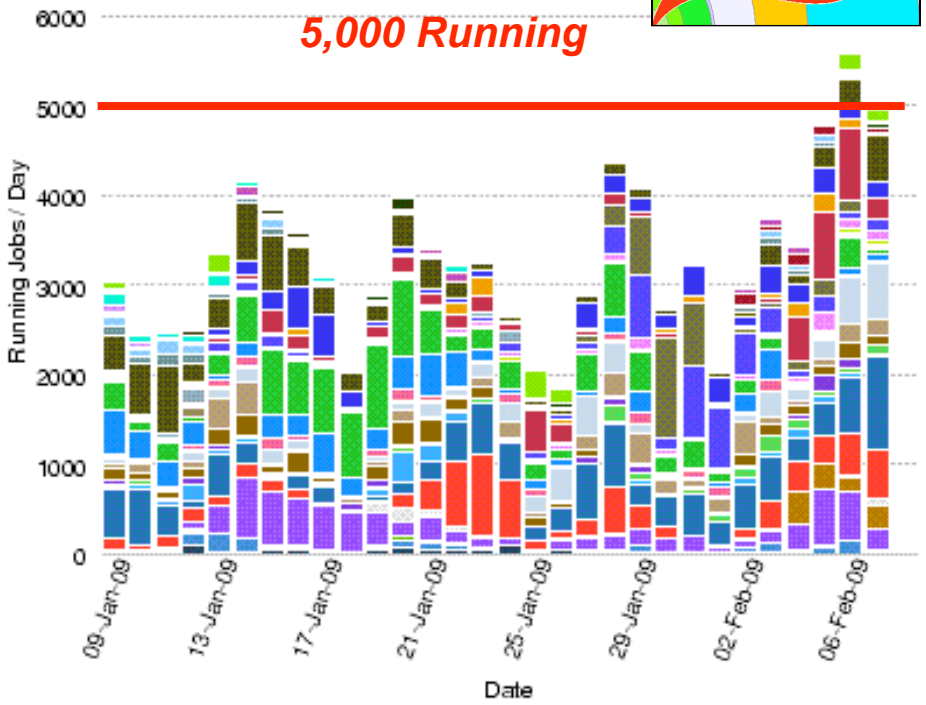


Warning: These numbers vary depending on what you put in your query

Analysis jobs last month

From F. Wuerthwein (UCSD-CMS)





BEIJING-LCG2, BEgrid-ULB-VUB, BUDAPEST, BelGrid-UCL, CIEMAT-LCG2, CIT_CMS_T2, CSC, CSCS-LCG2, DESY-HH, GLOW-CMS, GRIF, HEPGRID_UERJ, Hephy-Vienna, IFCA-LCG2, IN2P3-CC-T2, IN2P3-IRES, INDIACMS-TIFR, INFN-BARI, INFN-LNL-2, INFN-PISA, INFN-ROMA1-CMS, ITEP, JINR-LCG2, Kharkov-KIPT-LCG2, LCG_KNU, LIP-Lisbon, MIT_CMS, NDGF-T1, Nebraska, Purdue-RCAC, Purdue-Steele, RRC-KI, RU-Protvino-IHEP, RWTH-Aachen, SPRACE, T2_Estonia, TR-03-METU, TW-FTT, UCSDT2, UFlorida-HPC, UFlorida-IHEPA, UKI-LT2-Brunel, UKI-LT2-IC-HEP, UKI-LT2-IC-LeSC, UKI-SOUTHGRID-BRIS-HEP, UKI-SOUTHGRID-RALPP, WARSAW-EGEE, ru-Moscow-SINP-LCG2, ru-PNPI, ucsdt2-b

Note: We do not have stats for jobs that do not report to dashboard.
We know that such jobs exist.
⇒ Need WLCG <-> dashboard comparison !

