Site Reviews

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

WLCG Site Reviews

Prague, 21st March 2009

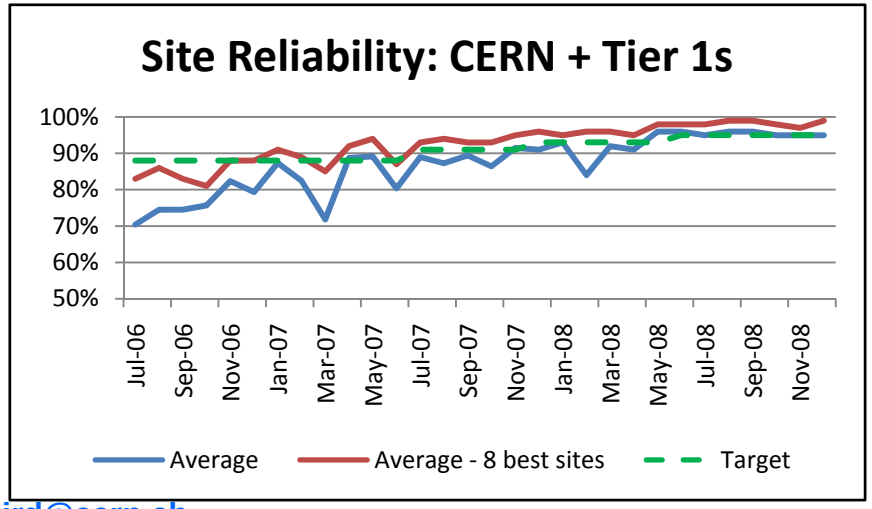
Ian Bird
LCG Project Leader

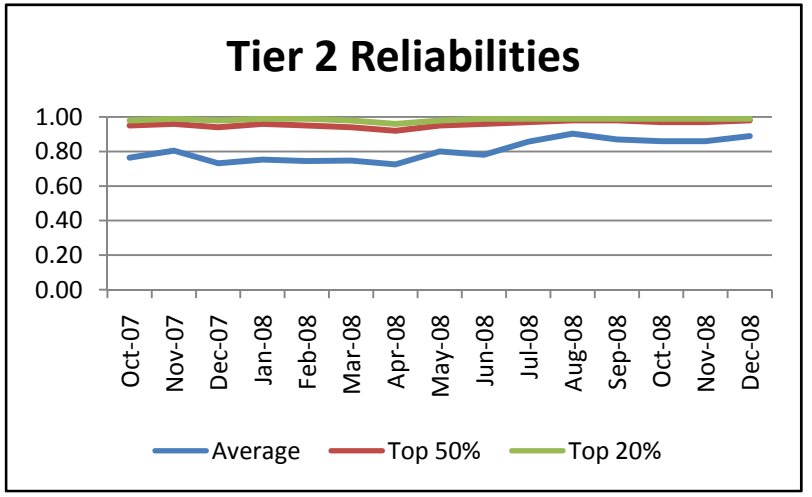
The problem(s)...

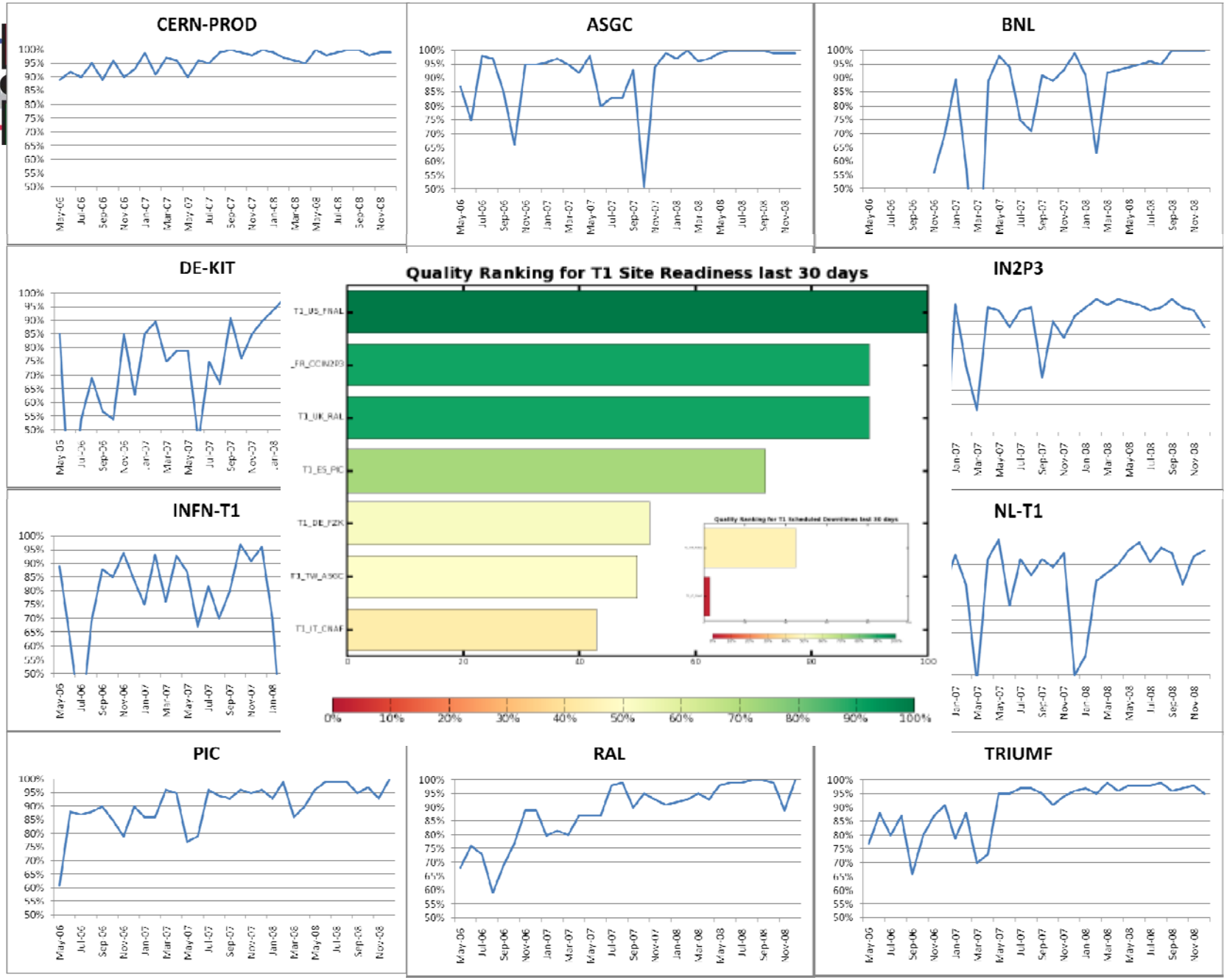
- Site/service unreliability
- Site unavailability
- Instabilities of the above...

