



# WLCG Status Report

16<sup>th</sup> February 2009  
LHCC Mini Review

Ian Bird  
LCG Project Leader





# Worldwide LCG Organisation

**LHC Committee – LHCC**  
*Scientific Review*

**Computing Resources  
Review Board – C-RRB**  
*Funding Agencies*

**Collaboration Board – CB**  
*Experiments and Regional Centres*

Resource Scrutiny  
Group – C-RSG

ARDA and 3-D projects  
now formally ended;  
- Services and results  
are part of production  
system

**Overview Board - OB**

**Management Board**  
*Management of the Project*

**Architects Forum**  
*Coordination of  
Common Applications*

**Grid Deployment Board**  
*Coordination of  
Grid Operations*

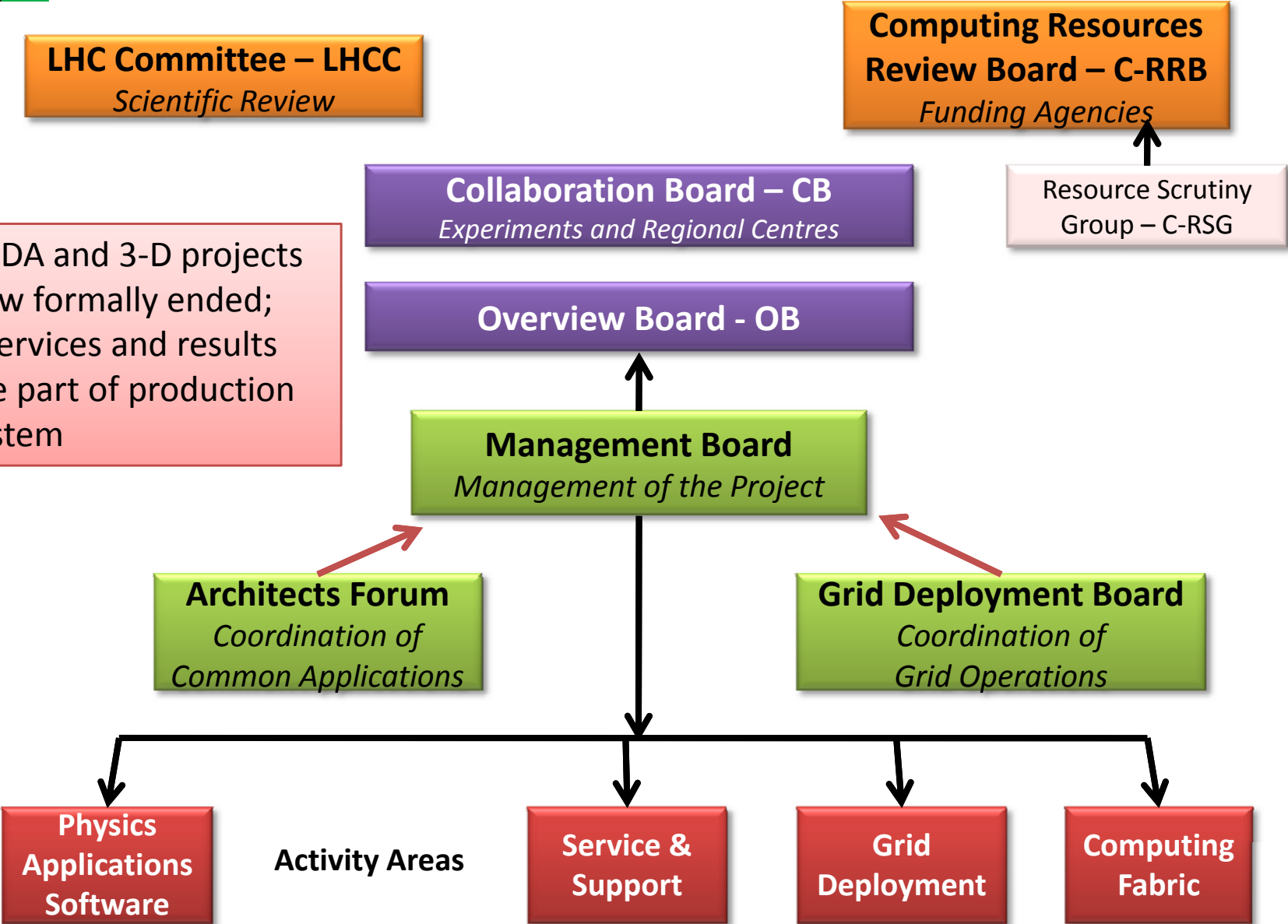
**Physics  
Applications  
Software**

**Activity Areas**

**Service &  
Support**

**Grid  
Deployment**

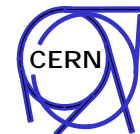
