

1. Introduction

The following report summarises

- Current signature status of the Worldwide LHC Computing Grid (WLCG) Memorandum of Understanding (MoU)
- WLCG funding and expenditure estimates at CERN up to 2013
- Resource accounting for Tier-1 and Tier-2 sites
- Status of experiment requirements and resource pledges

Complementary information can be found on the WLCG website <http://lcg.web.cern.ch/LCG/>

2. WLCG Memorandum of Understanding Signature Status

Since the April 2009 C-RRB meeting, Brazil has signed the WLCG MoU supporting the CMS experiment. There are plans to establish other Brazilian Tier centres supporting the other experiments, currently the timescales and details are under discussion.

There have been expressions of interest to establish Tier2 Centres by some countries and continued collaboration with the External Relations unit at CERN on these contacts and providing information as appropriate in the hope to further extend the WLCG collaboration. The C-RRB will be kept informed of all future developments and any new MoU signatures.

Table 1 presents the current MoU signature status.

	Country	Funding Agency/Signatory	Signature status	Comments
Member States	Austria	BMWF	Y	
	Belgium	FNRS	Y	
	Belgium	FWO	Y	
	Czech Rep.	MSMT CR	Y	
	Denmark	National Science Research Council	Y	
	Finland	HIP	Y	
	France	CEA/DSM/DAPNIA	Y	
	France	CNRS/IN2P3	Y	
	Germany	ALU/DESY	Y	
	Germany	BUW/DESY	Y	
	Germany	UGOE/DESY	Y	
	Germany	FZK	Y	
	Germany	GSI	Y	
	Germany	MPG	Y	
	Germany	LMU	Y	
	Germany	RWTH/DESY	Y	
	Hungary	NKTH	Y	
	Italy	INFN	Y	
	The Netherlands	NIKHEF	Y	
	Norway	Research Council of Norway	Y	
	Poland	The Minister of Science & Education	Y	
	Portugal	GRICES/FCT/UMIC	Y	
Spain	MEC	Y		
Sweden	Swedish Research Council	Y		
Switzerland	SER/SNF/ETH/CSCS	Y		
United Kingdom	STFC	Y		
Non-Member States	Australia	AusHEP	Y	
	Brazil	FAPESP	Y	Signed since last C-RRB
	Canada	CFI	Y	
	China	MoST/NSFC	Y	
	Estonia	NICPB	Y	
	India	DAE	Y	
	Israel	ICHEP	Y	
	Japan	Univ. Tokyo	Y	
	JINR, Dubna	JINR	Y	
	Korea	KICOS	Y	
	Pakistan	PAEC/NCP	Y	
	Romania	National Authority for Scientific Research	Y	
	Russia	Federal Agency for Science & Innovation	Y	
	Slovenia	Ministry of Higher Education, Science and Technology	Y	
	Taipei	Academia Sinica	Y	
	Turkey	TAEK	Y	
	Ukraine	National Academy of Sciences	Y	
USA	DOE	Y		
USA	NSF	Y		

Table 1: Signature Status of WLCG Memorandum of Understanding on 30/09/2009

3. Funding and Expenditure for WLCG at CERN

The final status of LCG Phase 2 at CERN covering the years 2005-2008 was reported on at the C-RRB meeting in April 2009 and therefore is no longer included in this report.

Table 2 shows future funding and estimated expenditure for the years 2009-2013. Personnel expenditure is based on detailed long-term planning including current personnel commitments, planned replacements and some new requests for key activity areas waiting management approval. As was the case in the April C-RRB meeting, the personnel balance shows deficit in 2009, increasing in 2010 due to the impact of the end of EGEE-III and the new requests, with continued but reduced deficit from 2011-2013.

The materials funding has significantly changed with respect to the numbers shown in the April C-RRB. This is due to a re-profiling of the Medium Term Plan which redistributed the annual reserve planned over 10 years for the replacement Computer Centre, to make it all available in 2010-2012 in line with the replacement Computer Centre strategy at the beginning of 2009. Since this re-profiling, the strategy has evolved therefore the current funding profile no longer fits the probable expenditure. This explains the very positive materials balance between 2010 and 2012 and the overall positive balance which will evolve once more information is available. Once the strategy and timescale has been confirmed, a further re-profiling will probably be necessary.

The evolution on both personnel and materials will be closely followed up and reported on at the next C-RRB meeting.

LHC Future Computing Funding and Expenditure Estimates						
(all figures in MCHF at 31/08/2009)						
	2009	2010	2011	2012	2013	TOTAL
Funding						
From CERN Budget						
- Personnel	13.3	14.5	14.5	13.9	13.9	70.2
- Materials *	18.7	37.5	47.5	27.5	17.5	148.8
Contributions via Team Accounts**						
- Personnel	1.0	0.7	0.1			1.8
- Carry-over from Phase 2 Materials	0.6					0.6
In-kind Contributions**						
- Personnel	1.0	1.0				2.0
Total						
- Personnel	15.3	16.2	14.6	13.9	13.9	74.0
- Materials	19.3	37.5	47.5	27.5	17.5	149.4
Total Funding	34.6	53.8	62.1	41.5	31.4	223.4
Expenditure						
- Personnel ***	15.8	17.8	15.8	15.0	15.0	79.4
- Materials	22.1	21.0	22.8	21.0	19.8	106.6
Total Planned Expenditure	37.9	38.8	38.6	35.9	34.8	186.1
Balance Personnel	-0.5	-1.6	-1.2	-1.0	-1.1	-5.4
Balance Materials	-2.8	16.5	24.7	6.6	-2.3	42.8
Balance	-3.3	15.0	23.5	5.5	-3.3	37.4
* Includes re-profiling within the Medium Term Plan for the replacement Computer Centre						
** As planned to be pledged in the WLCG MoU (Annex 6.6)						
*** - Personnel from EGEE-III will participate until April 2010 in LCG at CERN during this phase of the project						
- Operators Support from Computer Centre will participate in LCG at CERN during this phase of the project						
These resources are not included in this Table.						

