Site usability metrics

OPS and VO-specific tests

Maria Girone
Andrea Sciabà

WLCG Operations TEG Workshop
12/12/2011

CERN IT Department
CH-1211 Geneva 23
Switzerland
www.cern.ch/it

Goals of this talk

- Summarize the current status
- Describe limitations
- Suggest different alternative ways to measure the site usability

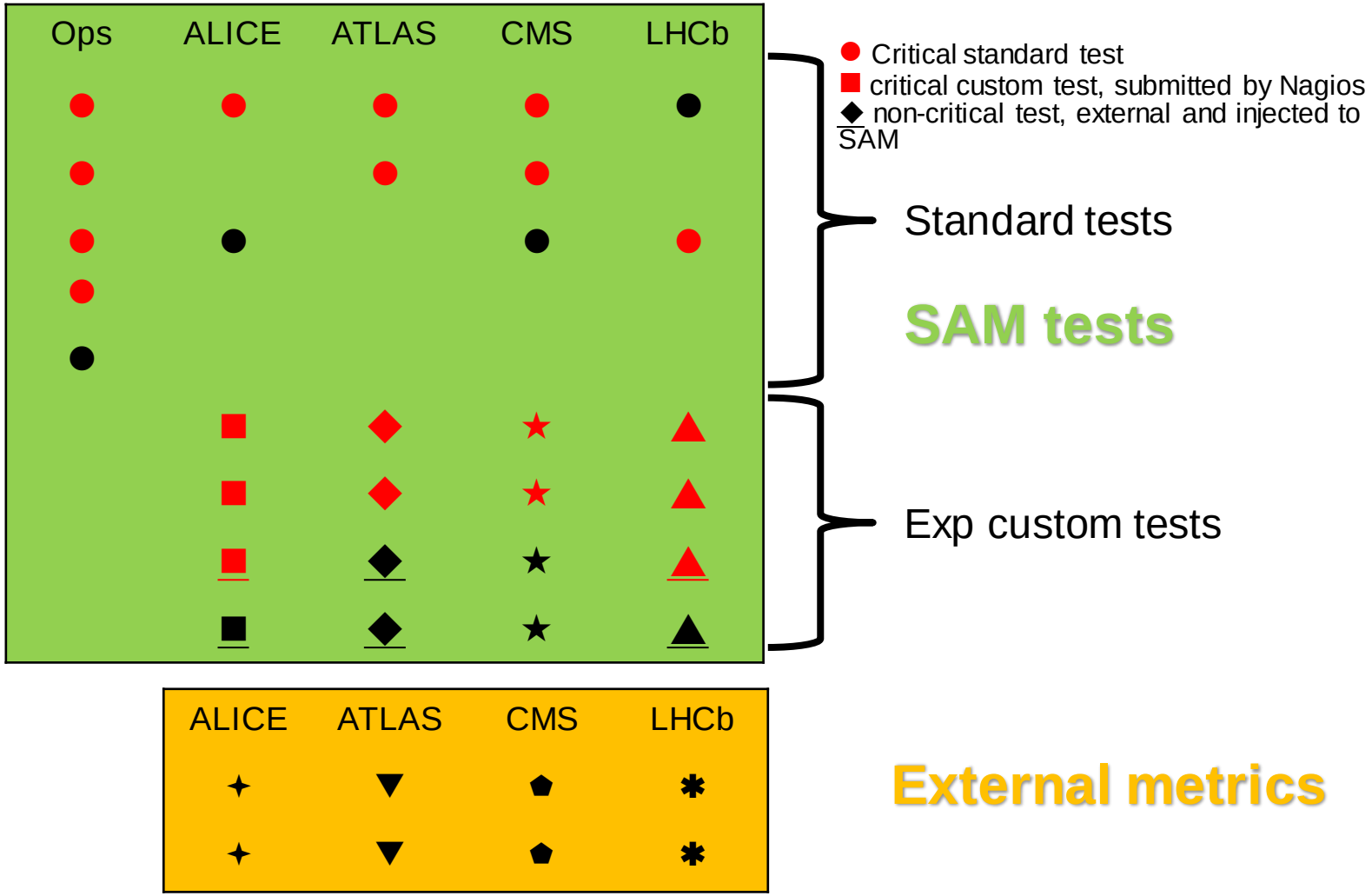
Basic concepts (1/2)

- Standard tests
  - Developed by EGI and bundled with the official SAM probes
- OPS tests
  - Tests run with an OPS proxy; they are all standard tests
- Experiment custom tests
  - Custom tests developed by an experiment and run with an experiment proxy
    - Submitted by a Nagios box, or
    - Submitted by other test systems and published in SAM
- Critical tests
  - Tests whose result is used to determine the state of a service instance (and hence the service and the site availability)
- Other quality metrics outside the SAM framework
  - E.g. quality of data transfers, success rate of typical jobs (Hammercloud, Job Robot, DIRAC), etc.

