

1. Introduction

The following report summarises the current signature status of the WLCG Memorandum of Understanding (MoU), WLCG funding and expenditure estimates at CERN up to 2012, resource accounting for Tier-1 and Tier-2 sites, draws conclusions from the revision of the computing pledge exercise in Autumn 2007, and summarises the current computing requirements and pledges. Complementary information can be found on the [LCG Project Planning](#) website.

2. WLCG Memorandum of Understanding Signature Status

Since the Autumn 2007 Computing Resources Review Board Meeting (C-RRB), 9 Funding Agencies have signed the WLCG MoU. Signatures were obtained from Finland, Norway and Sweden for their participation in the Nordic Data Grid Facility (NDGF) therefore all 11 Tier-1 Federations have now signed.

For the Tier-2 Centres and Federations of Centres that together constitute a Tier-2 Centre, signatures have been received from

- Finland for the HIP Tier-2 Federation supporting CMS
- Germany for the German Ludwig Maximilian Universität (LMU) and Freiburg (ALU) both supporting ATLAS
- Norway for the UNINETT Sigma Tier-2 Federation supporting ATLAS
- Sweden for the SNIC Tier-2 Federation supporting ALICE and ATLAS
- Estonia for the NICPB, Tallinn Tier-2 Federation supporting CMS
- Hungary for the HGCC Federation supporting ALICE and CMS
- Republic of Korea for the KISTI, Daejeon Federation supporting ALICE
- Turkey for the Turkish Tier-2 Federation supporting ATLAS and CMS

It should be noted that there is consideration for the extension of the Korean Federation to support CMS however this is not yet finally agreed or signed. Still pending at the time of writing this report are signatures from Austria which is waiting on approval from their Finance Ministry, and the Czech Republic which is under discussion with the Czech Ministry.

Table 1 summarises the current signature status and Table 2 shows the 3 Tier-2 Centres planning to join WLCG, namely Brazil, Canada East and Canada West.

	Country	Funding Agency/Signatory	Signature status	Comments
Member States	Austria	bm:bwk	N	Waiting Finance Ministry approval (05/03/08)
	Belgium	FNRS	Y	
	Belgium	FWO	Y	
	Czech Rep.	MSMT CR	N	To be discussed with the Czech Ministry (06/03/08)
	Denmark	National Science Research Council	Y	
	Finland	HIP	Y	Signed since last C-RRB
	France	CEA/DSM/DAPNIA	Y	
	France	CNRS/IN2P3	Y	
	Germany	ALU/DESY	Y	Signed since last C-RRB
	Germany	BUW/DESY	Y	
	Germany	DESY	Y	
	Germany	FZK	Y	
	Germany	GSI	Y	
	Germany	MPG	Y	
	Germany	LMU	Y	Signed since last C-RRB
	Germany	RWTH/DESY	Y	
	Italy	INFN	Y	
	The Netherlands	NIKHEF	Y	
	Norway	Research Council of Norway	Y	Signed since last C-RRB
	Poland	The Minister of Science & Education	Y	
	Portugal	GRICES/FCT/UMIC	Y	
	Spain	MEC	Y	
	Sweden	Swedish Research Council	Y	Signed since last C-RRB
Switzerland	SER/SNF/ETH/CSCS	Y		
United Kingdom	STFC	Y		
Non-Member States	Australia	AusHEP	Y	
	Canada	CFI	Y	
	China	MoST/NSFC	Y	
	Estonia	NICPB	Y	Signed since last C-RRB
	Hungary	NKTH	Y	Signed since last C-RRB
	India	DAE	Y	
	Israel	ICHEP	Y	
	Japan	Univ. Tokyo	Y	
	JINR, Dubna	JINR	Y	
	Korea *	KICOS	Y	Signed since last C-RRB
	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	Signed since last C-RRB
	Ukraine	National Academy of Sciences	Y	
USA	DOE	Y		
USA	NSF	Y		

* Korean T2 Federation extension supporting CMS currently under consideration

Table 1: Signature Status of WLCG Memorandum of Understanding

Institution	Experiments served with priority			
	ALICE	ATLAS	CMS	LHCb
Brazil, Brazilian Tier-2 Federation - CBPF - UERJ - UFRJ - UNESP	X	X	X	X
Canada, Canada East Tier-2 Federation		X		
Canada, Canada West Tier-2 Federation		X		

Table 2: Planned Additional Tier-2 Centres or Federations

In summary progress has continued, all Tier-1 MoU signatures and most of the Tier-2 signatures are now obtained, however urgent follow-up is required with Austria, Czech Republic¹, Brazil, Canada East and Canada West².