CMS Summary

From F. Wuerthwein (UCSD-CMS)

- 80% of analysis activity at T2 & T3.
- 1/4 of collaboration submitted jobs in 2008.
  ~1 Million hours consumed per week.
- 30 T2 & 3 T3 with CMS-SAM availability > 80% for the last month.
- 1.0 PB placed, and accounted for by “groups” at T2.
- Additional 8 PB placed outside group accounting:
  - 5.5PB at T1 and T0
  - 136TB at T3

Note: #s based on CMS dashboard and PhEDEx accounting.

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LCG

Placement Accounting Examples

ewk

Node	Subscribed	Resident
T1_FR_CCIN2P3_MSS	3.68 TB	3.34 TB
T2_CH_CSCS	403.89 GB	403.89 GB
T2_ES_CIEMAT	54.04 TB	51.13 TB
T2_FR_GRIF_LLR	4.52 TB	4.52 TB
T2_IT_Legnaro	20.84 TB	18.25 TB
T2_IT_Pisa	26.15 TB	25.84 TB
T2_UK_London_Brunel	5.53 TB	5.13 TB
T2_US_UCSD	13.57 TB	13.57 TB
T2_US_Wisconsin	16.39 TB	16.39 TB
T3_CH_PSI	403.89 GB	403.89 GB
T3_US_Minnesota	488.37 GB	362.52 GB
	145.98 TB	139.31 TB

Placement includes T0,T1,T2,T3
The same dataset may be "owned"
by different groups at different sites.

T2_IT_Pisa Group Usage

Group	Subscribed	Resident
DataOps	3.93 TB	3.93 TB
FacOps	492.51 GB	492.51 GB
b-tagging	21.32 TB	19.07 TB
ewk	26.15 TB	25.84 TB
tau/pflow	11.35 TB	11.35 TB
tracker	42.32 TB	41.03 TB
undefined	3.46 TB	3.42 TB
	109.00 TB	105.12 TB

T2_US_UCSD Group Usage

Group	Subscribed	Resident
DataOps	3.60 TB	3.60 TB
e-gamma	50.15 GB	50.15 GB
ewk	13.57 TB	13.57 TB
higgs	7.08 TB	7.01 TB
susy	1.66 TB	1.66 TB
top	55.24 TB	53.43 TB
tracker	708.82 GB	708.82 GB
undefined	60.23 TB	60.23 TB
	142.12 TB	140.24 TB