Basic concepts (2/2)

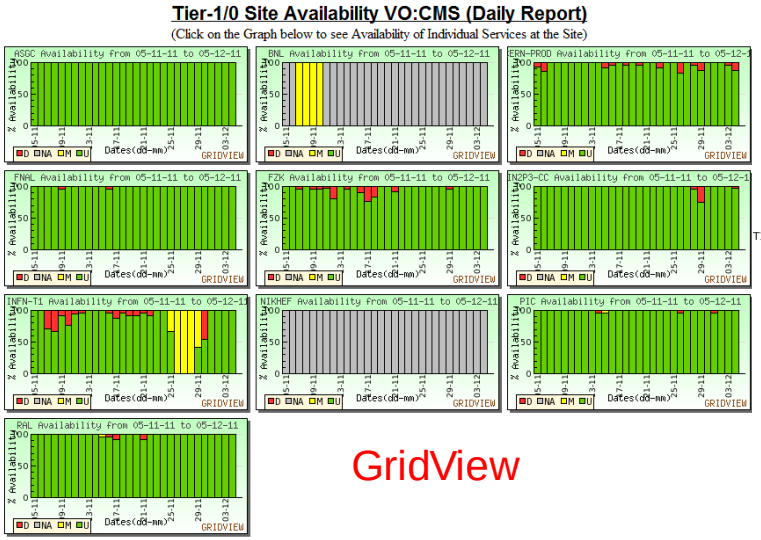
- Gridview availability
  - Used primarily by the WLCG management
  - Available for all the WLCG VOs and OPS
- Dashboard availability
  - Calculated by a Dashboard application (but the algorithm is the same)
  - Used by the experiment operations teams
  - May use different critical tests
- ACE availability
  - Not yet in production for the experiments (pending validation) but so for OPS
  - Will soon calculate all availabilities (possibly many per VO)