- Frequency of major incidents and consistent follow up

- Problems in procuring/commissioning resources to the pledge level






CERN-PROD
ASGC
BNL
DE-KIT
Quality Ranking for T1 Site Readiness last 30 days
IN2P3
INFN-T1
NL-T1
PIC
RAL
TRIUMF

Reliability of WLCG Tier-1 Sites + CERN for ALICE

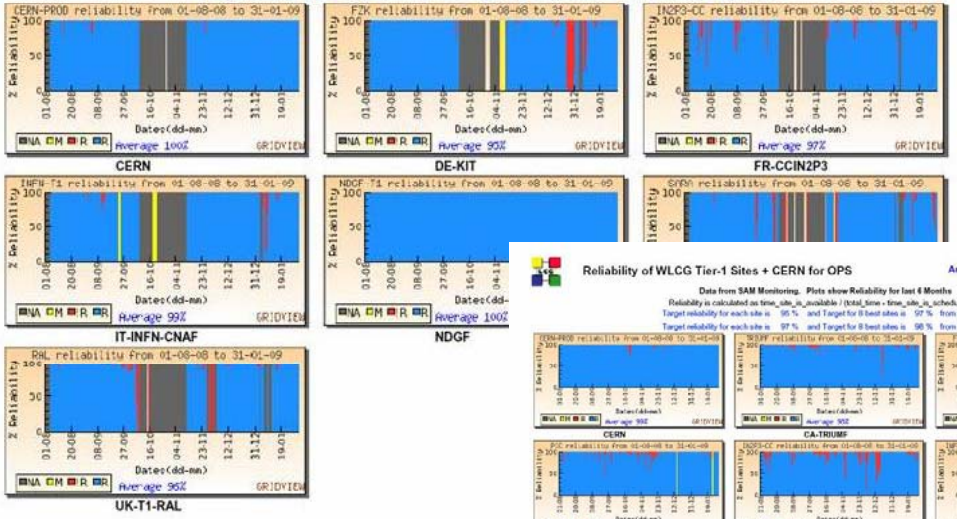
August 2008 - January 2009

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

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 95 % and Target for 8 best sites is 97 % from June, 2008

Target reliability for each site is 97 % and Target for 8 best sites is 98 % from January, 2009



Reliability of WLCG Tier-1 Sites + CERN for ATLAS

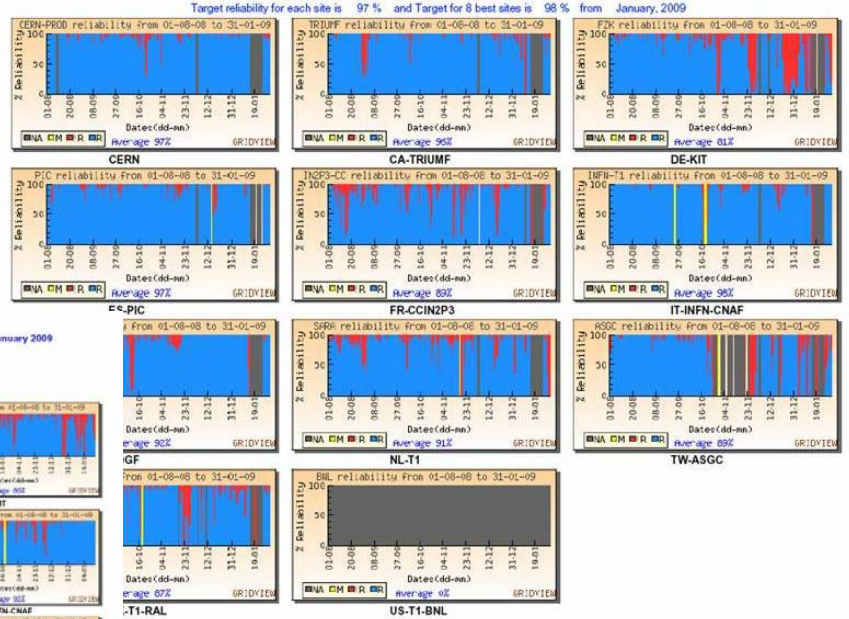
August 2008 - January 2009

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

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 95 % and Target for 8 best sites is 97 % from June, 2008

Target reliability for each site is 97 % and Target for 8 best sites is 98 % from January, 2009