**Computing  
Fabric**



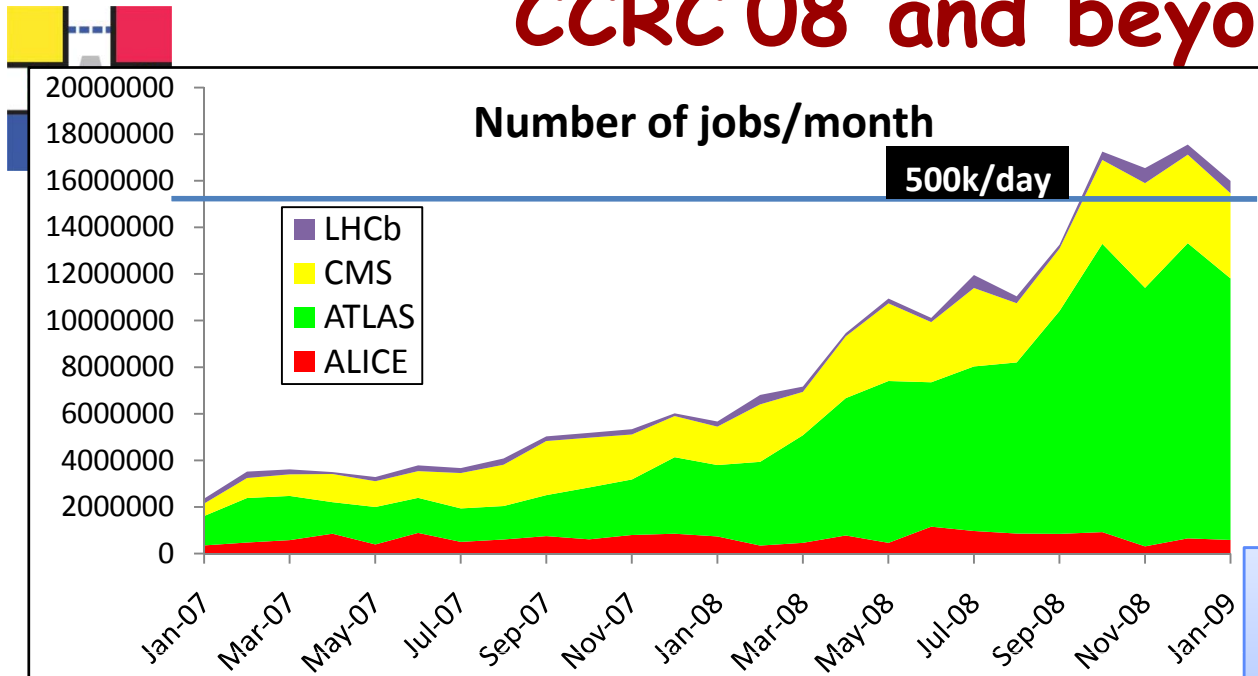


# WLCG MoU Signature Status (Nov C-RRB)

- Since the April 2008 C-RRB the Czech Republic has signed the WLCG MoU as a Tier-2 supporting ALICE and ATLAS
- All Tier-1s have now signed
- All of the Tier-2s have signed except Austria
  - Signature expected before mid November 2008 (done)
- A new MoU will be signed on 11/11/08 with Korea as a Tier-2 supporting CMS (done)
- Brazil is still planning to sign the MoU as a Tier-2 supporting all 4 experiments
  - Letter sent by J. Engelen in June 2008
  - WLCG MoU wording and future commitment being examined by their legal experts

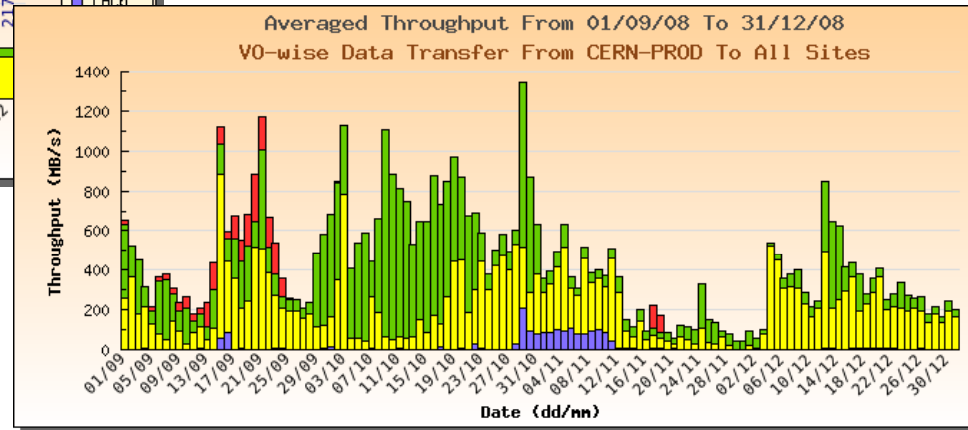
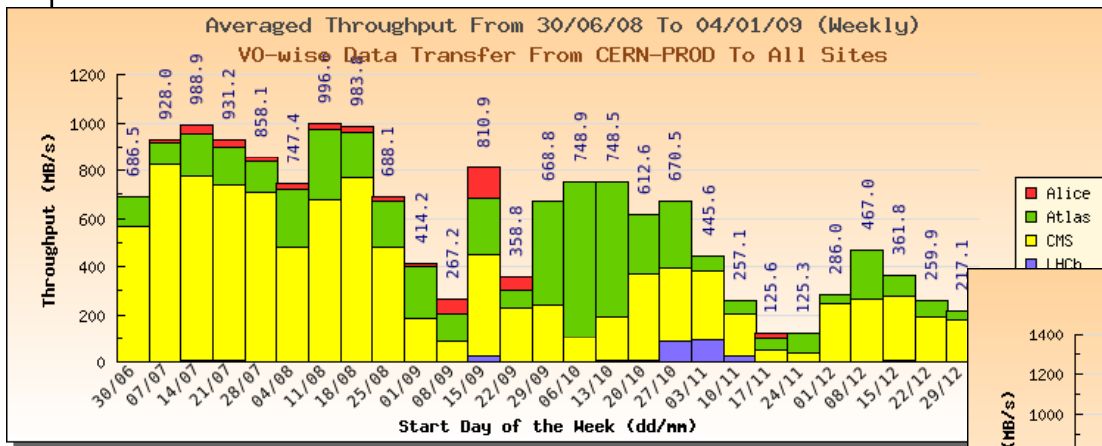


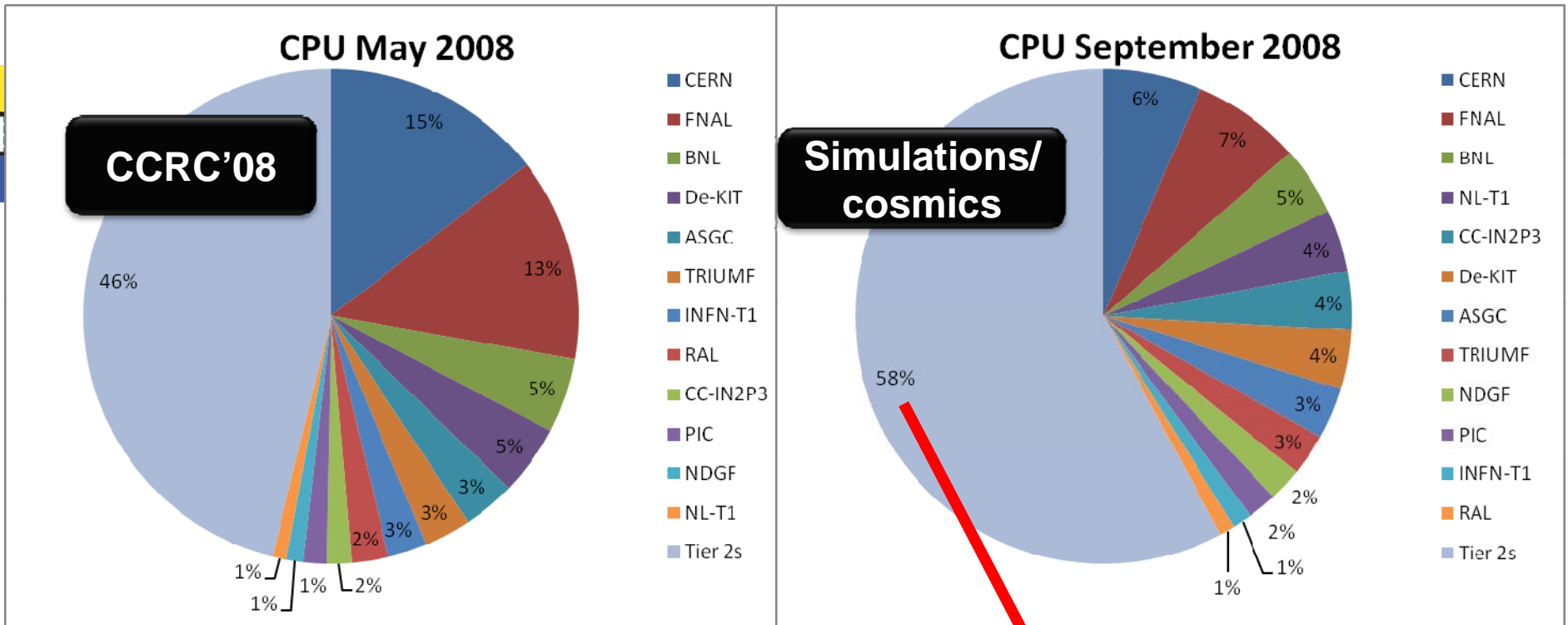
# CCRC'08 and beyond



Main outstanding issues related to service reliability.