Table 2: LHC Computing Budget Estimates for 2009-2013

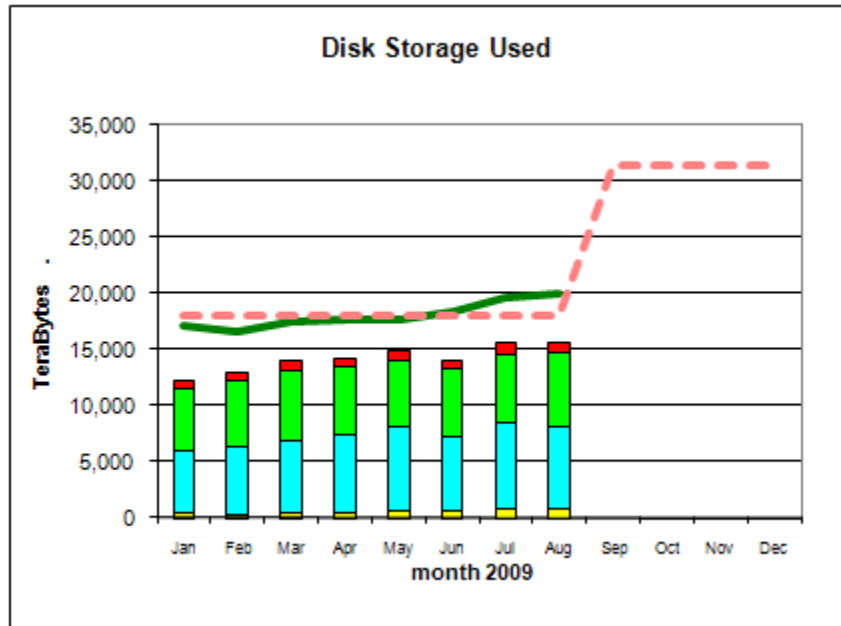
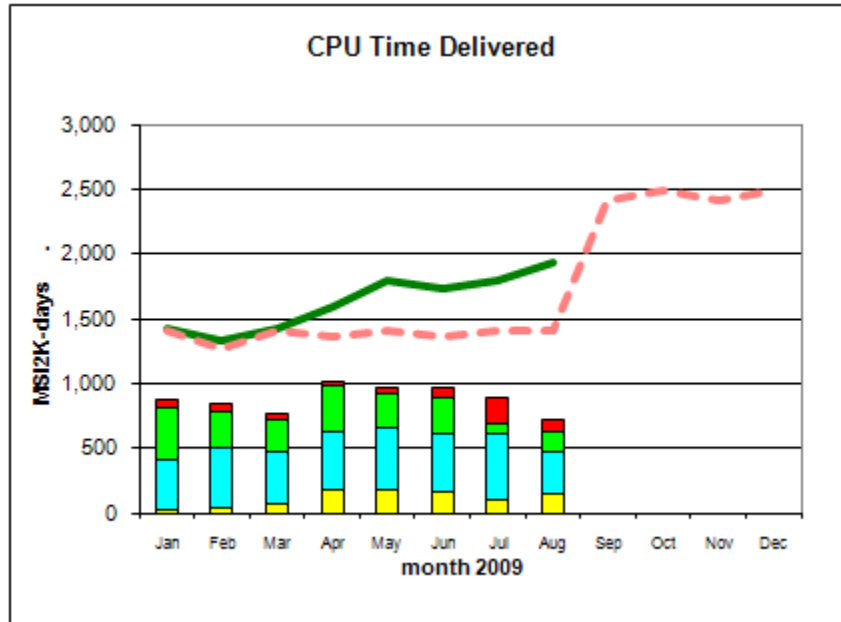
4. Resource Accounting

4.1 CERN and External Tier-1 Accounting

Accounting data for CERN and External Tier-1 sites has been reported at the last C-RRB meetings, and full accounting reports covering the years 2006, 2007 and 2008 are available on the LCG website Accounting page <http://lcg.web.cern.ch/LCG/accounts.htm>.

Figure 1 shows the CPU delivered, Disk and Tape used at CERN and the external Tier-1s for the period January to August 2009 inclusive. Normally the pledges should have changed in April to those of 2009, however following the LHC incident the WLCG Management Board agreed to a

revised schedule for 2009 resource purchasing and installation, and exceptionally the move to 2009 pledges in September 2009 instead of April.



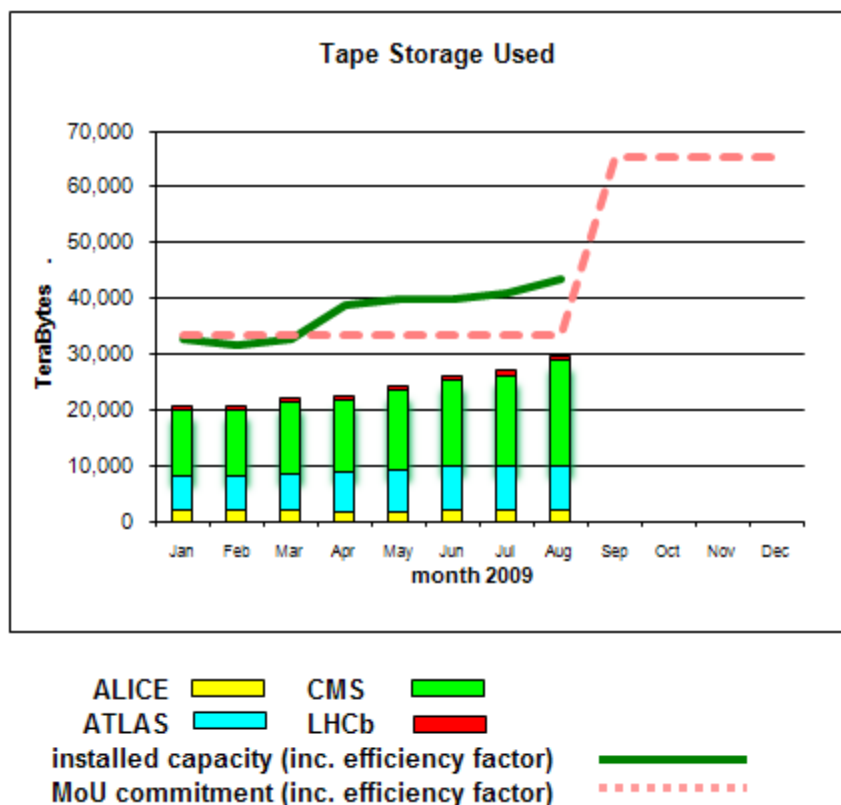


Figure 1: Accounting for CERN and External Tier-1s January - August 2009

Installed capacity therefore increased rather steadily throughout this period, and much installation to meet the 2009 pledges is currently ongoing. The monthly accounting reports will be watched with interest during the Autumn as they will show the increased installed capacity with respect to the 2009 pledges and will be reported on at the next meeting. These monthly graphs are distributed to the Overview Board Members and are available from the accounting page on the WLCG web as referenced above.

