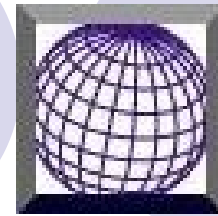


Monitoring the Availability of Grid Services using SAM and Gridview



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Outline of the Presentation



- Introduction to SAM and GRIDVIEW
- Goals
- Service Monitoring and Visualization Architecture
- Grid Services Monitored
- Computation of Availability Metrics
- Visualization Components
- On-going Work
- Target Users



Introduction



- SAM and GRIDVIEW are complementary monitoring tools developed and deployed in WLCG
- SAM is the Service Availability Monitoring Framework (Developed by IT-GD-OPS, CERN)
- GRIDVIEW is a Monitoring and Visualization Tool (Developed by BARC, India)
- GRIDVIEW also monitors Data Transfers and Job Status, here we focus on Service Availability Monitoring and Visualization



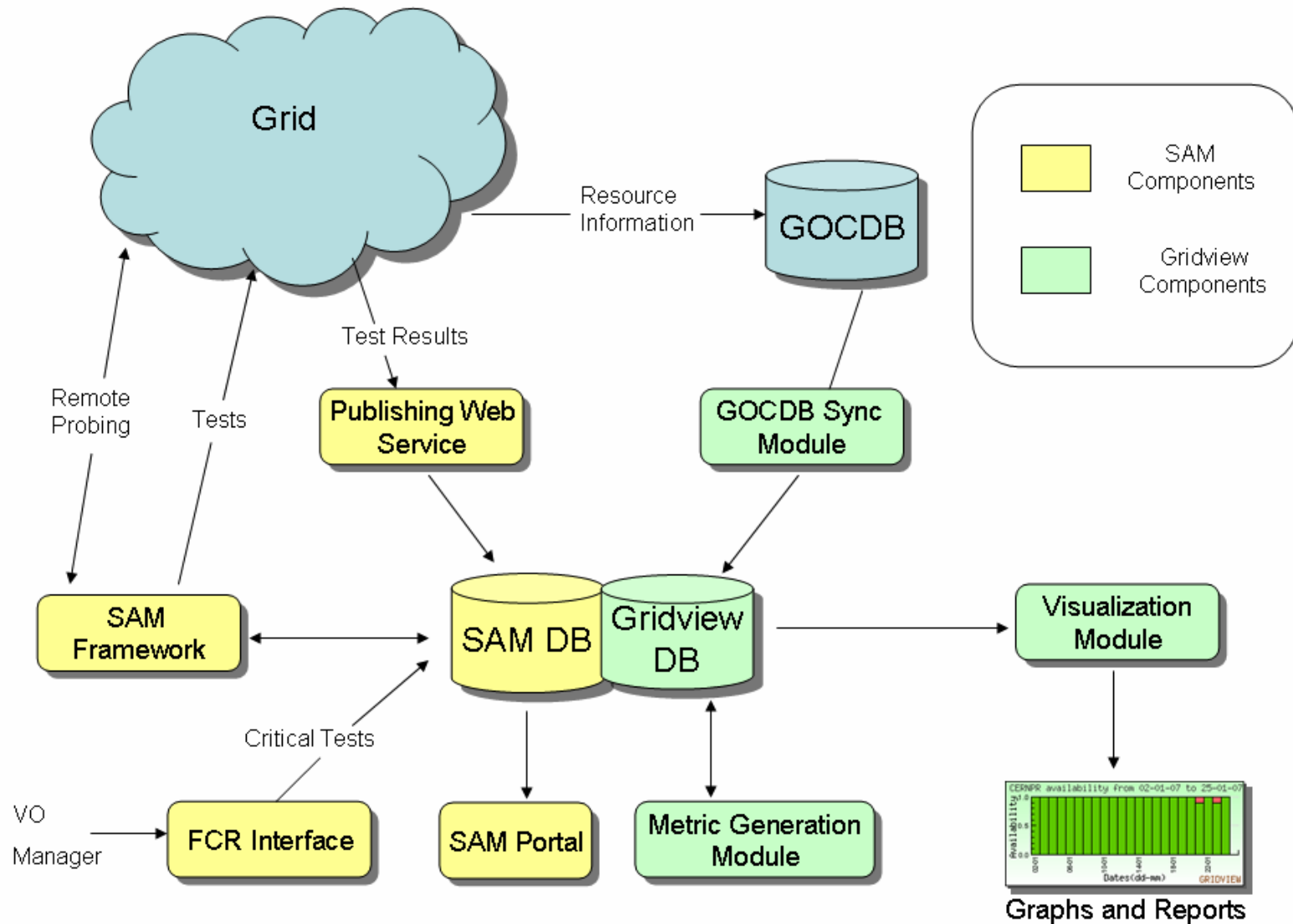
Goals



- To provide a service level view, a snapshot of the current operational status of the Entire Grid
- To help the operations team locate and troubleshoot the problems
- To monitor the Availability and Reliability of various services and sites in the Grid Infrastructure
- To provide VO specific view of the service, enable each VO to look at the service in its own perspective