Reliability of WLCG Tier-1 Sites + CERN for OPS

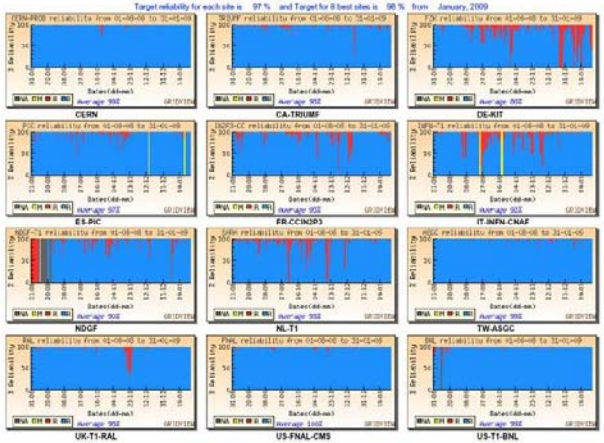
August 2008 - January 2009

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

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 95 % and Target for 8 best sites is 97 % from June, 2008

Target reliability for each site is 97 % and Target for 8 best sites is 98 % from January, 2009



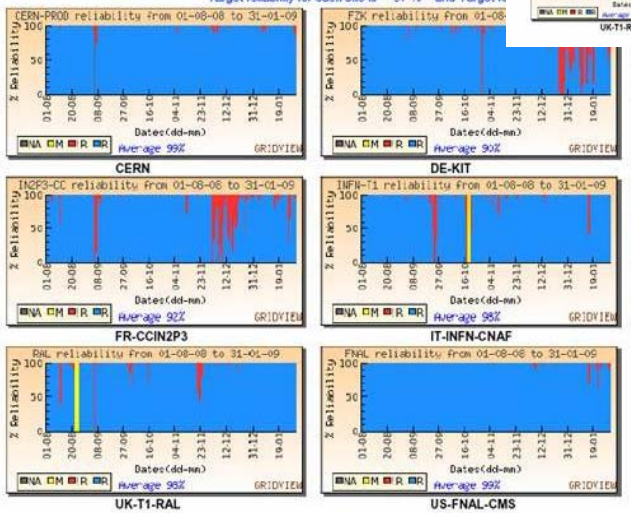
Reliability of WLCG Tier-1 Sites + CERN for CMS

Data from SAM Monitoring. Plots show R

Reliability is calculated as time_site_is_available / (to

Target reliability for each site is 95 % and Target fo

Target reliability for each site is 97 % and Target fo



WLCG Tier-1 Sites + CERN for LHCb

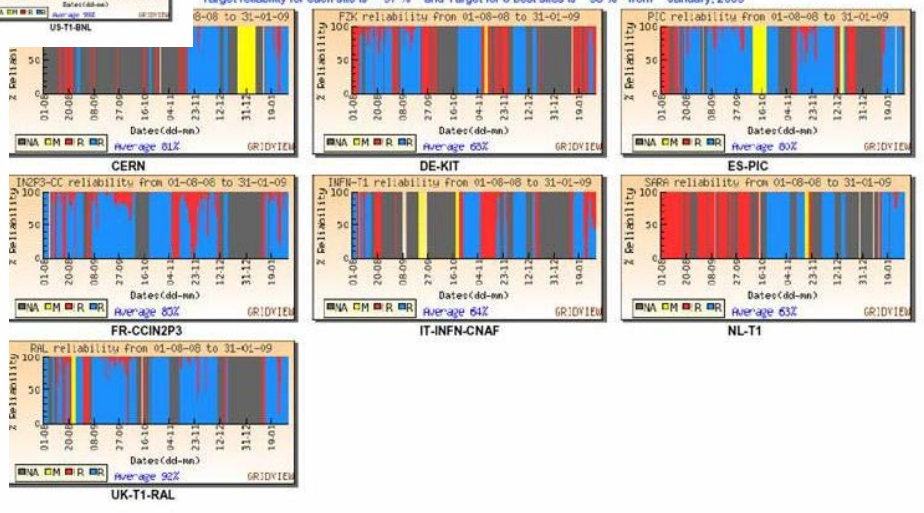
August 2008 - January 2009

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

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 95 % and Target for 8 best sites is 97 % from June, 2008

Target reliability for each site is 97 % and Target for 8 best sites is 98 % from January, 2009



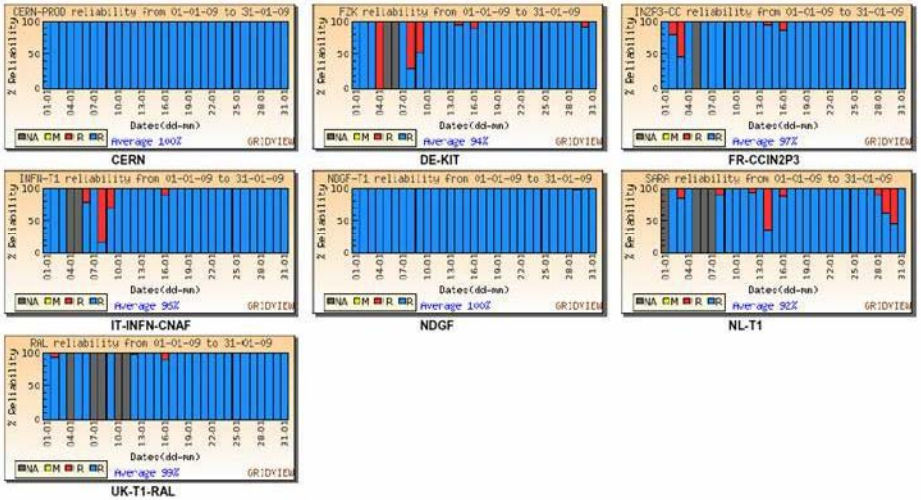
Reliability of WLCG Tier-1 Sites + CERN for ALICE

January 2009

Data from SAM Monitoring.