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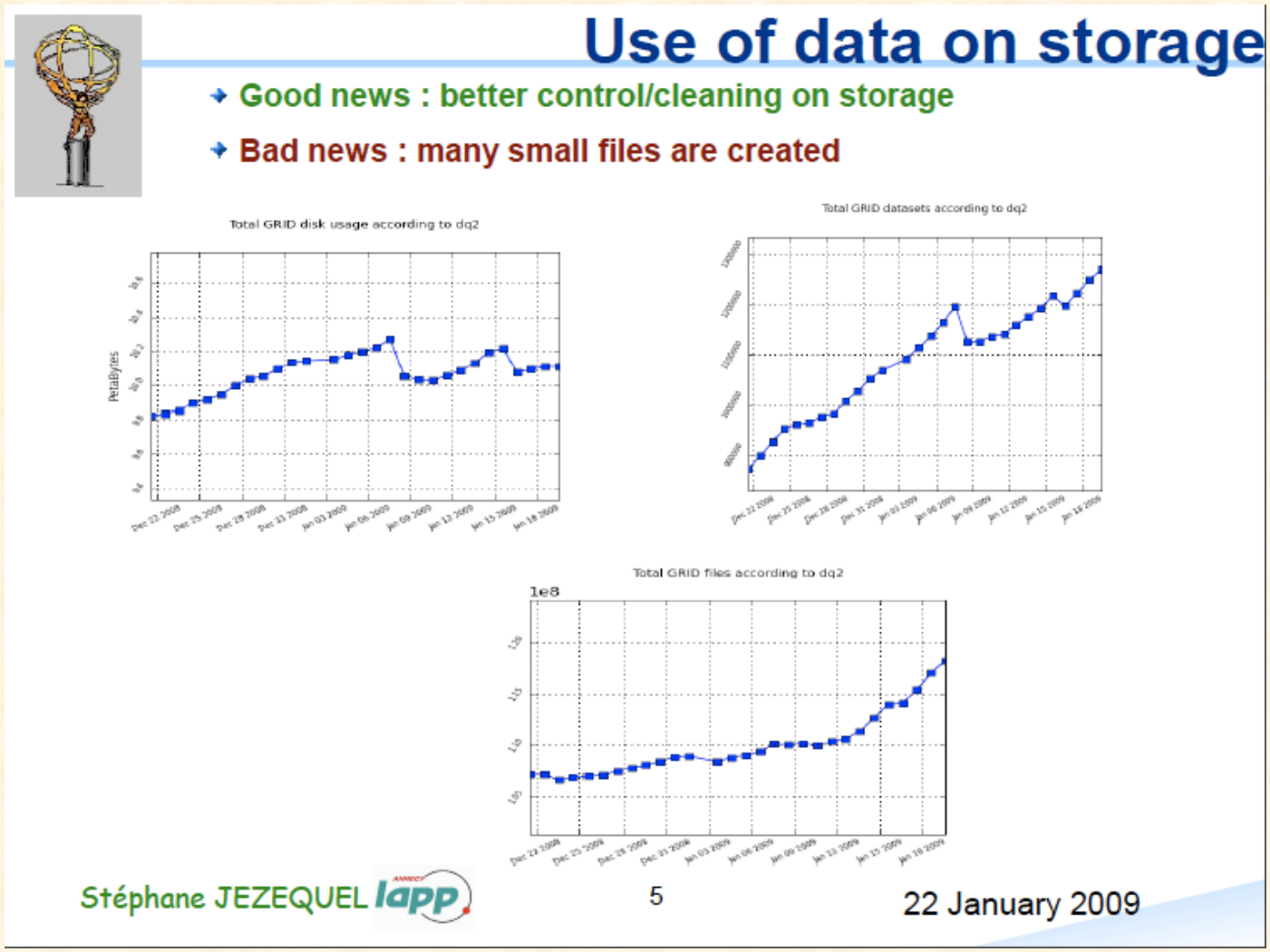
Data Issues at ATLAS