Schematic view

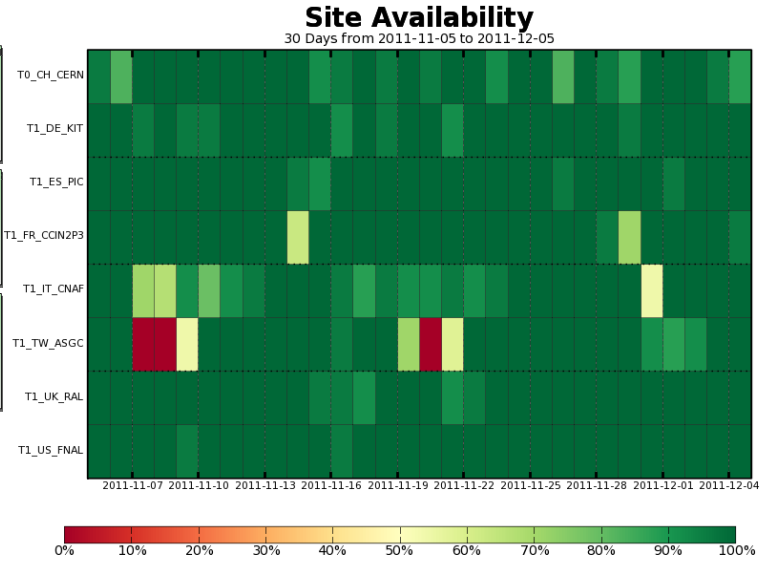


CERN IT Department
CH-1211 Geneva 23
Switzerland
www.cern.ch/it

Availability displays

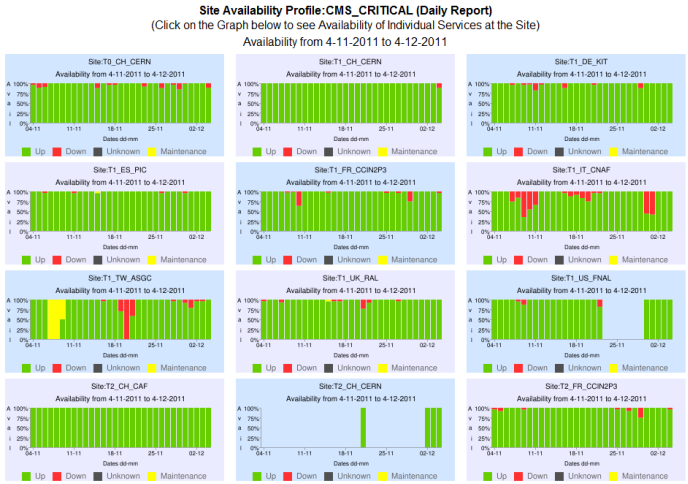


GridView

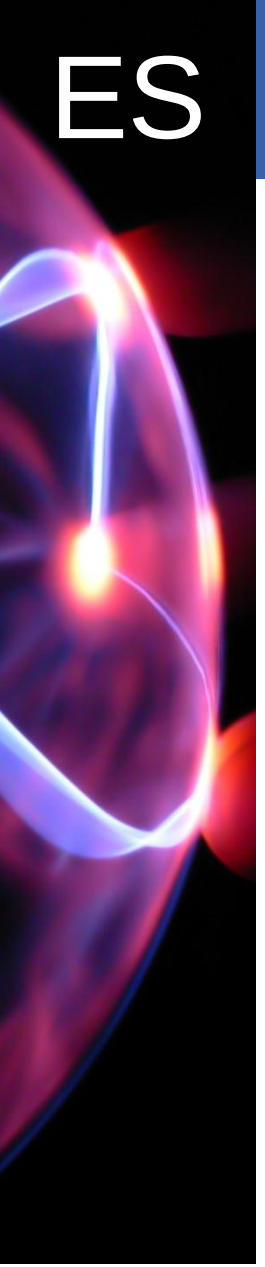


Dashboard

myWLCG



The site availability and usability



- Availability: technical definition
  - The fraction of time a site passes all the SAM critical tests
  - Provided for OPS and the experiments
    - Can be very different as it depends on choice of critical tests
- Usability
  - The fraction of time a site is usable by an experiment
  - It should be easy to interpret
  - It should be a realistic representation of the site usability

What we have and use today

- OPS tests run on all EGI sites
  - ⇒ OPS availability
- VO tests run on all WLCG sites
  - Some standard, some VO custom
- Gridview calculates the VO availability
  - According to a set of critical tests
- The Dashboard calculates another VO availability
  - According to another set of critical tests
- Why so many availabilities? Is it really necessary?

ES OPS (critical) tests

CERN IT Department

Test name	Service
org.sam.CE-JobSubmit	CE
org.sam.CREAMCE-JobSubmit	CREAM-CE
hr.srce.CREAMCE-CertLifetime	CREAM-CE
hr.srce.CADist-Check	CREAM-CE, CE
hr.srce.GRAM-CertLifetime	CE
hr.srce.SRM2-CertLifetime	CE
org.sam.WN-Bi	CREAM-CE, CE
org.sam.WN-Csh	CREAM-CE, CE
org.sam.WN-Rep	CREAM-CE, CE
org.sam.WN-SoftVer	CREAM-CE, CE
org.sam.SRM-GetSURLs	SRMv2
org.sam.SRM-GetTURLs	SRMv2
org.sam.SRM-LsDir	SRMv2
org.sam.SRM-Put	SRMv2
org.sam.SRM-Ls	SRMv2
org.sam.SRM-Get	SRMv2
org.sam.SRM-Del	SRMv2
org.bdii.Entries	Site-BDII
org.gstat.SanityCheck	Site-BDII

Test name	Service
org.osg.certificates.cacert-expiry	OSG-CE
org.osg.general.ping-host	OSG-CE
org.osg.globus.gram-authentication	OSG-CE
org.osg.general.osg-directories-CE-permissions	OSG-CE
org.osg.general.osg-version	OSG-CE
org.osg.srm.srmping	OSG-SRMv2, OSG-BestmanXrootd
org.osg.srm.srmcp-readwrite	OSG-SRMv2, OSG-BestmanXrootd
org.osg.globus.gridftp-simple	OSG-GridFtp
org.arc.ARC-STATUS	ARC-CE
org.arc.csh	ARC-CE
org.arc.GRIDFTP	ARC-CE
org.arc.LFC	ARC-CE
org.arc.SRM	ARC-CE
org.arc.Jobsubmit	ARC-CE
org.arc.AUTH	ARC-CE
org.arc.CA-VERSION	ARC-CE
org.arc.SW-VERSION	ARC-CE