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 97 % and Target for 8 best sites is 98 %



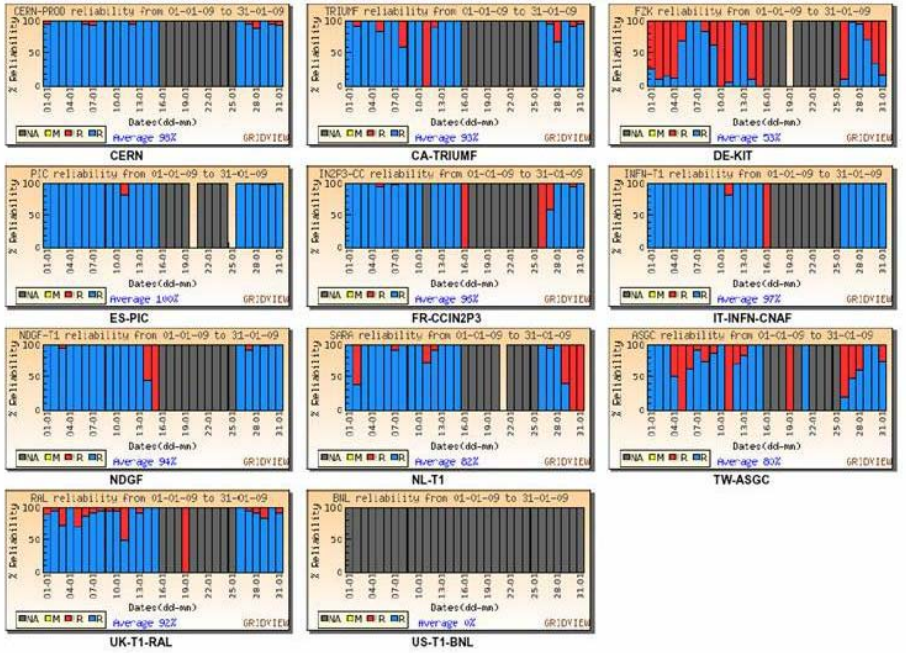
Reliability of WLCG Tier-1 Sites + CERN for ATLAS

January 2009

Data from SAM Monitoring.

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 97 % and Target for 8 best sites is 98 %



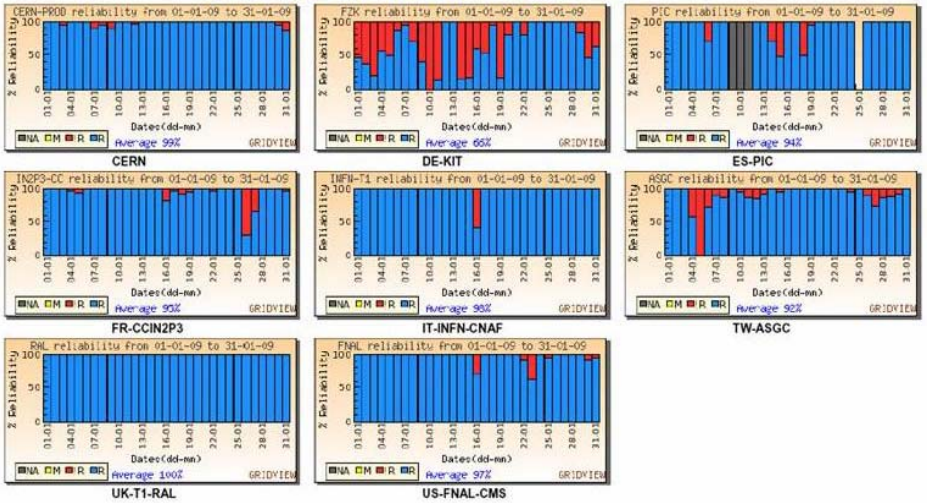
Reliability of WLCG Tier-1 Sites + CERN for CMS

January 2009

Data from SAM Monitoring.

Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 97 % and Target for 8 best sites is 98 %



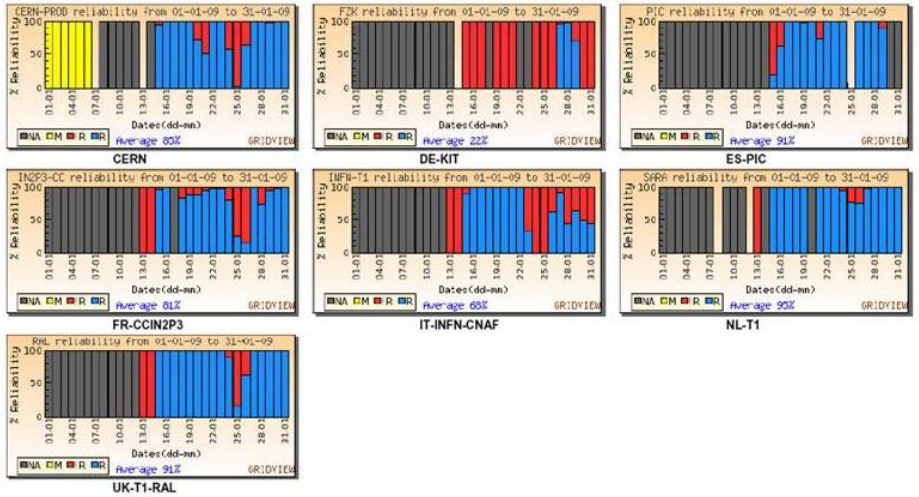
Reliability of WLCG Tier-1 Sites + CERN for LHCb