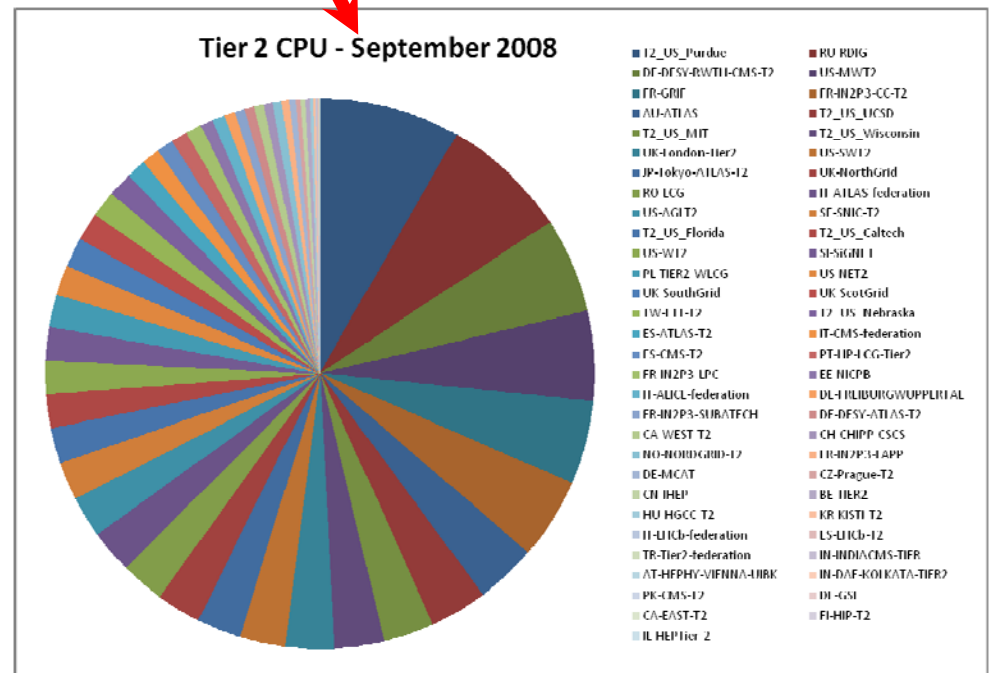
See details in following talks





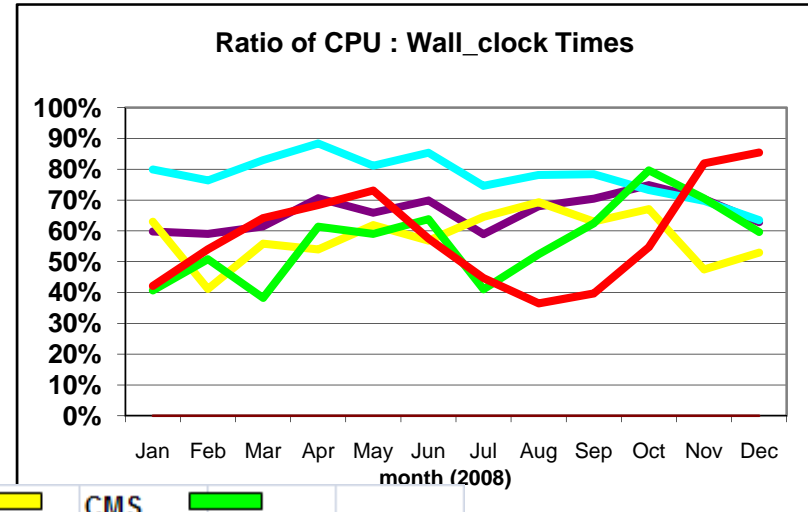
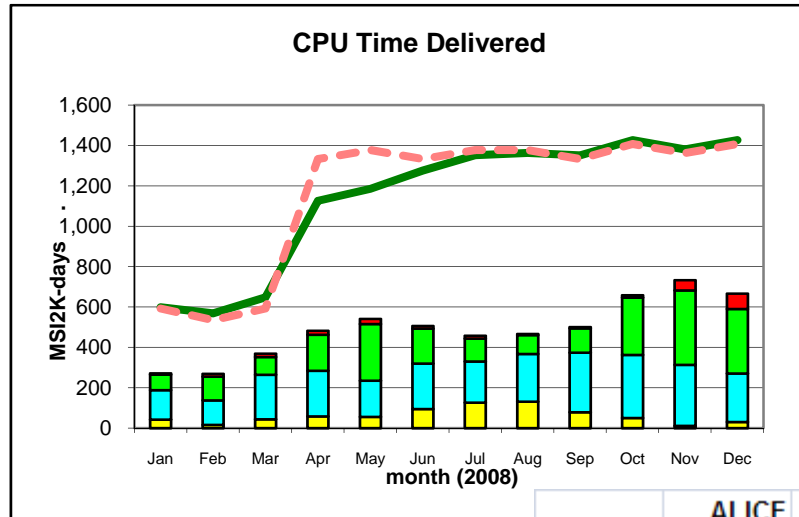
# Usage Patterns

- Can change significantly e.g. between CCRC'08 in May and cosmics/simulations in September
- Tier 2s consistently deliver ~50% of total