3. Funding and Expenditure for WLCG at CERN

The cost and funding estimates for LCG Phase 2 at CERN covering the years 2005-2008 are shown in Table 3. As stated in previous reports to the C-RRB, the personnel planning to complete LCG Phase 2 and continue in the next phase of the project relies on the successor to the EGEE2 project, namely EGEE3, to fund an estimated 14 Full Time Equivalent (FTE) collaborators to GRID deployment activities. This funding is now secured following the recent approval of the EGEE3 project. EGEE2 was extended by 1 month to end April 2008 and EGEE3 will run from May 2008 to April 2010.

With respect to the figures presented in the last report to the C-RRB for 2007, the financial year is now formally closed. The result for WLCG for personnel was slightly less expenditure than foreseen due to the move of some personnel from CERN funding to EGEE2 funding. Material expenditure increased with respect to the predicted expenditure due to the procurement at the end of 2007 of some material foreseen for 2008.

The estimated balance at the end of Phase 2 is 1.3 MCHF to be carried over to the next phase of the project covering the years 2009-2012. The current funding, contributions and estimated expenditure predicts an overall balance at the end of 2012 of 0.6 MCHF. This includes expenditure for the adaptation of the CERN infrastructure to cope with the increased power and cooling requirements necessary for the expected data from the experiments.

¹ At the time of writing this document it is expected that the Czech Republic will sign the MoU on the 15/04/07.

² At the time of writing this document it is expected that Canada East and Canada West will have signed the MoU before the C-RRB meeting.

LCG Phase 2 at 29/02/08

(in MCHF)

	2005	2006	2007	2008	TOTAL
Funding					
From CERN Budget					
<u>Personnel</u>	1.5	16.5	17.1	17.9	53.0
- <i>Physics Computing</i>		11.6	12.0	13.2	36.8
- IT		8.4	8.8	9.7	26.9
- PH		3.3	3.2	3.5	9.9
- <i>LCG Project</i>	1.5	4.9	5.1	4.7	16.2
- IT	1.2	3.6	3.9	3.6	12.3
- PH	0.3	1.2	1.2	1.1	3.9
<u>Materials</u>	1.8	21.3	18.6	26.6	68.2
- <i>Physics Operations</i>		5.0	5.1	5.0	15.1
- IT		4.5	4.6	4.5	13.7
- PH		0.5	0.5	0.4	1.4
- <i>Tier 0 and CERN Analysis Facility</i>	1.8	16.3	13.5	21.6	53.1
Contributions via Team Accounts*					
- Personnel		2.0	2.2	1.5	5.7
- Material			0.0	1.0	1.1
In-kind Contributions*					
- Personnel		1.4	1.7	1.0	4.1
Total					
- Personnel	1.5	19.8	21.1	20.4	62.9
- Materials	1.8	21.3	18.6	27.6	69.3
Total Funding	3.3	41.1	39.7	48.0	132.2
Expenditure					
- <u>Personnel</u> **	1.5	19.8	21.1	20.1	62.5
- <u>Materials</u>	1.8	21.3	18.6	26.7	68.4
- <i>Physics Operations</i>		5.0	5.1	5.0	15.1
- <i>Tier 0 and CERN Analysis Facility</i>	1.8	16.3	13.5	21.8	53.3
Total Planned Expenditure	3.3	41.1	39.7	46.8	130.9
Balance Personnel	0.0	0.0	0.0	0.4	0.4
Balance Materials	0.0	0.0	0.0	0.9	0.9
Balance	0.0	0.0	0.0	1.3	1.3

* As pledged and planned to be pledged in the WLCG MoU (Annex 6.6).

** - Personnel from EGEE, EGEE-II and EGEE-III will participate 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 3: Cost and funding estimates for LCG Phase 2

LHC Future Computing Funding and Expenditure Estimates

(all figures in MCHF at 29/02/2008)