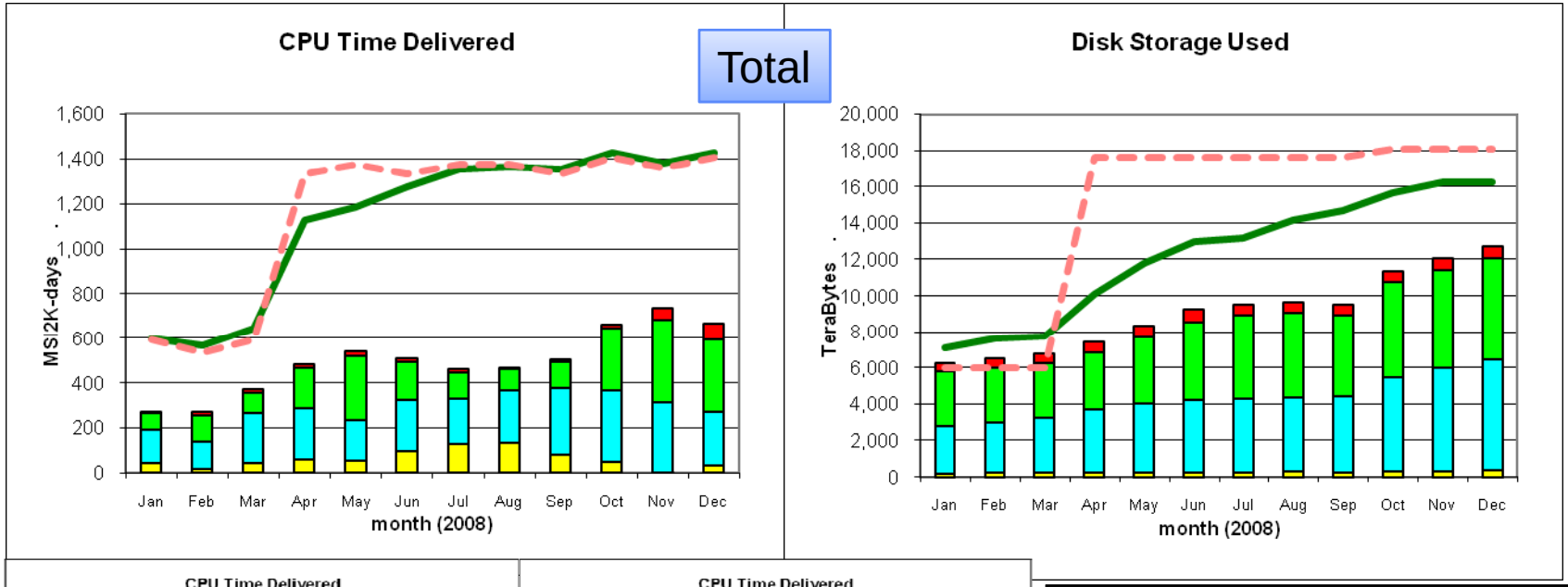
January 2009

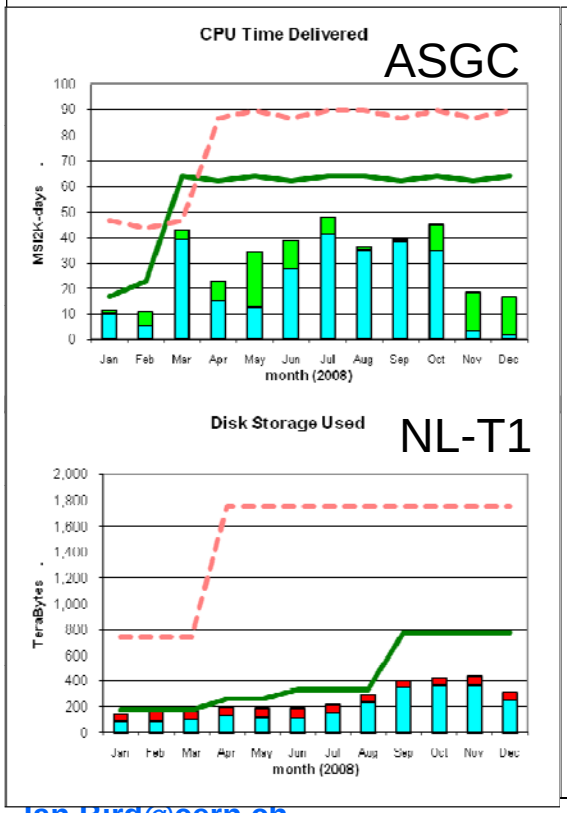
Data from SAM Monitoring.