- *ATLAS has started an organized program of file deletion.*



Data Issues at ATLAS

- *"10M files" exercise:*

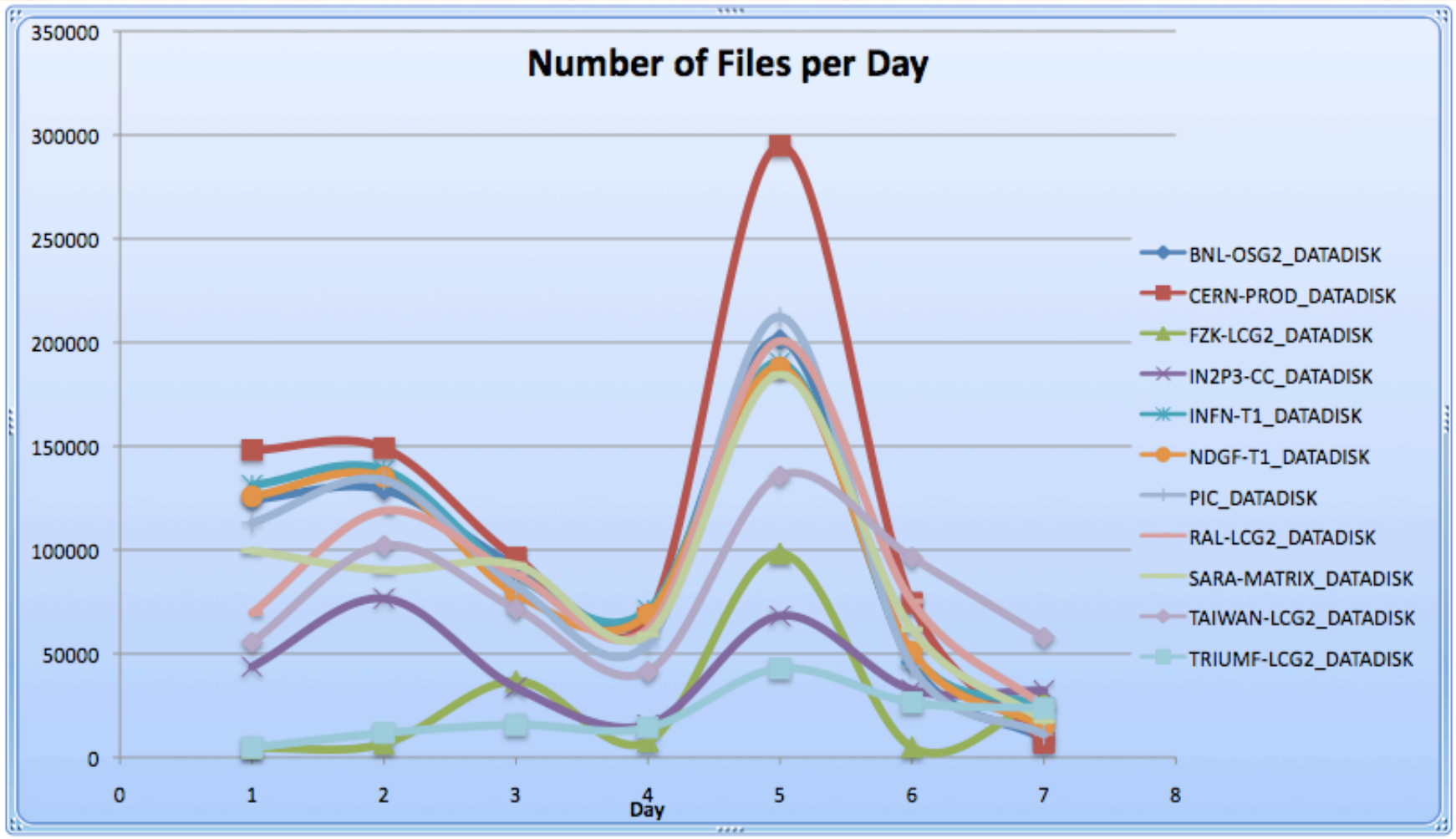
  - stress the data distribution system by transferring a huge number of files in a short time

  (10k datasets transferred in 10 days; 1M files to each T1)

  - Brought to light some issues with RTT for file registration; these should apply to large-scale T2 transfers too

  ➔ need bulk registration capabilities on the LFC

10M files Test @ ATLAS



(From S. Campana)

Tier-2 Hardware Questions

- *How does the LHC delay affect the requirements and pledges for 2009?*
  - + *We have heard about this earlier*
- *We need to use something other than SpecInt2000!*
  - + *this benchmark is totally out-of-date & useless for new CPUs*
  - + *SpecHEP06 will be used from now on; welcomed development*

Tier-2 Hardware Questions

- *Networking to the nodes is now an issue.*
  - + *with 8 cores per node, 1 GigE connection ≈ 16.8 MB/sec/core*
  - + *Tier-2 analysis jobs run on reduced data sets and can do rather simple operations*
  - ➔ *see M. Schott slide (next)*

Data processed per second

- Data read per second, as measured by root.
- All files cached on disk.

Data format, program	Reading speed [MB/s]
AOD (7 container), Athena	2.19 - 2.32
AOD (7 containers), ARA	3.75 – 5.0
AOD (trk.particles), Athena	2.75
Vector<vector<>>, ROOT	4.93
Simple ntuple, ROOT	6.99
ALICE esd file	18
ROOT example	47

(From M. Schott)

Tier-2 Hardware Questions

- *Networking to the nodes is now an issue.*
  - + *with 8 cores per node, 1 GigE connection ≈ 16.8 MB/sec/core*
  - + *Tier-2 analysis jobs run on reduced data sets and can do rather simple operations*
    - ➔ *see M. Schott slide (next)*
  - + *Do we need to go to Infiniband?*
  - + *We certainly need increased capability for the uplinks; we should have a minimum of fully non-blocking GigE the worker nodes.*