	2009	2010	2011	2012	TOTAL
Funding					
From CERN Budget					
- Personnel	12.1	13.8	13.8	13.8	53.5
- Materials	22.5	22.5	22.5	22.5	90.1
- Carry-over from Phase 2					
- Personnel	0.4				0.4
- Materials	0.0				0.0
Contributions via Team Accounts*					
- Personnel	1.5	0.7	0.1		2.3
- Carry-over from Phase 2 Materials	0.9				0.9
In-kind Contributions*					
- Personnel	1.1	1.1			2.2
Total					
- Personnel	15.1	15.6	13.9	13.8	58.4
- Materials	23.4	22.5	22.5	22.5	91.0
Total Funding	38.5	38.1	36.4	36.3	149.3
Expenditure					
- Personnel **	15.6	15.7	14.2	13.4	58.9
- Materials	23.0	21.5	23.4	22.1	89.9
Total Planned Expenditure	38.5	37.2	37.6	35.5	148.8
Balance Personnel	-0.5	-0.1	-0.3	0.4	-0.5
Balance Materials	0.5	1.1	-0.9	0.4	1.1
Balance	0.0	1.0	-1.2	0.8	0.6

* 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.

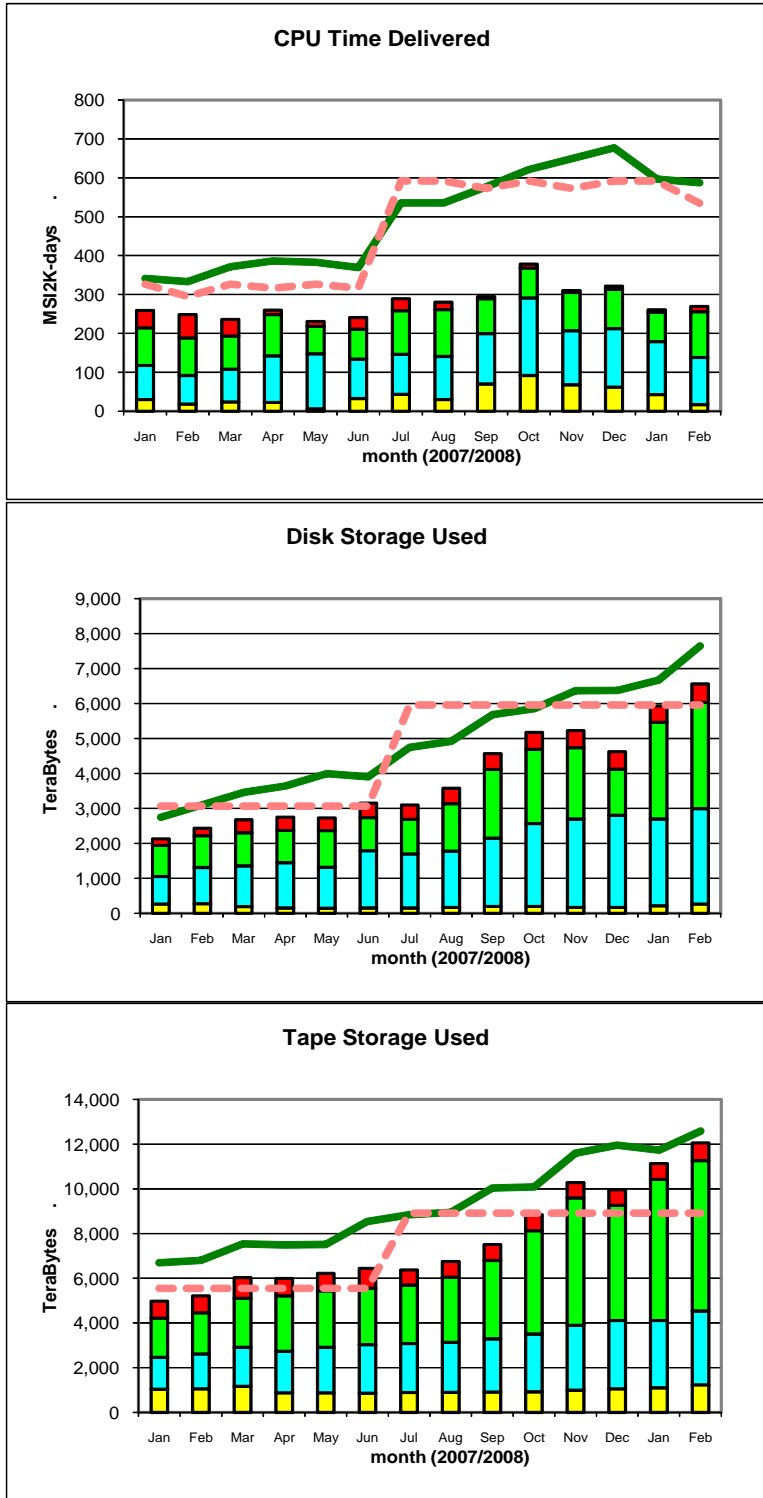
Table 4: LHC Computing Budget Estimates for 2009-2012

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 three C-RRB meetings, and full accounting reports covering 2006 and 2007 and the first months of 2008 are available on the LCG website in the Resources section of the Project Planning page.