- Only standard tests (by definition)
- Only critical tests in these tables (other tests are submitted)

ALICE tests

Test name	Service	Critical in GV	Critical in DB
org.sam.CREAMCE-DirectJobSubmit	CREAMCE	Y	Y
org.sam.CREAMCE-JobSubmit	CREAMCE	Y	Y
org.sam.WN-sft-vo-swdir	CREAMCE	Y	Y
VOBOX-org.alice.vobox-PM	VOBOX	Y	Y
VOBOX-org.alice.vobox-PR	VOBOX	Y	Y
VOBOX-org.alice.vobox-PSR	VOBOX	Y	Y
VOBOX-org.alice.vobox-SA	VOBOX	Y	Y
VOBOX-org.alice.vobox-UPR	VOBOX	Y	y

- Standard tests in red
- Only one set of critical tests
- All tests are critical

ES ATLAS tests

CERN IT Department

Test name	Service	Critical in GV	Critical in DB
org.sam.CE-JobSubmit	CE	Y	Y
org.sam.CREAMCE-JobSubmit	CREAMCE	Y	Y
org.atlas.WN-swtag	CE	Y	Y
org.atlas.WN-swspace	CE	Y	Y
org.atlas.WN-FrontierSquid	CE	N	N
org.atlas.WN-LocalFileAccess	CE	N	N
org.atlas.WN-gangarobot_panda	CE	N	N
org.atlas.WN-gangarobot_wms	CE	N	N
org.atlas.GetATLASInfo	SRM	N	N
org.atlas.SRM-VOPut	SRM	Y	Y
org.atlas.SRM-VOGet	SRM	Y	Y
org.atlas.SRM-VODel	SRM	Y	Y
org.atlas.SRMLs	SRM	N	N
org.atlas.SRMLsDir	SRM	N	N

- Standard tests in red
- Only one set of critical tests
- Only basic infrastructure tests are critical
- Other custom tests run but not critical

CMS tests

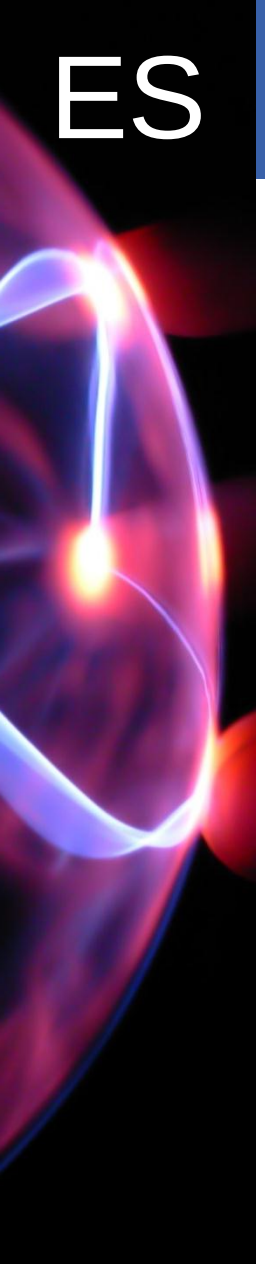
Test name	Service	Critical in GV	Critical in DB
org.sam.CE.JobSubmit	CE	Y	Y
org.sam.CREAMCE.JobSubmit	CREAMCE	Y	Y
org.sam.glexec.CE-JobSubmit	CREAMCE	N	N
org.sam.glexec.CREAMCE-JobSubmit	CREAMCE	N	N
org.cms.WN-basic	CE	N	Y
org.cms.WN-swinst	CE	N	Y
org.cms.WN-mc	CE	N	Y
org.cms.WN-analysis	CE	N	Y
org.cms.WN-frontier	CE	N	Y
org.cms.WN-squid	CE	N	Y
org.cms.glexec.WN-gLExec	CE	N	N
org.cms.SRM-GetPFNFromTFC	SRM	Y	Y
org.cms.SRM-VOPut	SRM	Y	Y
org.cms.SRM-VOGet	SRM	Y	Y
org.cms.SRM-VODel	SRM	N	N
org.cms.SRM-VOGetTURLs	SRM	N	N
org.cms.SRM-VOLs	SRM	N	N
org.cms.SRM-VOLsDir	SRM	N	N