4.2 Tier-2 Accounting

Tier-2 accounting began in September 2007 and as for Tier-1 accounting past reports can be found on the LCG website Accounting page <http://lcg.web.cern.ch/LCG/accounts.htm>. It has taken quite some time to get all Tier-2 sites fully on-board and this is not yet complete.

Figure 2 shows the Federations with MoU pledge values above 750 KSI2K. Figure 3 shows all those with pledge values below 750 KSI2K, in both cases ordered by pledge. The data shows the status for August 2009.

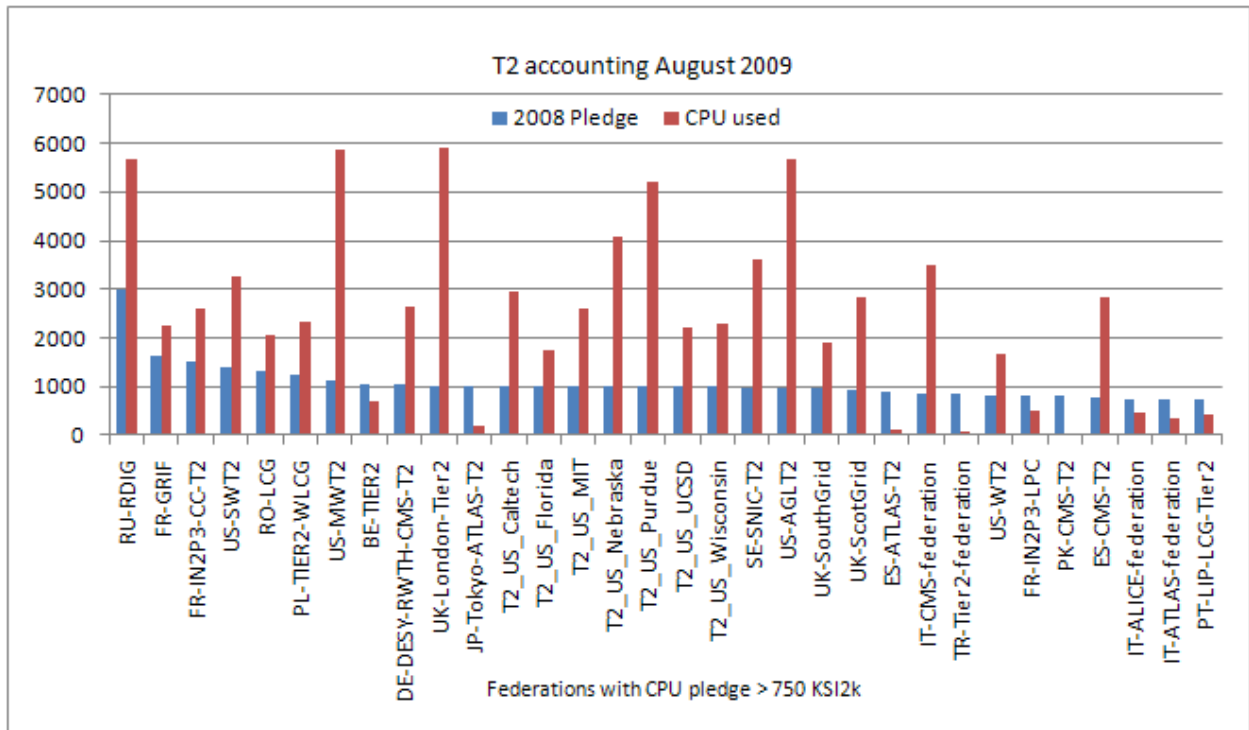


Figure 2: Accounting for Federations with CPU pledge > 750 KSI2K in August 2009

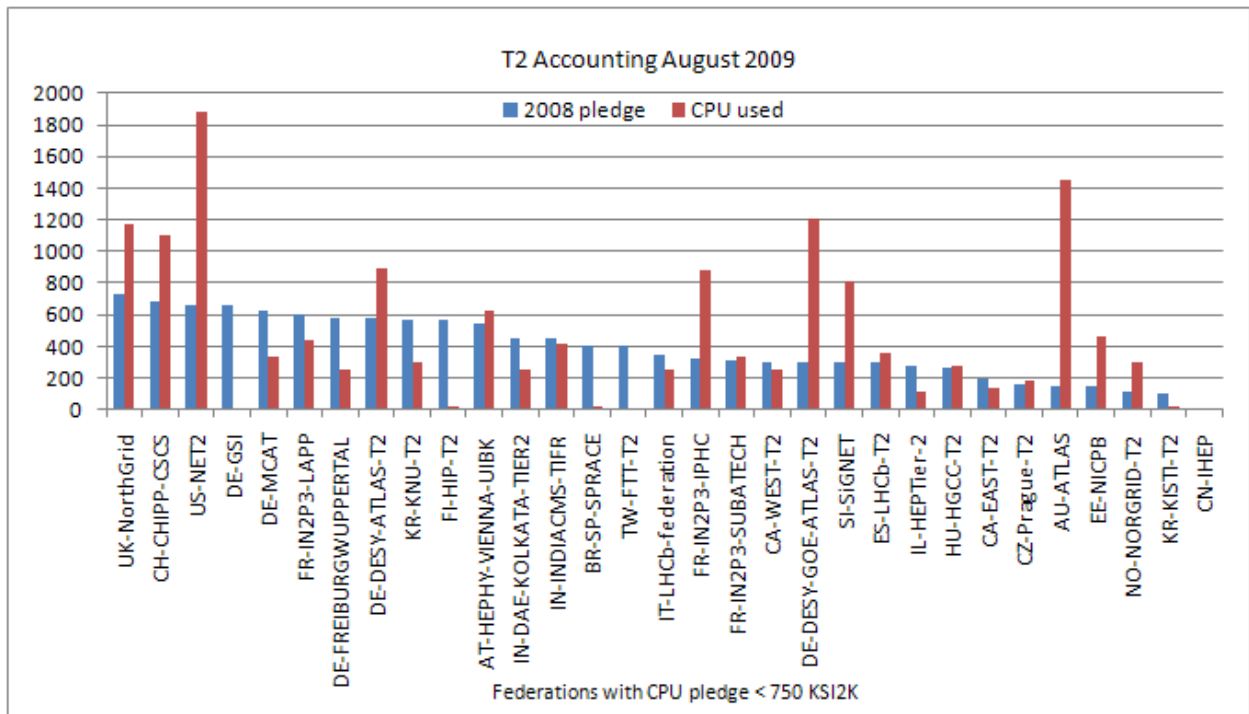


Figure 3: Accounting for Federations with CPU pledge < 750 KSI2K in August 2009

As for the Tier1 accounting, the 2008 pledge values are still being used. These figures show that many of the T2 sites are showing very encouraging results, however not all. Follow-up is ongoing to rectify this before first data taking.

5. Revised Computing Requirements and Pledges

As announced at the April C-RRB meeting, Funding Agencies were requested to provide their confirmed 2010 pledges by end September 2009 for approval at the Autumn C-RRB meeting. In early September a reminder was sent with the newly revised experiment requirements as a result of the LHCC and Computing Resource Scrutiny Group (C-RSG) deliberations. With the agreement of the C-RRB Chairman, it was decided to concentrate pledge data on 2010 only, and not beyond, until the LHC running scenario for 2011 is known and the experiments can revise their requirements in light of first data taking.

All sites were therefore asked to provide a short status of their 2009 pledge installation, and confirm their 2010 pledges for approval by the C-RRB. The replies, with the help of reminders were received towards the end of September however by end September the data from 10 sites: 2 Tier1s and 8 Tier 2s were still missing making it difficult to finalise the resource status on time.

The status of the 2009 pledge installation can be divided into 3 main categories:

- Installation complete or completion planned by end October
- Installation has progressed well with a revised installation schedule agreed with the experiment(s) following publication of their revised requirements
- Installation was delayed for procurement reasons, is currently on-going and planned to be complete in November or December 2009

For the 2010 status, many sites have changed their pledges with respect to the 2010 planned pledges already submitted. Table 3 compares the 2010 pledges, which are now mostly confirmed, with the revised experiment requirements giving the following summary and breakdown by experiment.

Summary Ext. Tier1s	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	245800	413356	Offered	52604	212009	106815	41928	413356
			Required	57600	192000	100500	44000	394100
			Balance	-9%	10%	6%	-5%	5%
Disk (Tbytes)	34890	46742	Offered	6490	23544	12866	3842	46742
			Required	10800	21900	13400	3290	49390
			Balance	-40%	8%	-4%	17%	-5%
Tape (Tbytes)	40189	54450	Offered	9160	16803	24513	3974	54450
			Required	16300	14200	23300	2400	56200