Figure1 shows the evolution of CPU, disk and tape usage at CERN and Tier-1 sites for the period January 2007-February 2008. With respect to the data shown at the last C-RRB, the installed capacity has evolved and even surpassed the MoU pledge values. It should be noted however that the MoU pledge values will change from April 2008 onwards and will increase significantly for CPU, disk and tape. Monthly reporting will continue to closely monitor the situation and when necessary it will be assessed and discussed at the WLCG Management Board where all Tier-1 sites are present.



ALICE ■ ATLAS ■ LHCb ■ CMS ■
 installed capacity (inc. efficiency factor) —
 MoU commitment (inc. efficiency factor) - - -

Figure 1: Accounting for CERN and External Tier-1s January 2007-February 2008

4.2 Tier-2 Accounting

Tier-2 accounting began in September 2007 following an information campaign and some test reporting during the summer of 2007. Currently 52 of the 57 Tier-2 Federations are reporting accounting data over a total of 107 sites. In some Federations sites are being added, removed or renamed so the situation is not yet fully stable, however there is mainly positive evolution on a monthly basis since reporting began. Figure 2 shows the situation in the various countries for the first 6-month period from September 2007 to February 2008.

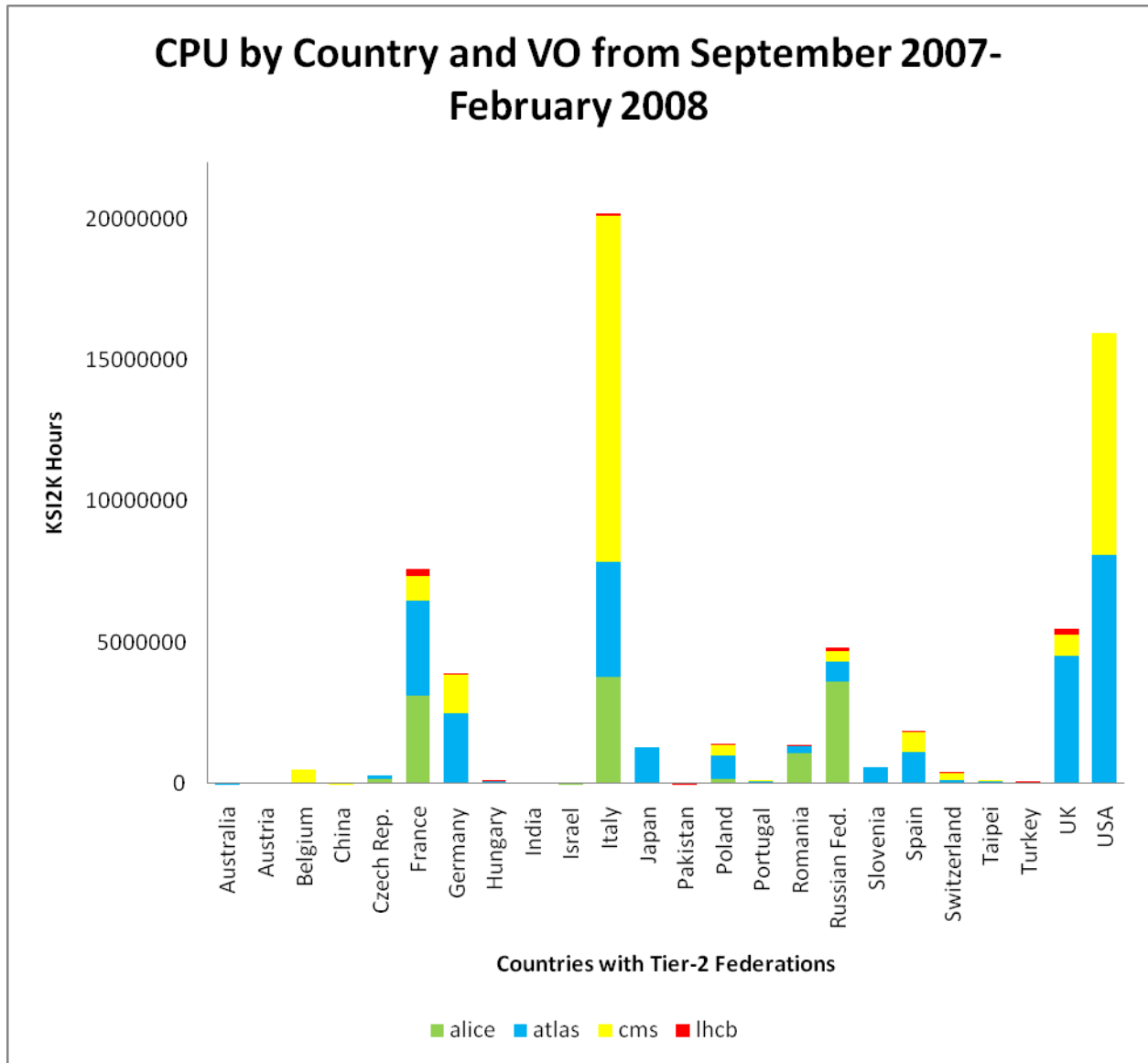


Figure 2: Accounting for Tier-2s September 2007-February 2008

The comparison of the MoU pledge and average CPU provided over the first 6 month period has been split. Figure 3 shows the 10 Federations with MoU pledge values higher than 600 KSI2K. Figure 4 shows all the others, in both cases ordered by pledge value.

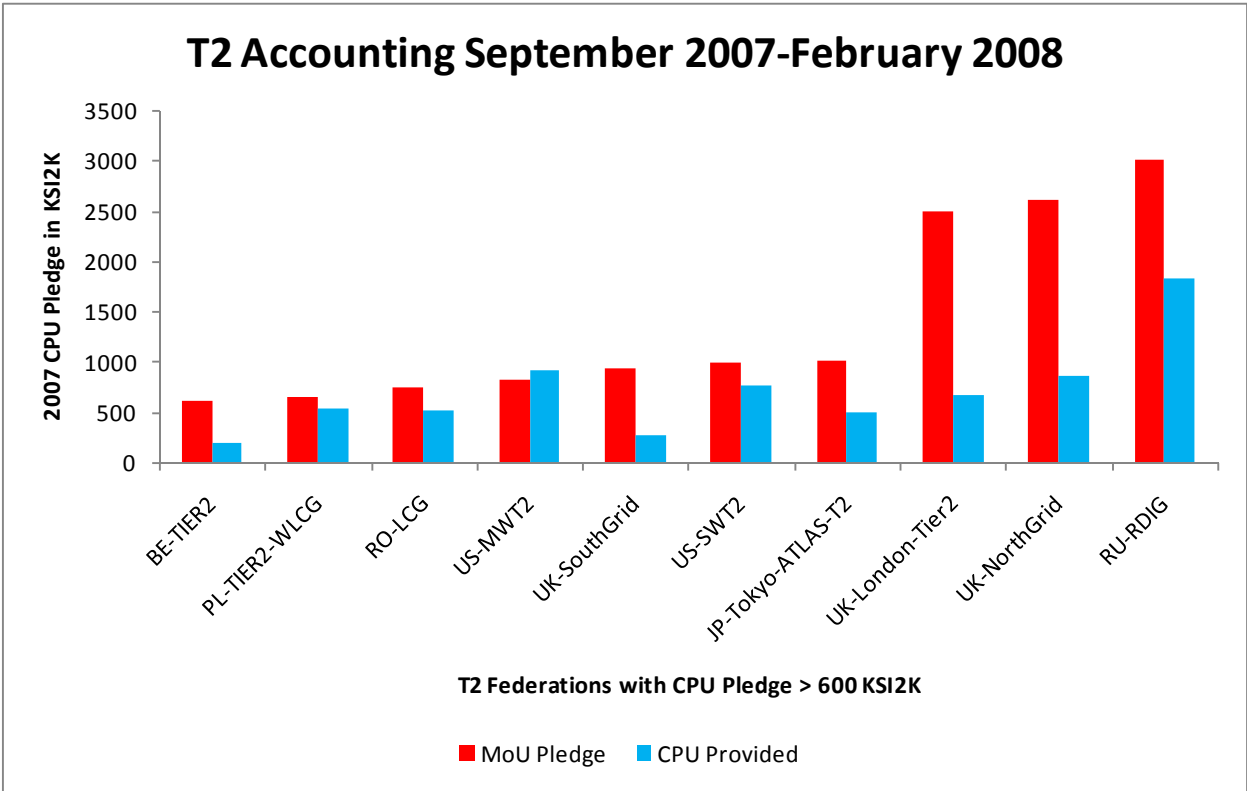


Figure 3: Accounting for Federations with CPU Pledge > 600 KSI2K from September 2007-February 2008