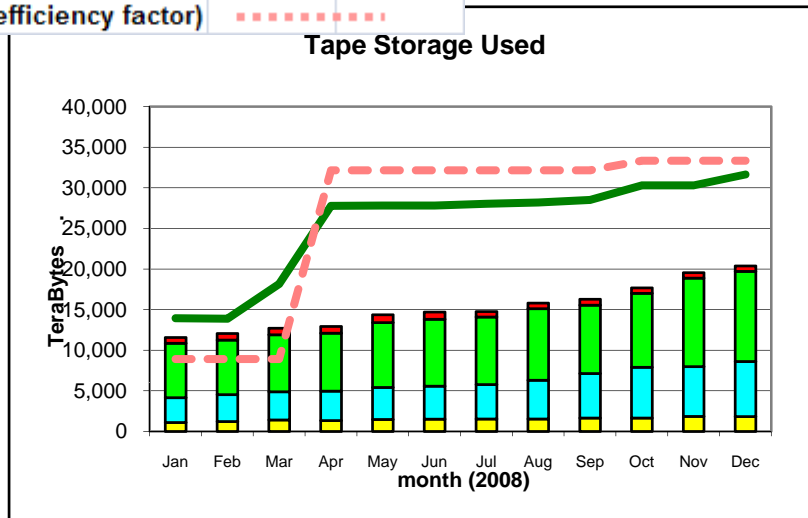
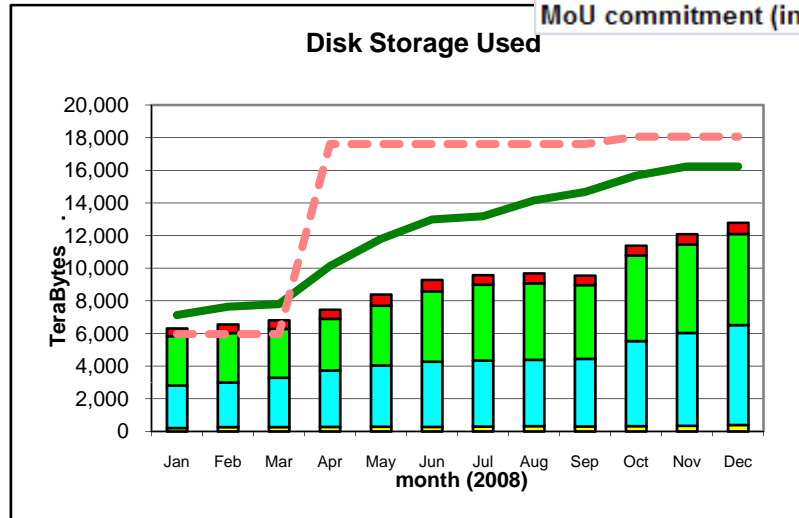




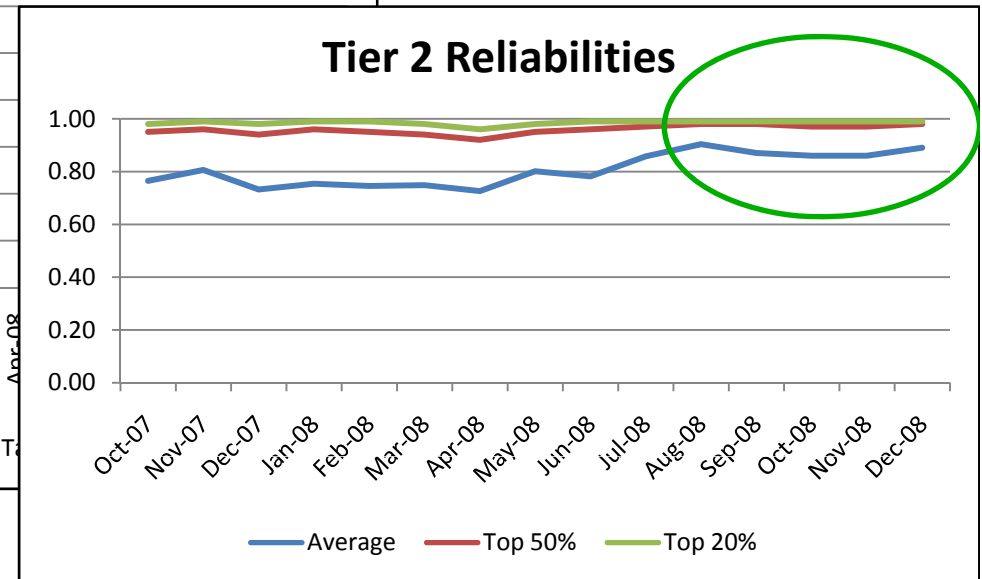
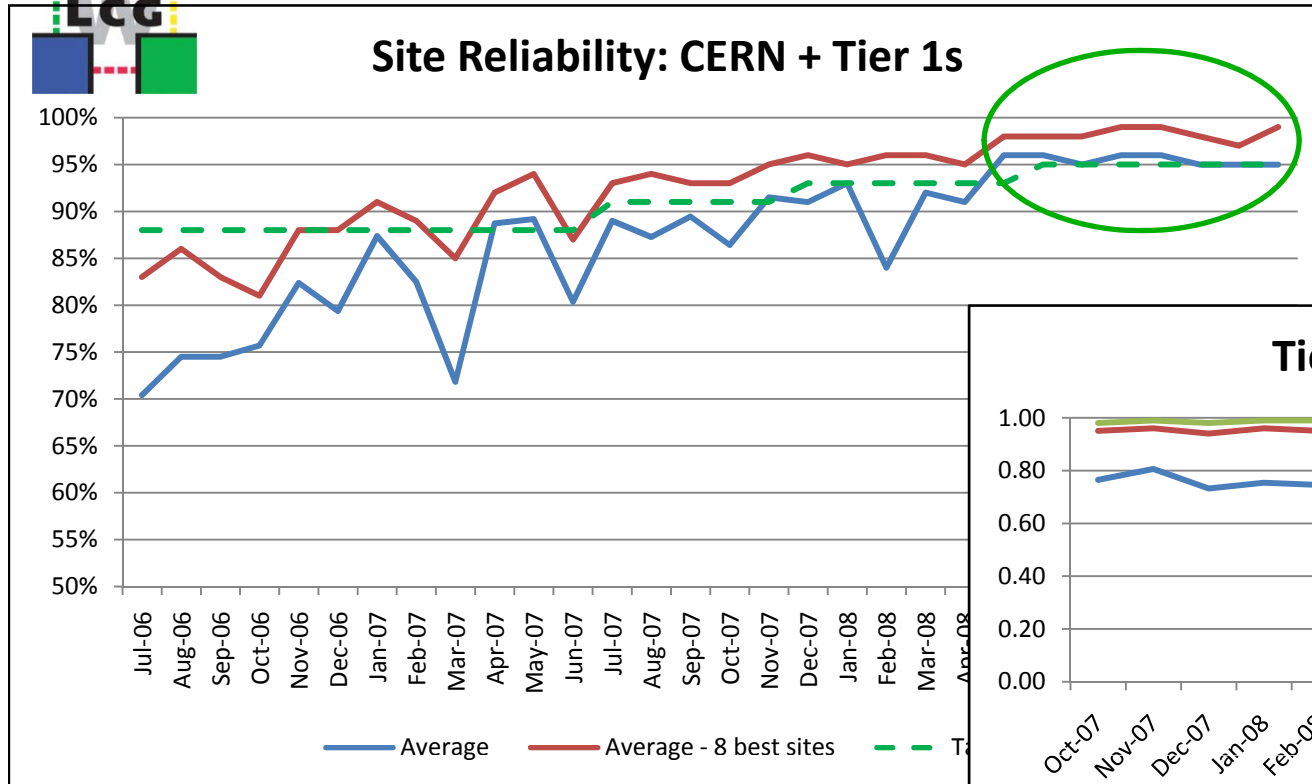
# CERN + Tier 1 accounting - 2008