			Balance	-44%	18%	5%	66%	-3%

Summary Tier2s with Split in 2010	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	308524	494221	Offered	50562	180106	186448	47105	494221
			Required	89600	240000	195000	38000	562600
			Balance	-44%	-25%	-4%	24%	-12%
Disk (Tbytes)	22647	36269	Offered	3484	17038	12646	301	36269
			Required	12600	24800	9200	20	46620
			Balance	-72%	-31%	37%	1404%	-22%

Table 3: 2010 Revised experiment computing requirements and pledges for Tier-1 and Tier-2 sites.

Status on 07/10/09 (some 2010 pledges are preliminary and not yet confirmed therefore numbers subject to change)

Annex 1 of this report gives the detailed breakdown of this information including some explanatory notes as requested or agreed by certain sites. In some cases the 2010 pledges are not yet confirmed and therefore may still change.

To conclude this section it probably goes without saying that 2009 should be viewed as an exceptional year due to the LHC incident and the agreement to revise the procurement and resource installation process. The publication of the revised experiment requirements came very late which puts the future scheduling and working relationship of the bodies involved in this process into question.

6. Conclusion

The MoU signatures are now well advanced and include Brazil as a Tier 2. Expressions of interest from other countries are being followed-up as appropriate.

The future funding and expenditure estimates up to and including 2013 illustrate some over-spending on personnel. Once the strategy for the replacement Computer Centre is clarified, re-profiling of the materials funding will take place and the expenditure profile will be realigned accordingly to give a more realistic balance.

Tier-1 and Tier-2 accounting continues to be monitored on a monthly basis particularly with respect to the change to the 2009 pledge values later than usual. Tier2 sites showing little or no CPU use in the accounting reports are being followed up.

Finally the revised experiment requirements for 2009 and 2010 were sent in September requesting all sites to give the status of their 2009 installations and their confirmed pledge values for 2010. The resulting summary in Table 3 above which is not yet fully confirmed puts the timing and the process to arrive at this result into question.



CERN Tier0 / CAF (note 1)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	131880	233400	Offered	46800	67000	96600	23000	233400
			Required	46800	67000	96600	23000	233400
			% of Req.	100%	100%	100%	100%	100%
Disk (Tbytes)	10065	14790	Offered	5500	3900	4100	1290	14790
			Required	5500	3900	4100	1290	14790
			% of Req.	100%	100%	100%	100%	100%
Tape (Tbytes)	25083	31600	Offered	6300	8900	14600	1800	31600
			Required	6300	8900	14600	1800	31600
			% of Req.	100%	100%	100%	100%	100%
Nominal WAN (Mbits/sec)	140000	160000						

Canada Tier1 (note 2)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5680	10800	Offered		10800			10800
			% of Total		6%			6%
Disk (Tbytes)	990	1095	Offered		1095			1095
			% of Total		5%			5%
Tape (Tbytes)	750	710	Offered		710			710
			% of Total		5%			5%
Nominal WAN (Mbits/sec)	10000	10000						