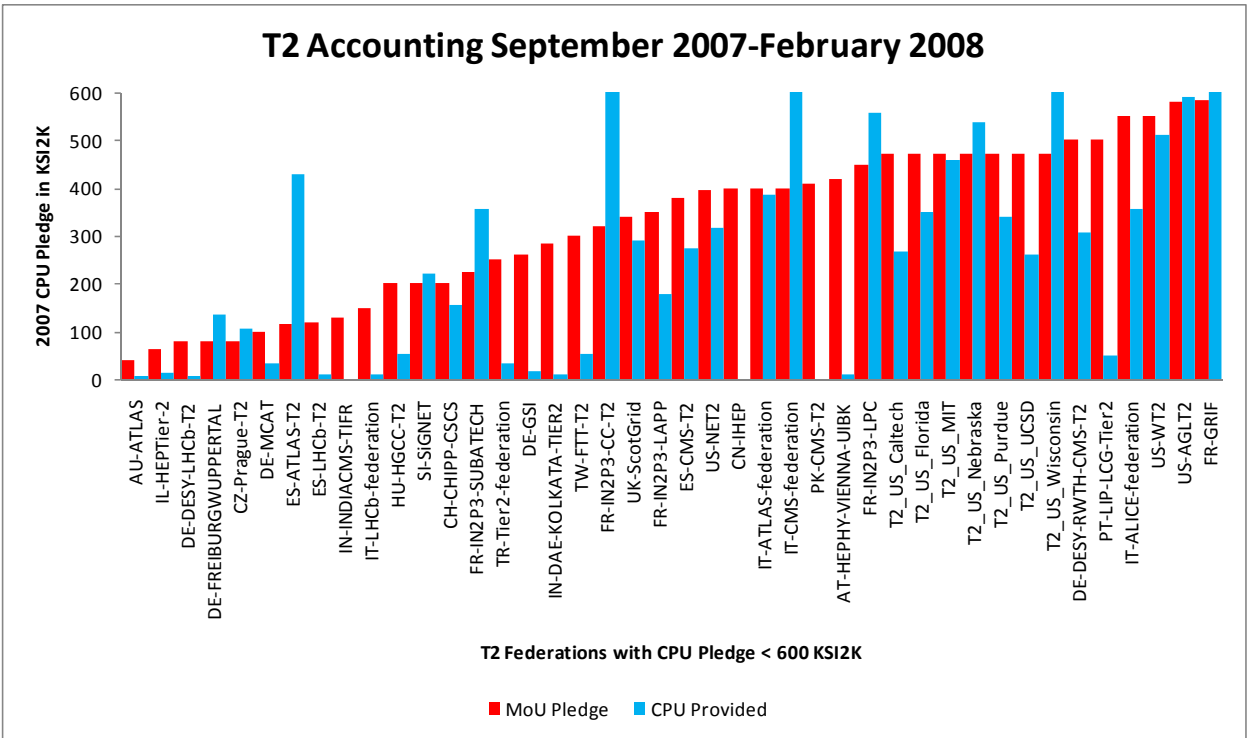


Figure 4: Accounting for Federations with CPU Pledge < 600 KSI2K from September 2007-February 2008

The following Federations have not yet started to report: Finland (FI-HIP-T2), India (IN-INDIACMS-TIFR), Norway (NO-NORDGRID-T2), Sweden (SE-SNIC-T2) and Ukraine (UA-T2-Federation). Follow-up is on-going with these Federations to ensure they begin to report accounting data as soon as possible.

5. Revised Computing Requirements and Pledges

At the time of the last C-RRB meeting, a campaign was ongoing to revise the pledge data for the years 2008-2012 inclusive with respect to the revised requirements from the experiments for the same years. This campaign took longer than anticipated and in some cases no information was received despite repeated reminders. It is essential that all WLCG collaborators understand the importance of this exercise and the timescales involved as it takes place on an annual basis in accordance with the terms of the WLCG MoU.