- Standard tests (or equivalent to) in red
- Two sets of critical tests: minimal for Gridview, complete for Dashboard
- Only very basic infrastructure tests are critical in Gridview
- Other custom tests run but critical only for Dashboard

LHCb tests

Test name	Service	Critical in GV	Critical in DB
org.lhcb.LFC-Ping	LFC	N	N
org.lhcb.LFC-Read	LFC	N	N
org.lhcb.LFC-Readdir	LFC	N	N
org.lhcb.LFC-Replicate	LFC	N	N
org.sam.CE-JobSubmit	CE	Y	Y
org.sam.CREAMCE-JobSubmit	CREAMCE	N	N
org.sam.glexec.CE-JobSubmit	CE	N	N
org.sam.CREAMCE.DirectJobSubmit	CREAMCE	N	N
org.lhcb.WN-CondDB	CE	N	N
org.lhcb.WN-lhcb-FileAccess	CE	N	N
org.lhcb.WN-sft-brokerinfo	CE	Y	Y
org.lhcb.WN-sft-csh	CE	Y	Y
org.lhcb.WN-sft-lcg-rm-gfal	CE	Y	Y
org.lhcb.WN-sft-voms	CE	Y	Y
org.lhcb.WN-sft-vo-swdir	CE	Y	Y
org.lhcb.WN-CE-lhcb-job-Boole	CE	N	N
org.lhcb.WN-CE-lhcb-job-Brunel	CE	N	N
org.lhcb.WN-CE-lhcb-job-DaVinci	CE	N	N
org.lhcb.WN-CE-lhcb-job-Gauss	CE	N	N
org.lhcb.WN-CE-lhcb-job-install	CE	N	N
org.lhcb.WN-CE-lhcb-job-os	CE	N	N
org.lhcb.WN-CE-lhcb-job-queues	CE	N	N
org.lhcb.SRM-Dirac-Unit	SRM	N	N
org.lhcb.SRM-GetLHCbInfo	SRM	Y	Y
org.lhcb.SRM-VODel	SRM	Y	Y
org.lhcb.SRM-VOGet	SRM	Y	Y
org.lhcb.SRM-VOLs	SRM	Y	Y
org.lhcb.SRM-VOLsDir	SRM	Y	Y
org.lhcb.SRM-VOPut	SRM	Y	Y

Problems with current status



- OPS tests
  - Sites are very familiar with them and look at them
  - Not useful to experiments as they may test different services than those used by them and test results may depend on the VO of the proxy
- Gridview availabilities are too good
  - Too few tests are critical!
  - Largely uncorrelated to the “real” usability
  - Included in a monthly report to the WLCG
- On the other hand VO custom tests may be obscure for sites
- There are site quality metrics that are not measured by SAM
  - E.g. CMS Job Robot, HammerCloud, data transfer quality etc.