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



# Reliabilities



Improvement during CCRC and later is encouraging

- Tests do not show full picture – e.g. Hide experiment-specific issues,
- “OR” of service instances probably too simplistic

- publish VO-specific tests regularly;
- rethink algorithm for combining service instances



## Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability

December 2008

# Tier 2 reliabilities

Critical SAM Tests - <http://sam-docs.web.cern.ch/sam-docs/docs/htmldocs/MANUserManual/node22.html>  
Availability = % of successful tests  
Reliability = Availability / Scheduled Availability  
Reliab

| Colour  | Federation        | Site                   | CPU Count | Reli-ability | Avail-ability | Reliability History |        |        |
|---|-------------------|------------------------|-----------|--------------|---------------|---------------------|--------|--------|
|   |                   |                        |           |              |               | Sep-08              | Oct-08 | Nov-08 |
| <b>AT-HEPHY-VIENNA-UIBK ( Austria, Austrian Tier-2 Federation )</b> |                   |                        |           |              |               |                     |        |        |
| T2_U  |                   | HEPHY-UIBK             | 262       | 92 %         | 92 %          | 100 %               | 100 %  | 99 %   |
| T2_U  |                   | Hephy-Vienna           | 324       | 97 %         | 97 %          | 96 %                | 96 %   | 95 %   |
| <b>FR-C AU-ATLAS ( Australia, University of Melbourne )</b>         |                   |                        |           |              |               |                     |        |        |
| FI-HI   |                   | Australia-ATLAS        | 80        | 93 %         | 93 %          | 98 %                | 97 %   | 94 %   |
| US-M  |                   | Australia-UNIMELB-LCG2 | 27        | N/A          | 0 %           | 3 %                 | 0 %    | 0 %    |
| <b>PT-L BE-TIER2 ( Belgium, Belgian Tier-2 Federation )</b>         |                   |                        |           |              |               |                     |        |        |
| UK-S  |                   | BEgrid-ULB-VUB         | 332       | 14 %         | 12 %          | 95 %                | 82 %   | 98 %   |
| CZ-P  |                   | BelGrid-UCL            | 579       | 96 %         | 96 %          | 88 %                | 97 %   | 97 %   |
| <b>JP-TI CA-EAST-T2 ( Canada-East Federation )</b>                  |                   |                        |           |              |               |                     |        |        |
| RO-L  |                   | TORONTO-LCG2           | 240       | 41 %         | 41 %          | 95 %                | 97 %   | 45 %   |
| <b>DE-E CA-WEST-T2 ( Canada-West Federation )</b>                   |                   |                        |           |              |               |                     |        |        |
| FR-II   |                   | ALBERTA-LCG2           | 44        | 98 %         | 98 %          | 99 %                | 98 %   | 92 %   |
| US-M  |                   | SFU-LCG2               | 64        | 92 %         | 92 %          | 87 %                | 92 %   | 93 %   |
| TW-F  |                   | VICTORIA-LCG2          | 65        | 95 %         | 95 %          | 84 %                | 93 %   | 91 %   |
| SI-SI   |                   |                        |           | 97 %         | 97 %          | 98 %                | 98 %   | 98 %   |
| UK  | NorthGrid         |                        |           | 97 %         | 96 %          | 97 %                | 97 %   | 97 %   |
| NO  | NORDGRID-T2       |                        |           | 97 %         | 97 %          | 97 %                | 97 %   | 97 %   |
| DE  | DESY-RWTH-CMS-T2  |                        |           | 97 %         | 96 %          | 97 %                | 97 %   | 97 %   |
| DE  | MCAT              |                        |           | 97 %         | 97 %          | 97 %                | 97 %   | 97 %   |
| T2_US   | Purdue            |                        |           | 96 %         | 96 %          | 96 %                | 96 %   | 96 %   |
| FR  | IN2P3-LAPP        |                        |           | 96 %         | 73 %          | 96 %                | 96 %   | 96 %   |
| UK  | London-Tier2      |                        |           | 96 %         | 95 %          | 96 %                | 96 %   | 96 %   |
| FR  | IN2P3-IPHC        |                        |           | 96 %         | 95 %          | 96 %                | 96 %   | 96 %   |
| HU  | HGCC-T2           |                        |           | 95 %         | 95 %          | 96 %                | 96 %   | 96 %   |
| AT  | HEPHY-VIENNA-UIBK |                        |           | 95 %         | 95 %          | 96 %                | 96 %   | 96 %   |
| CA  | WEST-T2           |                        |           | 95 %         | 95 %          | 96 %                | 96 %   | 96 %   |
| RU  | RDIG              |                        |           | 95 %         | 94 %          | 96 %                | 96 %   | 96 %   |
| UK  | SouthGrid         |                        |           | 95 %         | 90 %          | 96 %                | 96 %   | 96 %   |
| FR  | IN2P3-SUBATECH    |                        |           | 94 %         | 94 %          | 96 %                | 96 %   | 96 %   |
| US  | AGLT2             |                        |           | 94 %         | 94 %          | 96 %                | 96 %   | 96 %   |
| IN  | DAE-KOLKATA-TIER2 |                        |           | 94 %         | 71 %          | 96 %                | 96 %   | 96 %   |
| IL  | HEPTier 2         |                        |           | 87 %         | 87 %          | 96 %                | 96 %   | 96 %   |
| DE  | FREIBURGWUPPERTAL |                        |           | 85 %         | 72 %          | 96 %                | 96 %   | 96 %   |
| IN  | INDIACMS-TIFR     |                        |           | 85 %         | 82 %          | 96 %                | 96 %   | 96 %   |
| EE  | NICPB             |                        |           | 85 %         | 85 %          | 96 %                | 96 %   | 96 %   |
| CH  | CHIPP-CSCS        |                        |           | 84 %         | 83 %          | 96 %                | 96 %   | 96 %   |
| ES  | CMS-T2            |                        |           | 84 %         | 81 %          | 96 %                | 96 %   | 96 %   |
| PK  | CMS-T2            |                        |           | 80 %         | 77 %          | 96 %                | 96 %   | 96 %   |
| KR  | KNU-T2            |                        |           | 80 %         | 80 %          | 96 %                | 96 %   | 96 %   |
| US  | SWT2              |                        |           | 78 %         | 51 %          | 96 %                | 96 %   | 96 %   |
| T2_US   | UCSD              |                        |           | 78 %         | 79 %          | 96 %                | 96 %   | 96 %   |
| FR  | Tier2-federation  |                        |           | 66 %         | 60 %          | 96 %                | 96 %   | 96 %   |
| BE  | TIER2             |                        |           | 66 %         | 65 %          | 96 %                | 96 %   | 96 %   |
| CA  | EAST-T2           |                        |           | 41 %         | 41 %          | 96 %                | 96 %   | 96 %   |
| KR  | KISTI-T2          |                        |           | 0 %          | 0 %           | 96 %                | 96 %   | 96 %   |
| DE  | CCF               |                        |           | 0 %          | 0 %           | 96 %                | 96 %   | 96 %   |
| UA  | Tier2-Federation  |                        |           | N/A          | N/A           | 96 %                | 96 %   | 96 %   |