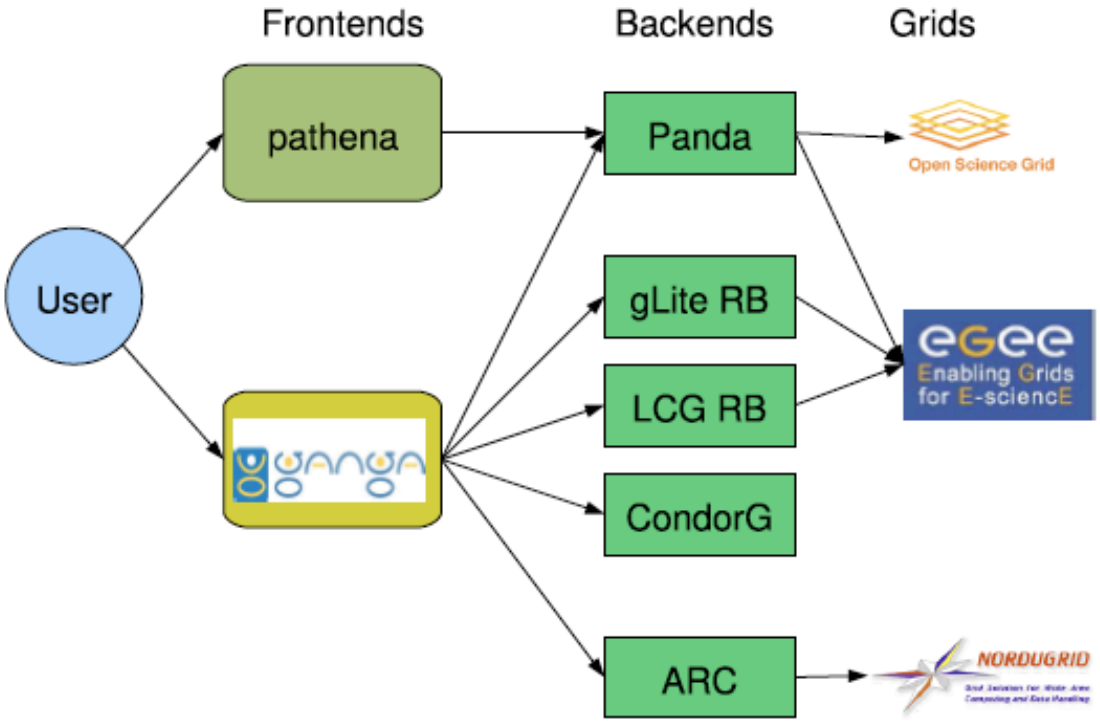
➔ *We need more guidance from the experiments*
The next round of purchases is soon/now!

User Issues: Load & Support

- *We saw earlier that the number of users has gone up significantly, but it will go up a lot more.*
  - *+ We must make the Grid easier to use*

User Issues: It's all still a little complicated

Distributed Analysis - Current Situation



Seeing an increased number of user in the last few months - but we expect many more !

User Issues: Load & Support

- *We saw earlier that the number of users has gone up significantly, but it will go up a lot more*
  - + *We must make the Grid easier to use*
- *User stress tests are being done regularly:*
  - ➔ *Hammercloud tests*
- *Work continues to make the "backend" invisible*
- *Much progress has been made on user support*
  - + *A distributed-analysis user support group has been formed*
  - + *Four people in the EU, four in the US; uses hypernews & gmail*
  - + *Quite successful but we need better documentation*
  - + *User2user support is starting to happen; encourage this.*

Summary

- *The role of the Tier-2 centres continues to increase*
- *Communication issues have been addressed but need more work*
- *Reliability continues to be generally good, but needs to be better*
- *Automatic resource & usage monitoring tools are almost ready*
- *Stress testing of data distribution and user analysis has ramped up*
- *The number of users continues to increase but we still need to make the Grid easier to use for beginners*
- *Organized user support is becoming a reality*
- *The Tier-2 layer of WLCG continues to improve!*