FZK-GridKa (Note 3)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	41420	58730	Offered	19600	21600	10050	7480	58730
			% of Total	34%	11%	10%	17%	15%
Disk (Tbytes)	5142	6924	Offered	2700	2190	1474	560	6924
			% of Total	25%	10%	11%	17%	14%
Tape (Tbytes)	7190	8932	Offered	4075	1420	3029	408	8932
			% of Total	25%	10%	13%	17%	16%
Nominal WAN (Mbits/sec)	30000	30000						

IN2P3 Lyon (Note 4)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	31992	53764	Offered	10754	21505	12365	9140	53764
			% of Total	19%	11%	12%	21%	14%
Disk (Tbytes)	4600	8224	Offered	986	4030	1892	1316	8224
			% of Total	9%	18%	14%	40%	17%
Tape (Tbytes)	5175	9180	Offered	1744	3029	2938	1469	9180
			% of Total	11%	21%	13%	61%	16%
Nominal WAN (Mbits/sec)	10000	10000						

INFN CNAF (Note 5)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	21200	44000	Offered	10000	16000	12500	5500	44000
			% of Total	17%	8%	12%	13%	11%
Disk (Tbytes)	2300	5300	Offered	1200	1800	1850	450	5300
			% of Total	11%	8%	14%	14%	11%
Tape (Tbytes)	2600	5450	Offered	1400	1400	2200	450	5450
			% of Total	9%	10%	9%	19%	10%
Nominal WAN (Mbits/sec)	30000	40000						

Netherlands LHC/Tier1	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	30176	47296	Offered	4808	33496		8992	47296
			% of Total	8%	17%		20%	16%
Disk (Tbytes)	3753	4186	Offered	478	3001		707	4186
			% of Total	4%	14%		21%	12%
Tape (Tbytes)	3548	3629	Offered	495	2122		1012	3629
			% of Total	3%	15%		42%	11%
Nominal WAN (Mbits/sec)	10000	10000						

NDGF Tier1 (Note 6)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	12120	13930	Offered	6290	7640			13930
			% of Total	11%	4%			6%
Disk (Tbytes)	1580	1770	Offered	910	860			1770
			% of Total	8%	4%			5%
Tape (Tbytes)	1660	1770	Offered	1120	650			1770
			% of Total	7%	5%			6%
Nominal WAN (Mbits/sec)	10000	10000						



Spain PIC	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	10364	18380	Offered		10288	5460	2632	18380
			% of Total		5%	5%	6%	5%
Disk (Tbytes)	1702	1968	Offered		1043	728	197	1968
			% of Total		5%	5%	6%	5%
Tape (Tbytes)	1844	2136	Offered		681	1266	189	2136
			% of Total		5%	5%	8%	5%
Nominal WAN (Mbits/sec)	10000	10000						

Taipei ASGC	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	20000	28000	Offered		14000	14000		28000
			% of Total		7%	14%		10%
Disk (Tbytes)	3000	3500	Offered		1750	1750		3500
			% of Total		8%	13%		10%
Tape (Tbytes)	3000	3500	Offered		1750	1750		3500
			% of Total		12%	8%		9%
Nominal WAN (Mbits/sec)	10000	10000						

UK Tier1	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	23100	44376	Offered	1152	27000	8040	8184	44376
			% of Total	2%	14%	8%	19%	11%
Disk (Tbytes)	3401	4638	Offered	216	2738	1072	612	4638
			% of Total	2%	13%	8%	19%	9%
Tape (Tbytes)	4045	4877	Offered	326	1775	2330	446	4877
			% of Total	2%	13%	10%	19%	9%
Nominal WAN (Mbits/sec)	10000	10000						

US-ATLAS Tier1 (Note 7)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	29348	49680	Offered		49680			49680
			% of Total		26%			26%
Disk (Tbytes)	5822	5037	Offered		5037			5037
			% of Total		23%			23%
Tape (Tbytes)	3277	3266	Offered		3266			3266
			% of Total		23%			23%
Nominal WAN (Mbits/sec)	29856	29856						

US-CMS Tier1	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	20400	44400	Offered			44400		44400
			% of Total			44%		44%
Disk (Tbytes)	2600	4100	Offered			4100		4100
			% of Total			31%		31%
Tape (Tbytes)	7100	11000	Offered			11000		11000
			% of Total			47%		47%
Nominal WAN (Mbits/sec)								

Summary Ext. Tier1s	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	245800	413356	Offered	52604	212009	106815	41928	413356
			Required	57600	192000	100500	44000	394100
			Balance	-9%	10%	6%	-5%	5%
Disk (Tbytes)	34890	46742	Offered	6490	23544	12866	3842	46742
			Required	10800	21900	13400	3290	49390
			Balance	-40%	8%	-4%	17%	-5%
Tape (Tbytes)	40189	54450	Offered	9160	16803	24513	3974	54450
			Required	16300	14200	23300	2400	56200
			Balance	-44%	18%	5%	66%	-3%

TIER 1 Notes

Note 1: Currently working to fulfill revised, increased 2009 CPU requirements received in September 2009 before end 2009.

Note 2: 2009 pledges based on providing 5% of resources in ATLAS computing model

Note 3: pledges are to be confirmed by the GridKa Overview Board on 6 Nov 2009.

Note 4: Pledges for FR-CCIN2P3 are not definitive. To be confirmed mid-October 2009. 2010 split based on 2009 allocation.

Note 5: Following the LHC incident INFN announced reduced procurement and installation of 2009 resources

Note 6: 2010 numbers are preliminary and not yet approved by the National Funding Agencies as of 30/09/09

Note 7: While all of the pledged 2009 CPU capacity is installed and usable by ATLAS, the pledged disk and tape capacity was adjusted to the capacity requested by ATLAS.