From some of the questions and comments received it was felt necessary to redefine the process, timescale and expectations to ensure that by Autumn 2008 there are fewer (or preferably no) surprises with respect to the last exercise. Annex 1 summarises what is expected from each Federation with the main points listed below:

- Autumn C-RRB meeting: firm commitment to pledge values for the following year and planned pledge values for the subsequent 4 years (exercise run in Autumn 2007 for pledges for 2008 and 2009-2012 and will continue each year for the equivalent future period).
- Spring C-RRB: confirmation that pledge values are installed and running a production service since 1st April of the same year or eventually explanation of any change. This is expected at the C-RRB meeting of 15/04/08 and all subsequent Spring C-RRB meetings.
- Every Federation is expected to provide by the latest 2 weeks before the Autumn C-RRB meeting their confirmed pledge values for the next year and their planned pledge values for the subsequent 4 years. The Autumn C-RRB meeting will take place on 11/11/08, therefore by 27/10/08 all Federations must have provided their confirmed pledge values for 2009 and planned values for 2010-2013.
- In this forward planning process, pledge values for the next year cannot be reduced however those for the subsequent 4 years can be revised if necessary.

Table 5 shows the latest status of the resources for 2008, including a split across the experiments, for CERN, Tier-1 and Tier 2 sites. Table 6 shows the resources for 2009-2012 summed over all experiments for the External Tier-1 and Tier-2 sites. This result includes pledge values for those federations having joined the WLCG collaboration, and any revisions communicated since the last meeting including a reduction of 2008 pledge values signalled after the Autumn C-RRB meeting. It is precisely this situation which must be avoided in future as outlined above and in Annex 1 in the interest of the overall planning of the project.

CERN Tier0						
	Split 2008	ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU (kSI2K)	Offered	1800	3710	5300	360	11170
	Required	1800	3705	5300	360	11165
	% of Req.	100%	100%	100%	100%	100%
Disk (Tbytes)	Offered	1600	153	400	270	2423
	Required	1600	152	400	270	2422
	% of Req.	100%	101%	100%	100%	100%
Tape (Tbytes)	Offered	3300	2450	4400	630	10780
	Required	3300	2449	4400	630	10779
	% of Req.	100%	100%	100%	100%	100%
CERN Analysis Facility						
	Split 2008	ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU (kSI2K)	Offered	500	2080	2100	0	4680
	Required	500	2081	2100	0	4681
	% of Req.	100%	100%	100%	100%	100%
Disk (Tbytes)	Offered	100	1146	1800	80	3126
	Required	100	1146	1800	80	3126
	% of Req.	100%	100%	100%	100%	100%
Tape (Tbytes)	Offered	0	370	900	0	1270
	Required	0	370	900	0	1270
	% of Req.	100%	100%	100%	100%	100%
Summary Tier-1 Sites						
	Split 2008	ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU (kSI2K)	Offered	5541	19195	10291	2536	37563
	Required	10100	18120	9600	1770	39590
	Balance	-45%	6%	7%	43%	-5%
Disk (Tbytes)	Offered	2395	10913	5546	1367	20221
	Required	4000	10730	7200	1025	22955
	Balance	-40%	2%	-23%	33%	-12%
Tape (Tbytes)	Offered	2983	7692	9429	1194	21298
	Required	5800	8070	9800	860	24530
	Balance	-49%	-5%	-4%	39%	-13%
Summary Tier-2 Sites						
	Split 2008	ALICE	ATLAS	CMS	LHCb	SUM 2008
CPU (kSI2K)	Offered	6693	17528	17042	4223	46336
	Required	12500	17510	13400	4550	47960
	Balance	-46%	0%	27%	-7%	-3%
Disk (Tbytes)	Offered	1363	6300	4309	139	12421
	Required	1700	7770	5100	9	14579
	Balance	-20%	-19%	-16%	1443%	-15%

Table 5: 2008 Computing Requirements and Pledges – status on 26/03/08

External Tier-1 Sites		SUM 2008	SUM 2009	SUM 2010	SUM 2011	SUM 2012
CPU (kSI2K)	Offered	37563	61692	101737	126523	146130
	Required	39590	69600	114720	152230	191810
	Balance	-5%	-11%	-11%	-17%	-24%
Disk (Tbytes)	Offered	20221	35222	60008	79875	93821
	Required	22955	40179	71000	96791	123892
	Balance	-12%	-12%	-15%	-17%	-24%
Tape (Tbytes)	Offered	21298	40329	65438	88837	108775
	Required	24530	46260	78664	114610	152396
	Balance	-13%	-13%	-17%	-22%	-29%
Tier-2 Sites		SUM 2008	SUM 2009	SUM 2010	SUM 2011	SUM 2012
CPU (kSI2K)	Offered	46336	69452	108588	137600	156110
	Required	47960	80750	164540	218720	275010
	Balance	-3%	-14%	-34%	-37%	-43%
Disk (Tbytes)	Offered	12421	22188	33937	42770	48758
	Required	14579	23023	34243	47903	61963
	Balance	-15%	-4%	-1%	-11%	-21%