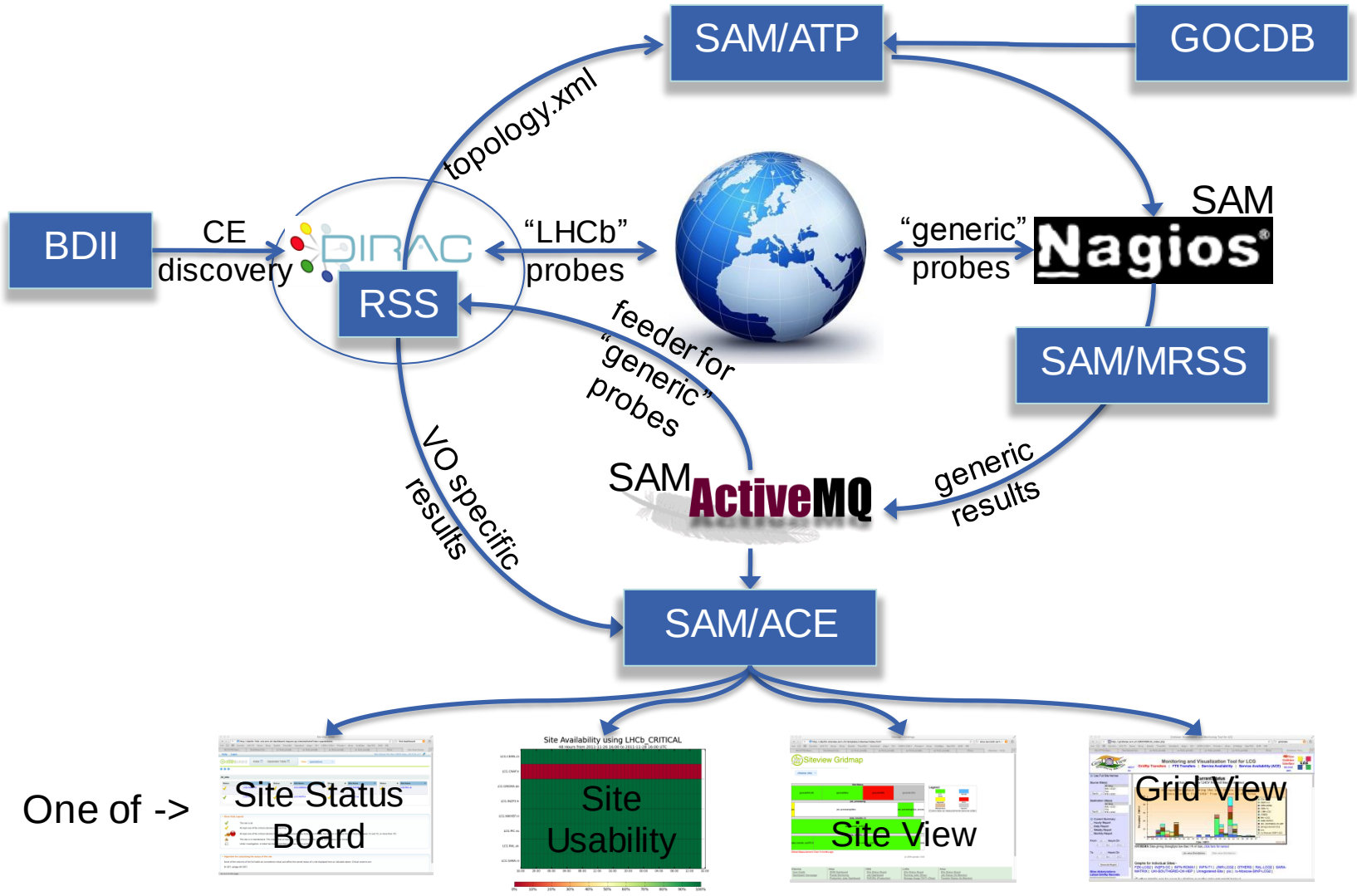
Current approach: simple tests

- Experiments run a subsample of the "standard" tests with their credentials
  - Note that the only standard tests which make sense to be run with an experiment proxy are
    - `org.sam.*CE-JobSubmit`
    - `org.sam.SRM-*`
    - (LFC tests)
- Limitations
  - Success of the standard tests is necessary but not sufficient for the site to be usable
  - Easy? Yes, sites are very familiar with them
  - Realistic? No

Alterative approach: experiment availability as usability

- To be a realistic estimate all relevant metrics must be expressed as SAM tests
  - In the real world many relevant metrics come from other sources
- The resulting set of SAM tests will strongly depend on experiment-specific functionality
- There will be many tests not trivial to interpret for a non-expert
- ⇒ Realistic? Yes
- ⇒ Easy to understand? Yes, if everything is properly documented

Example: a possible LHCb setup



LHCb setup

- LHCb Dirac Resource Status System (RSS)
  - Aggregates many different monitoring sources
  - Decides with LHCb policies how to operate
- LHCb Nagios Ops (generic) tests are testing the basic site functionality / availability
  - Results are fed back to the RSS for further decisions
- LHCb RSS decisions/results are fed into ACE
  - Further usage for availability calculation
  - Two result types for “LHCb” and “Sites”
- Visualization tool to be decided – should be one

⇒ A realistic view of LHCb grid operations

Alternative approach: use another estimator

- Use an estimator of the site usability which is a function of arbitrary metrics (possibly including availability)
  - $U(site) = F(M_1, \ldots, Mn)$
  - $U(site) \in \{good, bad\}$
  - Calculate *U* daily
  - Use metrics related to high-level functionality (e.g. transfers, job success, …)
  - Show *U* together with the original metrics (M, … Mn)
  - Provide adequate documentation