Ext. Tier1 Requ. 2010	ALICE	ATLAS	CMS	LHCb	SUM
CPU (HEP-SPEC06)	57600	192000	100500	44000	394100
Disk (Tbytes)	10800	21900	13400	3290	49390
Tape (Tbytes)	16300	14200	23300	2400	56200

NB. A change in the ATLAS Tier1 2010 CPU requirement was signaled on 05/10/09 (from 216,000 to 192,000 HEP-SPEC06)



Austria, Austrian Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4240	8850	Offered		1850	7000		8850
			% of Total		1%	4%		2%
Disk (Tbytes)	295	594	Offered		94	500		594
			% of Total		0%	5%		2%
Nominal WAN (Mbits/sec)	1000	1000						
Australia, University of Melbourne								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	800	2500	Offered		2500			2500
			% of Total		1%			1%
Disk (Tbytes)	110	250	Offered		250			250
			% of Total		1%			1%
Nominal WAN (Mbits/sec)								
Belgium, Belgian Tier-2 Fed. FNRS (note 1)								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	3740	6000	Offered			6000		6000
			% of Total			3%		3%
Disk (Tbytes)	265	450	Offered			450		450
			% of Total			5%		5%
Nominal WAN (Mbits/sec)	1500	2000						
Belgium, Belgian Tier-2 Fed. FWO (note 1)								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	1860	3000	Offered			3000		3000
			% of Total			2%		2%
Disk (Tbytes)	135	220	Offered			220		220
			% of Total			2%		2%
Nominal WAN (Mbits/sec)	1500	2000						
Brazil, SPRACE, Sao Paulo (Note 2)								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	3200	3200	Offered			3200		3200
			% of Total			2%		2%
Disk (Tbytes)	100	120	Offered			120		120
			% of Total			1%		1%
Nominal WAN (Mbits/sec)	10000	10000						
Canada, Canada-East Federation								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	3240	5760	Offered		5760			5760
			% of Total		2%			2%
Disk (Tbytes)	360	595	Offered		595			595
			% of Total		2%			2%
Nominal WAN (Mbits/sec)								
Canada, Canada-West Federation								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	1940	5760	Offered		5760			5760
			% of Total		2%			2%
Disk (Tbytes)	270	595	Offered		595			595
			% of Total		2%			2%
Nominal WAN (Mbits/sec)								
China, IHEP, Beijing								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	5600	8000	Offered		4000	4000		8000
			% of Total		2%	2%		2%
Disk (Tbytes)	400	600	Offered		300	300		600
			% of Total		1%	3%		2%
Nominal WAN (Mbits/sec)	1000	1000						
Czech Rep., FZU, Prague								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	1504	5900	Offered	4117	1783			5900
			% of Total	5%	1%			2%
Disk (Tbytes)	72	201	Offered	51	150			201
			% of Total	0%	1%			1%
Nominal WAN (Mbits/sec)	10000	10000						
Estonia, NICPB, Tallinn								
2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010	
CPU (HEP-SPEC06)	3200	3200	Offered			3200		3200
			% of Total			2%		2%
Disk (Tbytes)	80	120	Offered			120		120
			% of Total			1%		1%
Nominal WAN (Mbits/sec)	2000	2000						



Finland, NDGF/HIP Tier-2 (Note 3)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2680	2680	Offered			2680		2680
			% of Total			1%		1%
Disk (Tbytes)	210	210	Offered			210		210
			% of Total			2%		2%
Nominal WAN (Mbits/sec)								

France, CC-IN2P3, Lyon (Note 4)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	16360	27144	Offered	6643	3577	5595	11329	27144
			% of Total	7%	1%	3%	30%	5%
Disk (Tbytes)	544	687	Offered	354	23	215	95	687
			% of Total	3%	0%	2%	475%	1%
Nominal WAN (Mbits/sec)	10000	10000						

France, GRIF, Paris	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	11172	25808	Offered	2344	8640	7256	7568	25808
			% of Total	3%	4%	4%	20%	5%
Disk (Tbytes)	938	1570	Offered	330	893	342	5	1570
			% of Total	3%	4%	4%	25%	3%
Nominal WAN (Mbits/sec)	5000	5000						

France, IPHC, Strasbourg	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5120	8000	Offered	2000		6000		8000
			% of Total	2%		3%		3%
Disk (Tbytes)	240	440	Offered	110		330		440
			% of Total	1%		4%		2%
Nominal WAN (Mbits/sec)	1000	10000						

France, LAPP, Annecy	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4000	5200	Offered		4000		1200	5200
			% of Total		2%		3%	2%
Disk (Tbytes)	140	230	Offered		228		2	230
			% of Total		1%		10%	1%
Nominal WAN (Mbits/sec)	1000	1000						

France, LPC, Clermont	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5360	7080	Offered	2124	3540		1416	7080
			% of Total	2%	1%		4%	2%
Disk (Tbytes)	210	370	Offered	111	255		4	370
			% of Total	1%	1%		19%	1%
Nominal WAN (Mbits/sec)	1000	1000						

France, Subatech, Nantes	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1720	3000	Offered	3000				3000
			% of Total	3%				3%
Disk (Tbytes)	140	200	Offered	200				200
			% of Total	2%				2%
Nominal WAN (Mbits/sec)	1000	1000						

Germany, ATLAS Federation, DESY	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2400	4800	Offered		4800			4800
			% of Total		2%			2%
Disk (Tbytes)	290	740	Offered		740			740
			% of Total		3%			3%
Nominal WAN (Mbits/sec)	10000	10000						

Germany, ATLAS Federation, U. Goettingen	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1200	2280	Offered		2280			2280
			% of Total		1%			1%
Disk (Tbytes)	150	250	Offered		250			250
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	10000	10000						

Germany, CMS Federation DESY	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	8000	Offered			8000		8000
			% of Total			4%		4%
Disk (Tbytes)	230	400	Offered			400		400
			% of Total			4%		4%
Nominal WAN (Mbits/sec)	10000	10000						



Germany, CMS Federation RWTH Aachen	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2200	5000	Offered			5000		5000
			% of Total			3%		3%
Disk (Tbytes)	115	250	Offered			250		250
			% of Total			3%		3%
Nominal WAN (Mbits/sec)	10000	10000						

Germany, DESY-LHCb	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	3200	3200	Offered				3200	3200
			% of Total				8%	8%
Disk (Tbytes)	2	2	Offered				2	2
			% of Total				10%	10%
Nominal WAN (Mbits/sec)								

Germany, GSI, Darmstadt	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	3440	4400	Offered	4400				4400
			% of Total	5%				5%
Disk (Tbytes)	260	340	Offered	340				340
			% of Total	3%				3%
Nominal WAN (Mbits/sec)	1000	1000						