Big improvement

Federation average is now weighted by #CPU (where avail)

Would like to fix target at 95%

Should be achievable

e.g. of extended scheduled downtimes (availability << reliability)

Only 1 Federation still not reporting (Nordic started in Dec)



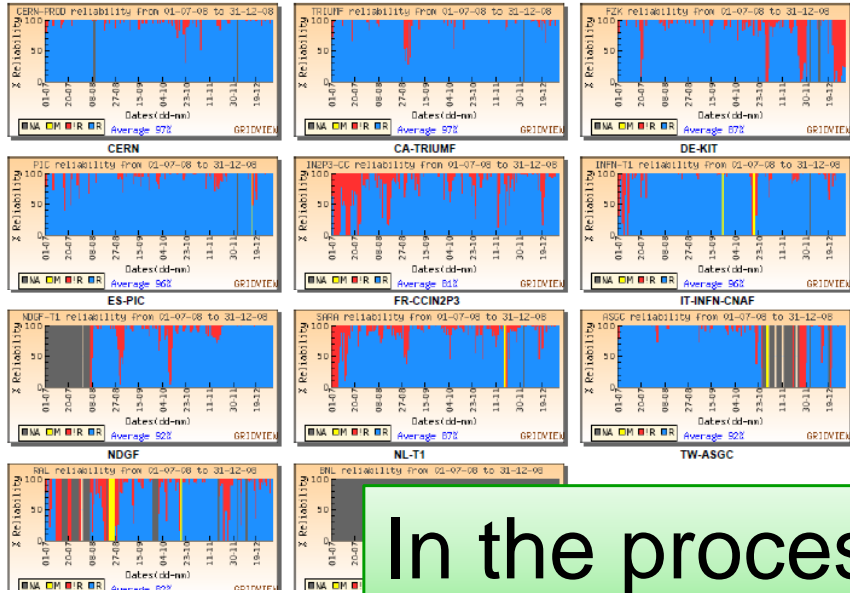
# VO-specific tests



## Reliability of WLCG Tier-1 Sites + CERN for ATLAS

July 2008 - December 2008

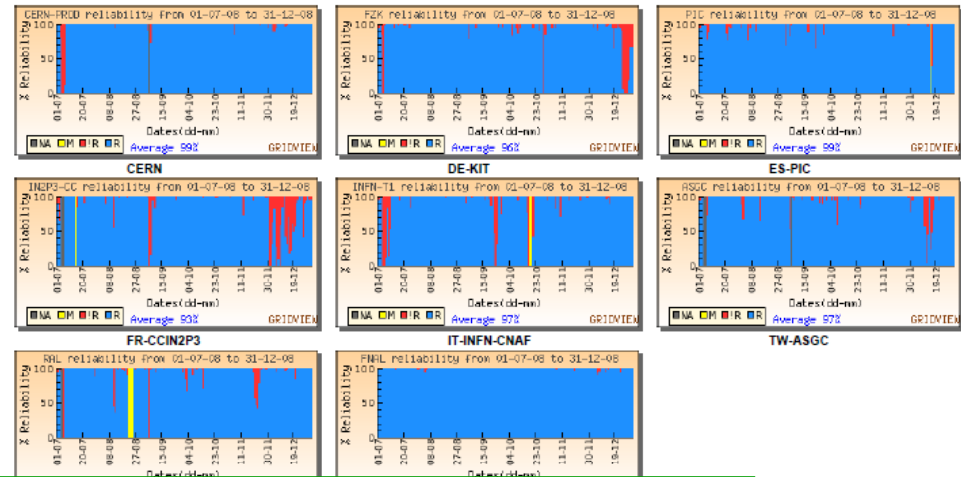
Data from SAM Monitoring. Plots show Reliability for last 6 Months  
Reliability is calculated as  $\text{time\_site\_is\_available} / (\text{total\_time} - \text{time\_site\_is\_scheduled\_down})$   
Target reliability for each site is 95% and Target for 8 best sites is 97% from June, 2008



## Reliability of WLCG Tier-1 Sites + CERN for CMS

July 2008 - December 2008

Data from SAM Monitoring. Plots show Reliability for last 6 Months  
Reliability is calculated as  $\text{time\_site\_is\_available} / (\text{total\_time} - \text{time\_site\_is\_scheduled\_down})$   
Target reliability for each site is 95% and Target for 8 best sites is 97% from June, 2008