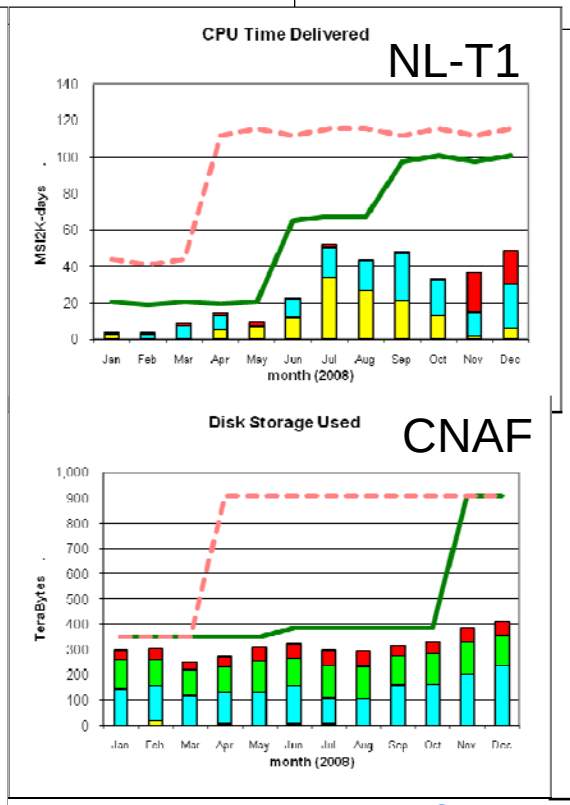
Reliability is calculated as time_site_is_available / (total_time - time_site_is_scheduled_down)

Target reliability for each site is 97 % and Target for 8 best sites is 98 %

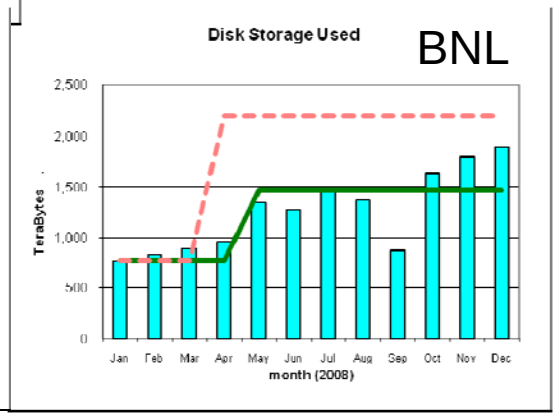








- Many problems to ramp up resources
  - Delays in procurements
  - Faulty equipment
  - Lack of power & planning



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/MAN/UserManual/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

Critical SAM Tests - http://sam-docs.web.cern.ch/sam-docs/docs/html/docs/MAN/UserManual/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
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 %	28 %
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

Page 2 of 8

September '08

Tier-2 Availability and Reliability Report

Federation Summary - Sorted by Reliability — January 2009

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

Availability = % of successful tests
Reliability = Availability / Scheduled Availability
Reliability and Availability for Federation - Weighted average of all sites in the Federation (based on cpucount)

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 Availability and Reliability Report

Federation Summary - Sorted by Reliability — January 2009

Critical SAM Tests - http://lcg-sam.cern.ch:8080/sam-docs/docs/html/docs/MANUserManual/node22.html

Availability = % of successful tests
Reliability = Availability / Scheduled Availability
Reliability and Availability for Federation - Weighted average of all sites in the Federation (based on cpucount)

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

Federation	Reli-ability	Avail-ability	Federation	Reli-ability	Avail-ability
JP-Tokyo-ATLAS-T2	100 %	100 %	UK-SouthGrid	94 %	84 %
CZ-Prague-T2	99 %	98 %	FR-IN2P3-LPC	94 %	94 %
T2_US_Nebraska	99 %	99 %	FR-IN2P3-LAPP	94 %	94 %
FR-IN2P3-SUBATECH	99 %	99 %	RU-RDIG	93 %	92 %
FR-GRIF	99 %	99 %	DE-DESY-RWTH-CMS-T2	93 %	93 %
PL-TIER2-WLCG	99 %	83 %	CA-WEST-T2	92 %	89 %
SI-SIGNET	99 %	98 %	AT-HEPHY-VIENNA-UIBK	92 %	91 %
T2_US_Florida	99 %	99 %	RO-LCG	91 %	86 %
CN-IHEP	98 %	98 %	US-AGLT2	90 %	90 %
TW-FTT-T2	98 %	98 %	UK-London-Tier2	90 %	89 %
UK-NorthGrid	98 %	98 %	KR-KNU-T2	89 %	89 %
T2_US_Purdue	98 %	98 %	PK-CMS-T2	88 %	82 %
UK-ScotGrid	98 %	97 %	T2_US_UCSD	88 %	88 %
IN-DAE-KOLKATA-TIER2	98 %	98 %	DE-FREIBURGWUPPERTAL	88 %	83 %
DE-DESY-ATLAS-T2	98 %	98 %	AU-ATLAS	87 %	87 %
US-MWT2	98 %	98 %	US-SWT2	86 %	86 %
US-WT2	97 %	64 %	ES-LHCb-T2	86 %	86 %
CH-CHIPP-CSCS	97 %	97 %	ES-CMS-T2	83 %	78 %
DE-MCAT	97 %	97 %	IN-INDIACMS-TIFR	79 %	79 %
CA-EAST-T2	97 %	97 %	T2_US_MIT	77 %	77 %
PT-LIP-LCG-Tier2	97 %	68 %	BE-TIER2	77 %	77 %
HU-HGCC-T2	97 %	95 %	IT-ALICE-federation	76 %	70 %
T2_US_Caltech	97 %	97 %	IT-ATLAS-federation	76 %	70 %
FR-IN2P3-CC-T2	96 %	96 %	IT-CMS-federation	76 %	70 %
FI-HIP-T2	96 %	96 %	IT-LHCb-federation	76 %	70 %
US-NET2	96 %	96 %	TR-Tier2-federation	58 %	54 %
T2_US_Wisconsin	96 %	89 %	IL-HEPTier-2	45 %	33 %
NO-NORDGRID-T2	95 %	95 %	SE-SNIC-T2	44 %	45 %
ES-ATLAS-T2	95 %	92 %	KR-KISTI-T2	25 %	14 %
FR-IN2P3-IPHC	95 %	95 %	DE-GSI	0 %	0 %
EE-NICPB	95 %	95 %	UA-Tier2-Federation	N/A	N/A

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***

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%	

Serious Incidents.