Germany, ATLAS Fed. Munich MPI/RZG (not	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2116	3440	Offered		3440			3440
			% of Total		1%			1%
Disk (Tbytes)	265	370	Offered		370			370
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	1000	1000						

Germany, ATLAS Fed. Munich LMU/LRZ (no	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1800	3440	Offered		3440			3440
			% of Total		1%			1%
Disk (Tbytes)	220	370	Offered		370			370
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	1000	1000						

Germany, ATLAS Fed. FR/W Wuppertal	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1800	3436	Offered		3436			3436
			% of Total		1%			1%
Disk (Tbytes)	219	369	Offered		369			369
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	1000	1000						

Germany, ATLAS Fed. FR/W Freiburg	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1800	3436	Offered		3436			3436
			% of Total		1%			1%
Disk (Tbytes)	219	369	Offered		369			369
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	1000	1000						

Hungary, HGCC Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1200	2500	Offered	625		1875		2500
			% of Total	1%		1%		1%
Disk (Tbytes)	100	140	Offered	35		105		140
			% of Total	0%		1%		1%
Nominal WAN (Mbits/sec)	1000	1000						

India, VECC/SINP, Kolkata	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1400	1800	Offered	1800				1800
			% of Total	2%				2%
Disk (Tbytes)	120	150	Offered	150				150
			% of Total	1%				1%
Nominal WAN (Mbits/sec)	180	180						

India, TIFR, Mumbai	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2400	3200	Offered			3200		3200
			% of Total			2%		2%
Disk (Tbytes)	450	600	Offered			600		600
			% of Total			7%		7%
Nominal WAN (Mbits/sec)	1000	1000						



Israel, IL-HEP Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1440	3200	Offered		3200			3200
			% of Total		1%		1%	
Disk (Tbytes)	200	375	Offered		375			375
			% of Total		2%		2%	
Nominal WAN (Mbits/sec)								

Italy, INFN ALICE Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5800	8000	Offered	8000				8000
			% of Total	9%			9%	
Disk (Tbytes)	550	500	Offered	500				500
			% of Total	4%			4%	
Nominal WAN (Mbits/sec)	1000	1000						

Italy, INFN ATLAS Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5920	12000	Offered		12000			12000
			% of Total		5%		5%	
Disk (Tbytes)	700	1000	Offered		1000			1000
			% of Total		4%		4%	
Nominal WAN (Mbits/sec)	1000	1000						

Italy, INFN CMS Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	13200	24000	Offered			24000		24000
			% of Total			12%	12%	
Disk (Tbytes)	640	1300	Offered			1300		1300
			% of Total			14%	14%	
Nominal WAN (Mbits/sec)	1000	1000						

Italy, INFN LHCb Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2400	4750	Offered				4750	4750
			% of Total				13%	13%
Disk (Tbytes)	0	0	Offered					
			% of Total					
Nominal WAN (Mbits/sec)	1000	1000						

Japan, ICEPP, Tokyo	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4000	12000	Offered		12000			12000
			% of Total		5%		5%	
Disk (Tbytes)	400	600	Offered		600			600
			% of Total		2%		2%	
Nominal WAN (Mbits/sec)	2000	2000						

Republic of Korea, KISTI, Daejeon	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	600	600	Offered	600				600
			% of Total	1%			1%	
Disk (Tbytes)	50	50	Offered	50				50
			% of Total	0%			0%	
Nominal WAN (Mbits/sec)	10000	10000						

Republic of Korea, CHEP of KNU, Daegu	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2560	2840	Offered			2840		2840
			% of Total			1%	1%	
Disk (Tbytes)	175	205	Offered			205		205
			% of Total			2%	2%	
Nominal WAN (Mbits/sec)	20000	20000						

Norway, UNINETT SIGMA Tier2 (Note 3)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1280	1280	Offered		1280			1280
			% of Total		1%		1%	
Disk (Tbytes)	90	130	Offered		130			130
			% of Total		1%		1%	
Nominal WAN (Mbits/sec)	10000	10000						

Pakistan, Pakistan Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	3280	3480	Offered			3480		3480
			% of Total			2%	2%	
Disk (Tbytes)	200	200	Offered			200		200
			% of Total			2%	2%	
Nominal WAN (Mbits/sec)	42	42						



Poland, Polish Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	7120	10540	Offered	2620	3180	2740	2000	10540
			% of Total	3%	1%	1%	5%	2%
Disk (Tbytes)	340	599	Offered	165	285	149		599
			% of Total	1%	1%	2%		1%
Nominal WAN (Mbits/sec)	2000	2000						

Portugal, LIP Tier-2 Federation (note 6)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6400	6400	Offered		3200	3200		6400
			% of Total		1%	2%		1%
Disk (Tbytes)	400	400	Offered		200	200		400
			% of Total		1%	2%		1%
Nominal WAN (Mbits/sec)	1000	1000						

Romania, Romanian Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	9284	12092	Offered	7256	3264		1572	12092
			% of Total	8%	1%		4%	3%
Disk (Tbytes)	576	816	Offered	570	240		6	816
			% of Total	5%	1%		30%	2%
Nominal WAN (Mbits/sec)	10000	10000						

Russian Federation, RDIG (note 7)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	24640	30000	Offered					30000
			% of Total					5%
Disk (Tbytes)	1813	2800	Offered					2800
			% of Total					6%
Nominal WAN (Mbits/sec)	2500	5000						
Tape (Tbytes)								

Slovenia, SiGNET, Jozef Stefan Inst.	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1800	5200	Offered		5200			5200
			% of Total		2%			2%
Disk (Tbytes)	200	350	Offered		350			350
			% of Total		1%			1%
Nominal WAN (Mbits/sec)	10000	10000						

Spain, ATLAS Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5396	10308	Offered		10308			10308
			% of Total		4%			4%
Disk (Tbytes)	656	1107	Offered		1107			1107
			% of Total		4%			4%
Nominal WAN (Mbits/sec)	10000	10000						

Spain, CMS Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5120	9040	Offered			9040		9040
			% of Total			5%		5%
Disk (Tbytes)	420	670	Offered			670		670
			% of Total			7%		7%
Nominal WAN (Mbits/sec)								