In the process of being validated

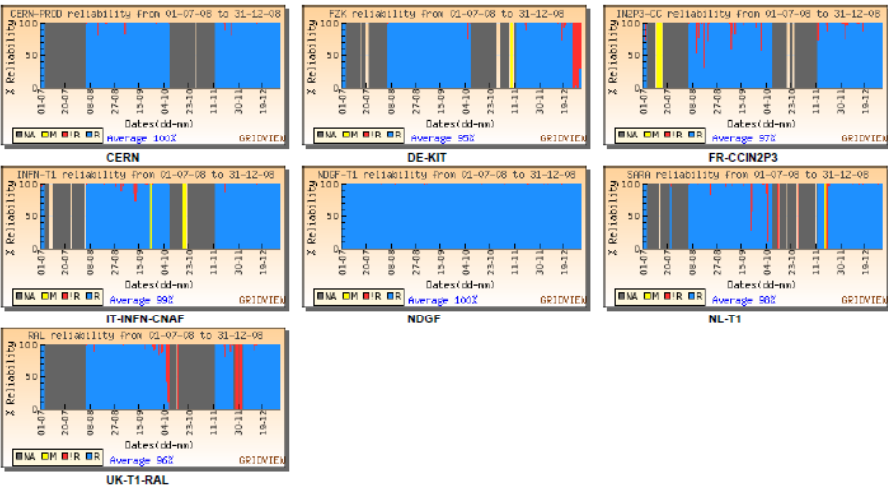
- December 2008



## Reliability of WLCG Tier-1 Sites + CERN for ALICE

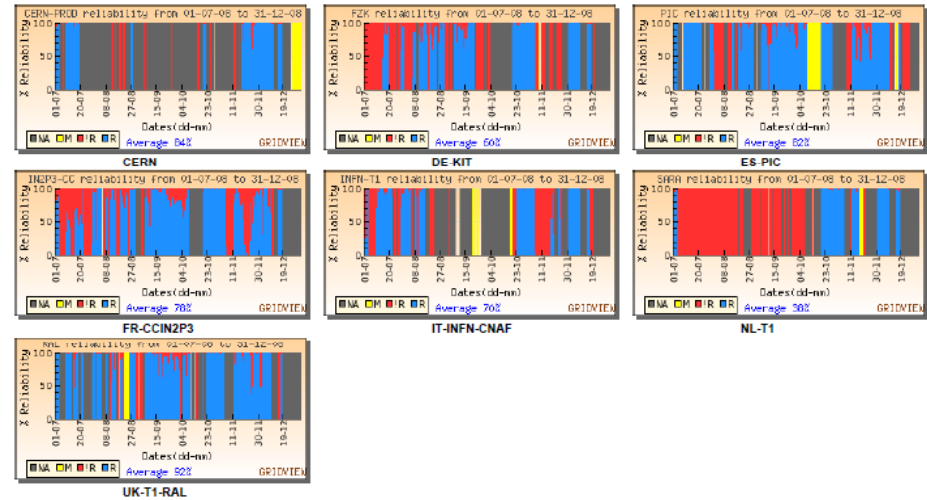
July 2008 - December 2008

Data from SAM Monitoring. Plots show Reliability for last 6 Months  
Reliability is calculated as  $\text{time\_site\_is\_available} / (\text{total\_time} - \text{time\_site\_is\_scheduled\_down})$   
Target reliability for each site is 95% and Target for 8 best sites is 97% from June, 2008



Data from SAM Monitoring. Plots show Reliability for last 6 Months

Reliability is calculated as  $\text{time\_site\_is\_available} / (\text{total\_time} - \text{time\_site\_is\_scheduled\_down})$   
Target reliability for each site is 95% and Target for 8 best sites is 97% from June, 2008





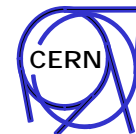
# Pledge Balance in 2009

The table below shows the status at 27/10/08 for 2009 from the responses received from the Tier-1 and Tier-2 sites

- The Total 2009 pledge from Russia is included but not the split across the experiments
- Following a re-organisation of some of the German Federations, pledges for 3 are still to be included
- Pledges for the new French Tier2 IPHC Strasbourg not included

▪ % indicates the balance between offered and required.

|         | ALICE | ATLAS | CMS  | LHCb | Sum 2009 |
|---------|-------|-------|------|------|----------|
| T1 CPU  | -49%  | 6%    | -2%  | 2%   | -12%     |
| T1 Disk | -43%  | -5%   | -13% | -2%  | -13%     |
| T1 Tape | -50%  | -7%   | 7%   | 6%   | -13%     |
| T2 CPU  | -44%  | 0%    | -8%  | -40% | -12%     |
| T2 Disk | -44%  | -20%  | 35%  | -    | -2%      |





# Pledge Balance 2008-2013

- The table below shows the global picture for 2008-2013, status as of 17/11/08. % indicates the balance between offered and required
- Some Federations have recently signalled a change to procurements for 2009, not supported by WLCG Management or Overview Boards

|         | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---------|------|------|------|------|------|------|
| T1 CPU  | -5%  | -12% | -11% | -15% | -20% | -26% |
| T1 Disk | -12% | -13% | -15% | -18% | -24% | -29% |
| T1 Tape | -13% | -13% | -16% | -22% | -24% | -23% |
| T2 CPU  | -2%  | -8%  | -29% | -31% | -32% | -37% |
| T2 Disk | -12% | -1%  | 3%   | -6%  | -6%  | -17% |

- Last RRB agreed that planning timescale would change from 5 years to 3 to be more realistic



# Schedule for 2009 - 2010

## Schedule with running in winter months

- Gains 20 weeks of LHC physics (independent of “slip”)

| Year   | 2009                      |    |    |    |    |    |    |    |    |    |    |    | 2010 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--|---------------------------|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Month  | F                         | M  | A  | M  | J  | J  | A  | S  | O  | N  | D  | J  | F    | M  | A  | M  | J  | J  | A  | S  | O  | N  | D  | J  | F  | M  |    |
| Baseline   | SH                        | SH | SH | SH | SH | SH | SH | SH | SU | PH |    | SH | SH   | SH | SH | SH | SH | SU | PH | PH | PH | PH | SH | SH | SH | SH |    |
|  | 24 weeks physics possible |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Base 1   | SH                        | SH | SH | SH | SH | SH | SH | SH | SU | PH | PH | PH | PH   | PH | PH | PH | PH | PH | PH | PH | PH | SH | SH | SH | SH | SH |    |
|  | 44 weeks physics possible |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Gain 20 weeks of physics in 2010 by running during winter months |                           |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| HIGH price Electricity   |                           |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Delay (4W)   | SH                        | SH | SH | SH | SH | SH | SH | SH | SU | PH | PH | PH | PH   | PH | PH | PH | PH | PH | PH | PH | PH | PH | SH | SH | SH | SH | SH |
| Delay (8W)   | SH                        | SH | SH | SH | SH | SH | SH | SH | SH | SU | PH | PH | PH   | PH | PH | PH | PH | PH | PH | PH | PH | PH | SH | SH | SH | SH | SH |

From Chamonix summary: <http://indico.cern.ch/conferenceDisplay.py?confId=45433>



# Likely scenario

- Injection: end September 2009
- Collisions: end October 2009
- Long run from ~November 2009 for ~44 weeks
  - This is equivalent to the full 2009 + 2010 running as planned with 2010 being a nominal year
  - Short stop (2 weeks) over Christmas/New Year
- Energy will be limited to 5 TeV
- Heavy Ion run at the end of 2010
  - No detailed planning yet
- 6 month shutdown between 2010/2011 (?) – restart in May ?



# Implications for resources

- This extended run is equivalent to the original plans for 2009 + 2010
  - 2009
    - Start is delayed until October (we always planned to be ready for machine switch-on)
    - Thus should have full 2009 resources commissioned by September
  - 2010
    - Assume starts in May
    - Need to have full 2010 resources commissioned by April (as planned)
      - NB have always said will stage installation of disk during 2010: April + August (?)
- ⇒ This is close to the original plan, but with an initial delay in 2009
- Allows newer equipment (in some cases!)