Table 6: 2008-2012 Computing Requirements and Pledges – status on 26/03/08

With respect to the status on 10/10/07 presented at the last C-RRB meeting, the 2008 situation has globally worsened for CPU, Disk and Tape at the Tier-1s and CPU at the Tier-2s. From 2009-2012 while there is still an increasing shortfall, the situation has slightly improved with respect to the status on 10/10/07.

Following the next pledge revision exercise the situation will be reviewed again at the Autumn C-RRB meeting. It should also be noted that the newly-formed Resource Scrutiny Group which has met in December 2007 and March 2008 will be looking in detail at the experiment resource requests with respect to the revised pledges, and will report conclusions at future C-RRB meetings.

6. Conclusion

The MoU signatures are now well advanced with just a couple of Tier-2 Federations (Austria, Brazil) still needing follow-up.

The WLCG Funding and Expenditure situation up to and including 2012 as laid out in Tables 3 and 4 illustrate that globally the project will not run into major financial difficulties, however this should continue to be monitored and reviewed frequently.

Tier-1 and Tier-2 accounting over the past months shows that there has been mainly a positive evolution, however the 2008 pledge values will be used from April onwards for accounting

reporting and sites should work towards reaching them as soon as possible. The Tier-2 Federations not yet reporting must start to do so to enable a more complete picture of Tier-2 accounting to be presented at the next C-RRB meeting.

The Computing requirements and pledge data for 2008-2012 inclusive still shows significant shortfall. The pledge revision exercise and the result which will be reviewed in the Autumn C-RRB will hopefully show a different and better perspective. All Federations must ensure that by the Autumn C-RRB meeting they are in a position to commit to their revised 2009 pledge values, and provide revised planned pledge values for 2009-2013 inclusive.

Computing Resource Pledge Responsibilities

Introduction

As the Worldwide LHC Computing Grid (WLCG) Project moves towards a new phase, the Project Management would like to take this opportunity to remind participating Institutions of their responsibilities with respect to Computing Resource pledges.

Background

Participating Institutions have either signed or are preparing to sign the WLCG Memorandum of Understanding (MoU). The MoU document can be found on the LCG web at <http://lcg.web.cern.ch/LCG/C-RRB/MoU/WLCGMoU.pdf> and is updated regularly to reflect the latest pledge data available.

The Computing Resources Review Board (C-RRB) meets in Spring and Autumn with an obligation to commit and confirm computing resource pledges. Dates of the C-RRB meetings can be found at <http://lcg.web.cern.ch/LCG/Boards/crrb.html> including all associated documentation.

Autumn C-RRB

At the Autumn C-RRB, Funding Agency representatives must commit to pledge values for the following year for CPU, Disk, Tape and Network for the Tier-1 and/or Tier-2 Centers they are representing. This commitment implies that all resources pledged will be installed and running in production mode by the latest on 1st April of the following year. Planned CPU, Disk, Tape and Network pledge values for the next 4 years must also be provided.

Procedure

All pledge information including updates, new values or confirmation that values have not changed, must be sent by email to lcg.office@cern.ch 2 weeks before the Autumn C-RRB meeting at the latest. This will enable all data to be assembled for presentation at the meeting. Email input by this deadline should be respected for all participating countries, irrespective of whether or not they will be represented at the meeting.

As each country has a different procedure and timescale for deciding on allocations to experiments and requesting and obtaining funding, representatives are asked to respect the Autumn C-RRB minus 2 weeks deadlines and therefore organize the timing of the necessary steps to enable pledge values to be approved internally and provided accordingly.

Spring C-RRB

At the Spring C-RRB meeting, Funding Agency representatives must confirm that the full pledge values for the year are effectively installed and running in production. If this is not the case all changes for the year, and/or any changes to the plans for the subsequent years, must be signaled and explained.

Aim

The information in this note is complementary to the WLCG MoU. Clarification was felt necessary to improve the communication flow and the overall resource planning of the project. The WLCG project is one of shared responsibility where all participating Institutions must collaborate and communicate regularly in the collective interest of all involved, and for the overall efficiency of the project.