In last six months

- Castor – ASGC, CERN, CNAF, RAL
- dCache – FZK, IN2P3, NL-T1
- Oracle – ASGC, RAL
- Power – ASGC, PIC, NL-T1, CNAF
- Cooling- CERN, IN2P3
- Network- CNAF, PIC, BNL, CERN
- Other – CNAF, RAL, NL-T1,
- Fire – ASGC

Tier1s **will** be down. Experiment models should cope.

Major Service Incidents

Site	When	What	Report?
CNAF	21 Feb	Network outage	Promised…
ASGC	25 Feb	Fire	E-mails 25/2 & 2/3
nl-t1	3 Mar	Cooling	E-mailed
CERN	3 Mar	Human error	Provided by IT-FIO (Olof) **(FIO wiki of service incidents)**

- Wide disparity in reports – both level of detail and delay in producing them (some others still pending…)
  - **We agreed that they should be produced by the following MB – even if some issues were still not fully understood**
  - **Would adopting a template – such as that used by IT-FIO or GridPP – help? (Discuss at pre-CHEP workshop…)**

¿ **Is the MB content with the current situation ?**

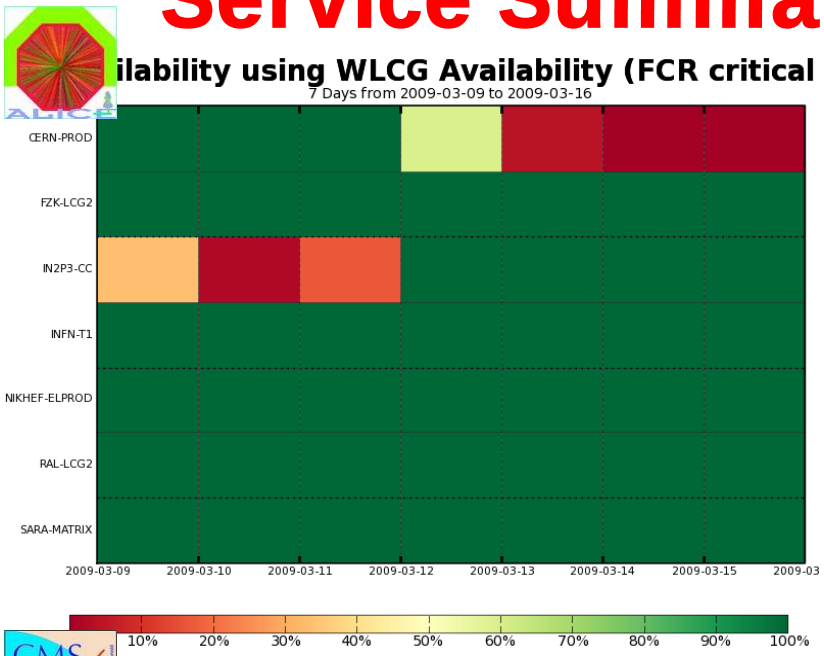
FZK DB SIR

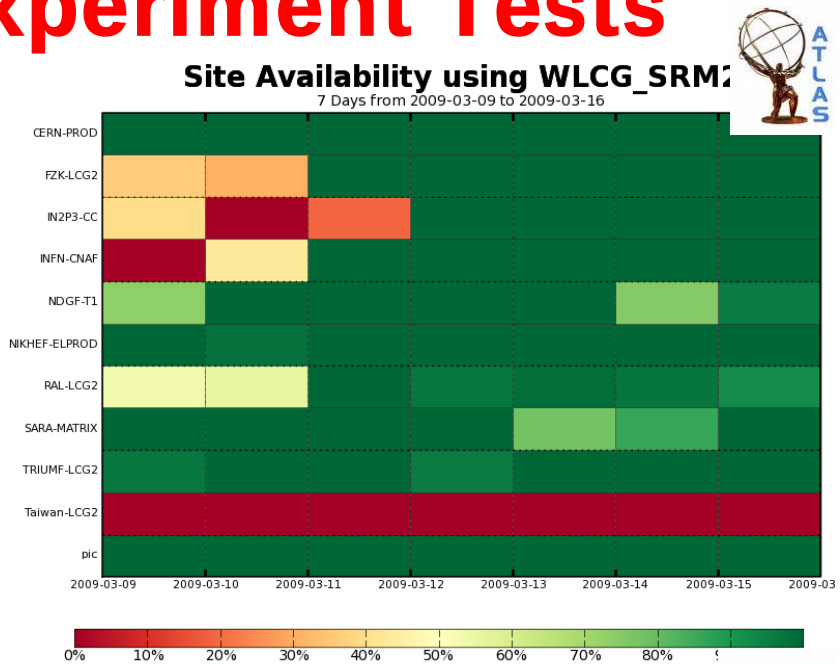
- At GridKa/DE-KIT the FTS/LFC Oracle RAC database backend was down from January 24 to 26 (Sat, approx. 0:00 to Mon, approx. 22:30 CET).
- On Sat, our on-call team immediately received Nagios alerts. From approx. 9:30 on Sat, our DBA worked on the issue and found, that many Oracle backup archive logs had been filling up the disks.
- By trying to add an additional disk, ASM (the Oracle storage manager, i.e. the file system) got blocked. The reason was probably a mistake made by the DBA when preparing the disk to be added.
- Due to the fact, that the LFC data was on the affected RAC system and it was unclear if the last daily backup worked properly, the DBA decided not try simple repair attempts like rebooting nodes etc but to involve Oracle support.
- At approx. 16:30 on Sat. she opened an Oracle Service Request. After info/files exchange with an Oracle supporter (in timezone CET-8h) till Sat late night, another supporter (in our CET zone) came back to us on Mon, approx. 11:00. With his aid, the problem finally was solved.