# Issues?

- No allowance for any change in experiment requirements
  - No change in budgets, but delay *in some cases* allows for more resources for same cost
  - How to handle the ATLAS request for additional Tier 0 resources?
  - How do experiment models deal with no shutdown?
  - Tier 1 issues with installation schedules for 2010?
    - Installation while supporting data taking
  
- Funding agencies (and some sites) see the delay as a reason to push back all procurements by ~ 1 year (i.e. 2009 is like 2008 should have been etc.)
  - ⇒ must ensure that we have adequate resources to rapidly exploit the data from this first period of running – the computing must not be the block to extracting physics



# Upgrade plans

- Since several software upgrades were postponed in anticipation of LHC start-up, we proposed that the following changes are addressed in the coming months:
  - SRM – agreed list of “short term” changes; available by end 2008
  - FTS on SL4 (+available for SL5?) – deployment was postponed
  - WN on SL5 to be available for deployment
  - glEXEC/SCAS to support pilot jobs with identity changing
  - CREAM CE – make available in parallel to existing CE which is known to have scaling issues when there are many different users;
- + a few other smaller changes ...
- Many of the above are deployments in parallel to existing production services and so non-disruptive





## Re-validation of the service

- All experiments are continually running simulations, cosmics, specific tests (and have been since CCRC'08) at high workload levels – this will continue
- A full CCRC'09 in the same mode as 2008 was not regarded as useful
- But, we will perform specific tests/validations:
  - Service validation if software is changed/updated
  - Specific tests (e.g. throughput) to ensure that no problems have been introduced
  - Tests of functions not yet tested (e.g. Reprocessing/data recall at Tier 1s)
  - Analysis scenario testing
- Details of the test programme were discussed in the workshop last November – will be refined now timescale is clearer



## Resources ...

- Plans for 2009, 2010 based on existing requirements, validated last November by the C-RSG
  - Except that the increased Tier0/CAF request of ATLAS is not budgeted for
    - Need guidance on how to manage this
- New benchmark agreed
  - kSI2K → HEP-SPEC06 (based on SPEC06 c++ - mix of FP and Int tests)
  - Shown to scale well for LHC experiments
  - Simple conversion factor
  - Sites will benchmark existing capacity; vendors must run this benchmark suite (simple to run)
  - Process underway to convert requirements/pledges, and accounting
- Automated gathering of installed capacity
  - Process agreed between all parties – will be put in place to allow better understanding of available capacity; changes in information system will also improve normalisation between sites



# Milestones

| 15-Dec-08              |          | WLCG High Level Milestones – 2008/09   |              |          |      |        |                         |      |     |          |                      |         |     |      |     |
|------------------------|----------|--|--------------|----------|------|--------|-------------------------|------|-----|----------|----------------------|---------|-----|------|-----|
| ID                     | Date     | Milestone  | Done (green) |          |      |        | Late < 1 month (orange) |      |     |          | Late > 1 month (red) |         |     |      |     |
|                        |          |  | ASGC         | CC IN2P3 | CERN | DE-KIT | INFN CNAF               | NDGF | PIC | RAL      | SARA NIKHE           | TRIUM F | BNL | FNAL |     |
| <b>VOBoxes Support</b> |          |  |              |          |      |        |                         |      |     |          |                      |         |     |      |     |
| WLCG-07-04             | Apr 2007 | VOBoxes SLA Defined<br>Sites propose and agree with the VO the level of support (upgrade, backup, restore, etc) of VOBoxes | Aug 2008     | Aug 2008 |      |        |                         |      |     | Aug 2008 |                      |         |     |      |     |
| WLCG-07-05             | May 2007 | VOBoxes SLA Implemented<br>VOBoxes service implemented at the site according to the SLA                                    | Aug 2008     | Aug 2008 |      |        |                         |      |     | Aug 2008 |                      |         |     |      |     |
| WLCG-07-05b            | Jul 2007 | VOBoxes Support Accepted by the Experiments<br>VOBoxes support level agreed by the experiments                             | ALICE        | n/a      |      |        |                         |      |     | n/a      |                      |         | n/a | n/a  | n/a |
|                        |          |  | ATLAS        |          |      |        |                         |      | n/a | n/a      |                      |         | n/a | n/a  | n/a |
|                        |          |  | CMS          |          |      |        |                         |      | n/a | n/a      |                      |         | n/a | n/a  | n/a |
|                        |          |  | LHCb         | n/a      |      |        |                         |      | n/a | n/a      |                      |         | n/a | n/a  | n/a |

- Timescales being discussed for:
  - Pilot job deployment; glexec/SCAS + framework reviews
  - Publication of VO-specific SAM testing
  - Accounting: improved T2 reports; installed capacity; user-level accounting
  - New CPU benchmarks – deployment
  - Middleware + SRM improvements
  - Metrics & monitoring: Tier 1 MSS metrics; storage system monitors; site monitoring/alarms; performance metrics



## Planning for 2010 (end of EGEE)

- A final draft of the EGI blueprint has been produced (January)
- Process will be discussed in the Overview Board next week
  - Document how the countries (Tier 1 + Tier 2) will provide the services and support needed for WLCG
    - Either as part of their NGI
    - Specific contribution
    - Must be no break in service at the end of EGEE-III
  - EGEE-III have transition planning
  - The Tier 0 is probably in a reasonable position – current planning does not rely on external funding; but the capability will be strictly limited to core WLCG Tier 0/CAF tasks
- The location of the EGI.org is being studied now – bids have been received
  - Decision 1<sup>st</sup> week of March at EGEE User Forum ?
- Still not clear how many NGIs will really exist in 2010 to support this



# Planning for Tier 0 infrastructure

- Capacity in CERN CC will run out in ~2010; electrical capacity cannot be extended above currently foreseen levels
- Strategy:
  - Expand the capacity of the building as far as possible (2.5 → 2.9 MW), addition of water-cooled racks: NB. This leaves no redundancy in the power supply;
  - Aggressive removal & replacement of older equipment with new lower-power units. Replace at end of warranty (3 yrs);
  - Planning for a second centre to be built on Prévessin site;
  - Investigate stop-gap solutions for 1.5 – 2 years between running out of power and having a new building available
- First 2 points + better estimate of power evolution of new systems → sufficient capacity until ~end 2010
- Planning ongoing at the level of conceptual designs
- Stop gap solutions being investigated; commercial solutions very expensive (x10 over CERN cost), some possibilities under discussion with other WLCG sites.



# New Tier 0 centre

- New CERN management now strongly supporting the construction of a new Computer Centre
  - Will be on CERN Preveessin site
  - Must take into account environmental issues
    - This introduces some delay as previous conceptual designs could not take this into account
  - Anticipate timescale (optimistic) is to have a new building in place for 2012
    - Improvements in power efficiency of machines, take advantage of LHC delay may mean that existing building will be sufficient until then
    - But – this will be close – need to foresee alternatives for ~1 year until timescale is clarified



# Pending issues for 2009

- Plan to have visits of Tier 1 sites – to understand service issues
  - MSS
  - Databases – seems to be often a source of problems
  - Share and spread knowledge of running reliable services
- SRM performance
  - Need good testing of Tier 1 tape recall/reprocessing, together with Tier 1 tape writing – for several experiments together
    - Encapsulated tests?
- Data access with many users for analysis – need to see experiment testing of analysis



# Summary

- CCRC'08 was successful
  - Almost all experiments' and service targets were achieved
    - Exception: user analysis with 100's of users; T1 reprocessing at full scale
- Service has continued to be used at significant levels
  - Main focus is on improving service reliability – especially storage systems
- Important that resource ramp-up for 2009/10 continues:
  - Delay allows for more effective purchases in some cases
  - Resource procurements/installations were significantly delayed in 2008
  - Must be ready for the accelerator start-up, even if resources are today not saturated
- Planning for future – Tier 0/CAF and European Grid infrastructure – ongoing