CERN IT Department
CH-1211 Geneva 23
Switzerland
www.cern.ch/it

Limitations of this approach

- Requires to read the documentation to fully understand all the metrics
- Metrics may be different for different experiments
- Easy? Yes, if high level information is enough and documentation is good
- Realistic? Yes

Example: CMS Site Readiness

CERN IT Department

T2_AT_Vienna

Site Readiness Status:	R	R	R	R	W	R	R	R	R	R	R	W	W	R	R							
Daily Metric:	O	O	O	O	O	O	O	O	E	E	E	O	O	O	O	O	O	E	E	O	O	
Maintenance:	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	
Maintenance (Topology):	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	
Job Robot:	99%	100%	100%	100%	100%	98%	97%	100%	66%	16%	100%	99%	98%	99%	100%	100%	100%	73%	100%	91%	100%	
SAM Availability:	100%	100%	100%	100%	100%	100%	100%	100%	72%	12%	100%	84%	100%	100%	100%	100%	100%	100%	100%	96%	100%	
Good T2 links from T1s:	8/8	8/8	8/8	8/8	8/8	8/8	8/8	8/8	0/8	0/8	0/8	8/8	8/8	8/8	8/8	8/8	7/8	8/8	2/8	8/8	8/8	
Good T2 links to T1s:	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	4/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	
Active T2 links from T1s:	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
Active T2 links to T1s:	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
	18	19	20	21	22	23	24	25	26	27	28	29	30	01	02	03	04	05	06	07	08	09
	Nov													Dec								

Report made on 2011-12-09 03:30:01 (UTC)

* = Due to operational errors, the metric has been corrected manually (!= $SB).

-- = Errors on weekends are ignored on Site Readiness computation for T2s [+info]

"Site Readiness Status" as defined in Site Commissioning Twiki:
- R = READY
- W = WARNING
- NR = NOT-READY
- SD = $SCHEDULED-DOWNTIME

"Daily Metric" as boolean AND of all invidual metrics:
- O = OK (All individual metrics above Site Commissioning Thresholds; "n/a" ignored)
- E = ERROR ($some individual metrics below Site Commissioning Thresholds)
- SD = $SCHEDULED-DOWNTIME

- INDIVIDUAL METRICS -

"Scheduled Downtimes": site maintenances
- Up = Site is not declaring $scheduled-downtime
- SD = full-site in $D OR all CMS $E(s) in $D OR all CMS CE(s) in $D
- ~ = $some $E or CE services (not all) Downtime
- UD = full-site in UD OR all CMS $E(s) in UD OR all CMS CE(s) in UD

"Job Robot":
- = Job success rate is ≥ 80%
- = Job success rate is < 80%
- = Jobs submitted but not finished
- n/a = Job success rate is n/a

"Good Links":
- = at least half of links have 'good' transfers (i.e. with transfer quality > 50%)
- = Otherwise

"SAM Availability":
- = $AM availability is ≥ 80%
- = $AM availability is < 80%

"Active T2 links to T1s":
- = Site has ≥ 2 DDT-commissioned links to T1 sites
- = Otherwise

"Active T2 links from T1s":
- = Site has ≥ 4 DDT-commissioned links from T1 sites
- = Otherwise

Custom display

Site Readiness in Site Status Board

CERN IT Department

Final considerations (1/2)

- There is no subset of the standard tests which is representative of the site usability for an experiment. Therefore:
  - The standard tests must be expanded, or
  - The VO custom tests must be used
- But new standard tests should be general and in most cases VO custom tests cannot be generalized
  - The largest common set would be too small
- Therefore, VO custom tests are necessary

Final considerations (2/2)

- Is availability the best metric to measure usability or something else can be defined?
  - Must be both realistic and understandable

Advantages	Disadvantages
Availability	
Compatible with GridView	SAM developed for functional tests (OK/WARNING/ERROR): not all metrics fit in (e.g. job success rate)
All metrics published in Nagios	Tests of complex workflows must be artificially converted into tests of “service instances”
Usability	
Easier to combine heterogeneous metrics	Requires a visualisation tool other than GridView (e.g. the Site Status Board)
Easier to drill down to input metrics	Combination algorithms may differ from one experiment to another