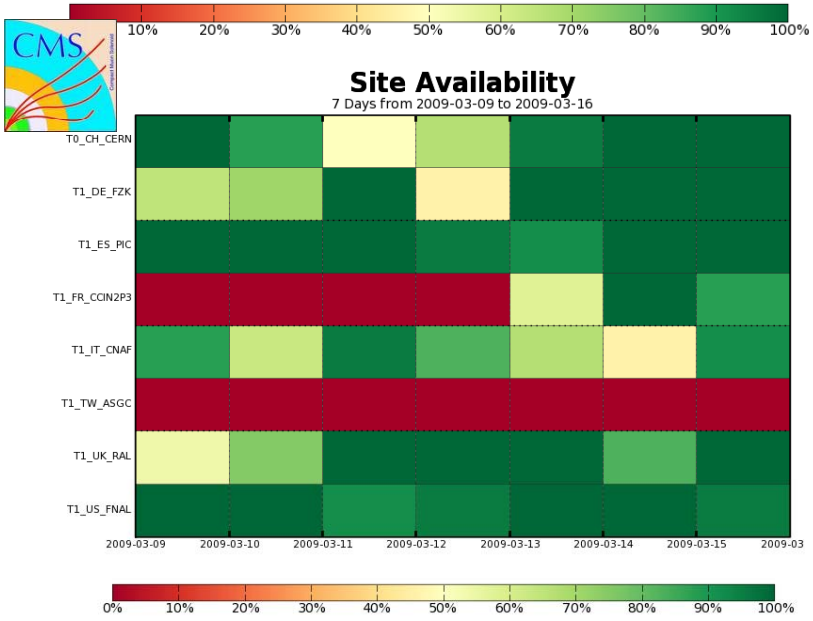
- Remarks:

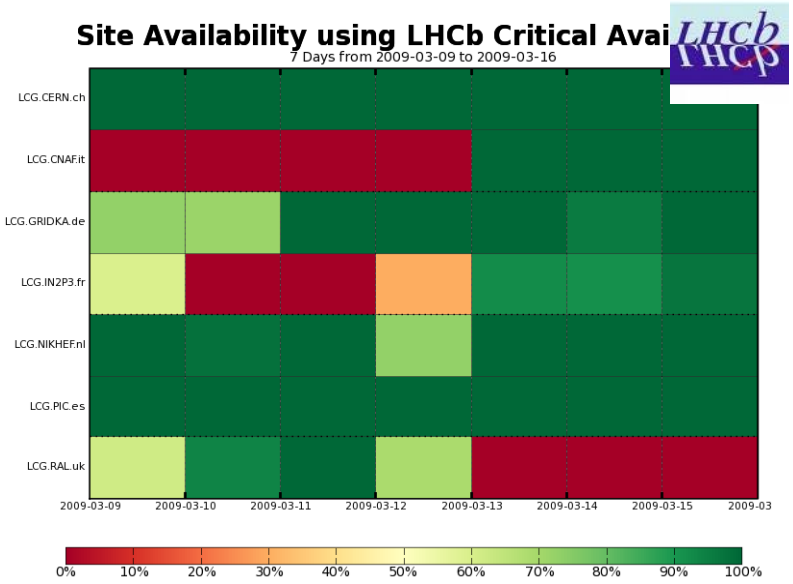
  - It is unclear to me, why it took more than a day until we got an Oracle supporter in our timezone. It could be, that the support request was not filled in correct. I wanted to clarify this before sending a SIR since it is not clear if bashing on Oracle is fair in this case.
  - As soon as I get to talk to the DBA I will try to clarify on which side mistakes happend.
  - My personal opinion: even though the disk to be added to the ASM was not prepared correctly, the system should not block but the command issued to add the disk should throw an error message. From a software costing thousands of Euros per licence, I would expect that.

Service Summary – Experiment Tests









How can we improve reliability? Discuss

- Simple actions
  - Ensure sites have sufficient local monitoring; including now the grid service tests/results from SAM and experiments
  - Ensure the response to alarms/tickets works and is appropriate – test it
  - Follow up on SIRs – does your site potentially have the same problem???
  - If you have a problem be honest about what went wrong – so everyone can learn
- Workshops
  - To share experience and knowledge on how to run reliable/fault tolerant services
    - WLCG, HEPiX, etc.
    - Does this have any (big) effect?
- Visits
  - Suggested that a team visits all Tier 1s (again!) to try and spread expertise ...
  - Who, when, what??? Also for some Tier 2s?

. . .

- Is communication adequate?
  - Are the relevant people consistently informed (NO!)
  - There are sufficient communication opportunities, but they are not always used...

- Is staffing of services adequate?
  - E.g. We know Tier 1s need a ~full time DBA for many daily operational actions (Castor, dCache, 3-D, etc.)
    - But they don't all have one
  - Large scale MSS systems need fairly large teams to operate ...
    - Sometimes does not seem enough ...

Potential Actions

- Ensure the monitoring that we have available is really fully used by everyone – there is a lot of information available now
- Ensure that communication of issues and problems improves
  - We must expose the problems and follow up on them
- Ensure that communication of best practices happens
  - Workshops, documentation, visits

- Take a look at the staffing levels and the priorities of those staff
  - Easy for me to say ...