Spain, LHCb Federation (note 8)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2960	3420	Offered				3420	3420
			% of Total				9%	9%
Disk (Tbytes)	1	1	Offered				1	1
			% of Total				5%	5%
Nominal WAN (Mbits/sec)								

Sweden, SNIC Tier2 (Note 3)	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6000	7870	Offered	2820	5050			7870
			% of Total	3%	2%			2%
Disk (Tbytes)	430	920	Offered	400	520			920
			% of Total	3%	2%			2%
Nominal WAN (Mbits/sec)	10000	10000						

Switzerland, CHIPP, Manno	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5760	10560	Offered		3063	3907	3590	10560
			% of Total		1%	2%	9%	2%
Disk (Tbytes)	490	910	Offered		364	364	182	910
			% of Total		1%	4%	910%	3%
Nominal WAN (Mbits/sec)	10000	10000						



Taipei, Taiwan Analysis Facility Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	2320	3200	Offered		1600	1600		3200
			% of Total		1%	1%		1%
Disk (Tbytes)	250	350	Offered		175	175		350
			% of Total		1%	2%		1%
Nominal WAN (Mbits/sec)	10000	10000						

Turkey, Turkish Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5400	9800	Offered		5100	4700		9800
			% of Total		2%	2%		2%
Disk (Tbytes)	550	900	Offered		550	350		900
			% of Total		2%	4%		3%
Nominal WAN (Mbits/sec)	1000	1000						

UK, London	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6336	10551	Offered		2039	7097	1415	10551
			% of Total		1%	4%	4%	2%
Disk (Tbytes)	428	781	Offered		219	561	1	781
			% of Total		1%	6%	5%	2%
Nominal WAN (Mbits/sec)	1000	1000						

UK, NorthGrid	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4556	8309	Offered		7875		434	8309
			% of Total		3%		1%	3%
Disk (Tbytes)	501	845	Offered		845			845
			% of Total		3%			3%
Nominal WAN (Mbits/sec)	1000	1000						

UK, ScotGrid	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6340	9025	Offered		5629		3396	9025
			% of Total		2%		9%	3%
Disk (Tbytes)	360	606	Offered		604		2	606
			% of Total		2%		10%	2%
Nominal WAN (Mbits/sec)	1000	1000						

UK, SouthGrid	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6036	9258	Offered	1061	3152	3230	1815	9258
			% of Total	1%	1%	2%	5%	2%
Disk (Tbytes)	394	669	Offered	75	338	255	1	669
			% of Total	1%	1%	3%	5%	1%
Nominal WAN (Mbits/sec)	1000	1000						

Ukraine, Ukrainian Tier-2 Federation	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	1208	1440	Offered	1152		288		1440
			% of Total	1%		0%		1%
Disk (Tbytes)	78	108	Offered	43		65		108
			% of Total	0%		1%		0%
Nominal WAN (Mbits/sec)	1000	1000						

USA, Northeast ATLAS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4196	6368	Offered		6368			6368
			% of Total		3%			3%
Disk (Tbytes)	445	727	Offered		727			727
			% of Total		3%			3%
Nominal WAN (Mbits/sec)								

USA, Southwest ATLAS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	6936	7864	Offered		7864			7864
			% of Total		3%			3%
Disk (Tbytes)	328	650	Offered		650			650
			% of Total		3%			3%
Nominal WAN (Mbits/sec)								

USA, Midwest ATLAS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	3912	5048	Offered		5048			5048
			% of Total		2%			2%
Disk (Tbytes)	358	580	Offered		580			580
			% of Total		2%			2%
Nominal WAN (Mbits/sec)								



USA, Great Lakes ATLAS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	5624	6680	Offered		6680			6680
			% of Total		3%			3%
Disk (Tbytes)	542	709	Offered		709			709
			% of Total		3%			3%
Nominal WAN (Mbits/sec)								

USA, SLAC ATLAS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4808	4764	Offered		4764			4764
			% of Total		2%			2%
Disk (Tbytes)	413	619	Offered		619			619
			% of Total		2%			2%
Nominal WAN (Mbits/sec)								

USA, Caltech CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, Florida CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, MIT CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, Nebraska CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, Purdue CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, UC San Diego CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						

USA, U. Wisconsin CMS T2	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	4400	7760	Offered			7760		7760
			% of Total			4%		4%
Disk (Tbytes)	360	570	Offered			570		570
			% of Total			6%		6%
Nominal WAN (Mbits/sec)	10000	10000						



Summary Tier2s with Split in 2010	2009	2010	Split 2010	ALICE	ATLAS	CMS	LHCb	SUM 2010
CPU (HEP-SPEC06)	308524	494221	Offered	50562	180106	186448	47105	494221
			Required	89600	240000	195000	38000	562600
			Balance	-44%	-25%	-4%	24%	-12%
Disk (Tbytes)	22647	36269	Offered	3484	17038	12646	301	36269
			Required	12600	24800	9200	20	46620
			Balance	-72%	-31%	37%	1404%	-22%
Tape (Tbytes)								

Requirements 2010	ALICE	ATLAS	CMS	LHCb	SUM
CPU (HEP-SPEC06)	89600	240000	195000	38000	562600
Disk (Tbytes)	12600	24800	9200	20	46620
Number of T2s	17	39	34	15	

TIER 2 Notes

- Note 1:** 2009 CPU pledge not reached due to LHC delay. 2010 pledge must be considered as indicative and will evolve with the first CMS data-handling experience.
- Note 2:** Could not start CPU or Disk installations due to bureaucratic and import delays. Pledges have dropped back by one year.
- Note 3:** 2010 numbers are preliminary and not yet approved by the National Funding Agencies as of 30/09/09
- Note 4:** Pledges for FR-CCIN2P3 are not definitive. To be confirmed mid-October 2009. 2010 split based on 2009 allocation.
- Note 5:** The availability of Munich ATLAS Tier2 2010 resources follow the time profile for ATLAS installation.
- Note 6:** 2009-2010 data originally published was never confirmed - data was indicative for RRB reasons but never intended to be taken as confirmed pledges. This data is confirmed.
- Note 7:** Experiment splits in 2010 for RDIG are to be confirmed early December 2009.
- Note 8:** 2010 CPU may increase following confirmation of requirements of LHCb by the Scrutiny Group