Service Monitoring and Visualization Architecture





- The various components of the Architecture include
 - SAM Framework
 - Service Discovery Mechanism
 - Transport Mechanism
 - Schema/Repository
 - VO Policy Enforcement Mechanism
 - Metric Generation Module
 - Visualization Module
 - Programmatic Interface



SAM Framework



- SAM Framework launches remote probes to Grid Services
- It Includes
 - Sensors for Grid Services
 - A set of functional tests for each service
 - Test submission Module
 - Periodically invokes service sensors, that is launches tests to Grid Services
 - Web Service Client
 - Publishes test results to the central web service



Service Discovery Mechanism



- Information services such as GOCDDB and BDII are sources of information about resources and services
- GOCDDB:
 - Grid Resources, services in EGEE/WLCG
 - Service maintenance schedules
 - GridView maintains a local synchronized replica of relevant tables in GOCDDB which is used by SAM for service discovery
- SAM also uses Information System (BDII) for Dynamic Discovery



Transport Mechanism



- A web services based transport mechanism is used for publishing new test definitions and test results to the central database
- Jointly developed by SAM (client) and Gridview (server) teams.
- A transport schema (format) is defined for publishing data
- Custom data serialization



Schema/Repository



- A specifically designed and well optimized schema is used to archive the data
- SAM and GridView Databases are tightly coupled sharing tables across each other
- SAM DB hosts test related tables and test results
- GridView DB stores all derived service Availability Metrics



VO Policy Enforcement Mechanism



- VOs can define their own specific tests for services
 - These tests may either be included in SAM, or
 - They may themselves execute the tests and publish results
- They can define their own criteria for Service Availability
 - VO Managers can define a set of critical tests using FCR (Freedom of Choice for Resources) interface
 - Service Availability metrics are computed per VO based on these critical tests



Metric Generation and Visualization



- SAM raises an alarm for failure of every critical test
- Gridview's Metric Generation Module
 - Computes Service Availability Metrics based on SAM test results
- Gridview's Visualization Module
 - Display of test results and Service Availability Metrics in graphical form
 - Multiple views with various levels of details and provision to drill down to view more details



Programmatic Interface



- SAM provides programmatic interface to the SAM-GRIDVIEW repository
- The Request/Response format used is http/xml
- Used by sites and experiments to integrate test results and service metrics into their local monitoring tools
- Used by CIC portal to integrate test failure alarms on COD Dashboard



Grid Services Monitored



- We classify Grid Services broadly in two Categories
 - Site Services
 - Central Services
- Following Grid Services in WLCG/EGEE are currently monitored
 - Site Services : CE, SE/SRM, sBDII
 - Central Services : RB, BDII, LFC, FTS



Computation of Availability Metrics



- Gridview computes Service Availability per VO based on Critical Tests
- Service Availability is computed
 - per Service Instance
 - per Service Type (eg. CE) for a site
 - Per Site
 - Aggregate of all Tier-1/0 sites in WLCG
- Computation of Aggregate Metrics
 - Redundant services are ORed
 - Critical services are ANDed
- Different periodicities like Hourly, Daily, Weekly and Monthly



Visualization Components



- Display of test results
 - SAM portal
 - Display of latest test results using HTML tables
 - Gridview Visualization of SAM Test Results
 - Bar Graphs indicating status
 - Summary tables displaying result summaries
 - Detailed results displaying output of the tests (useful for troubleshooting purposes)
- Visualization of Service Availability Metrics in Gridview
- All Visualization components display metrics for the specified VO



Visualization of Availability Metrics



- GridView displays include Graphs and Reports for
 - Central Service Availability (FTS, LFC, RB)
 - Aggregate tier-1 site Availability
 - Site-wise availability for individual tier-1 sites
 - Site-wise service availability of tier-2 sites (grouped by associated VOs)
 - Detailed availability of various services (CE, SE, SRM) and their individual instances running at a particular site
- Full traceability from aggregate Availability to detailed SAM test results
- Provision for saving user preferences based on certificates

Service Availability Monitoring : Central Service Availability



Gridview: Visualization and Monitoring Tool for LCG - Opera

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http://gridview.cern.ch/GRIDVIEW/same_index.php

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Monitoring and Visualization Tool for LCG

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

OPS Central Service Availability : Current Status

Overall

OPS availability during the last 24 hrs

Individual Service Availability

(Click on the Graph below to see Individual Service Instance Availability)

Service	Availability
BODII	1.0
FTS	1.0
LFC	1.0
RB	1.0

Back

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS

Service: Overall

Tier-1 Site: None

Sites for VO: Any

Tier-2 Site: 339, 340

Current Status

From: 15/3/2007 To: 15/3/2007

Display Graphs Set Defaults

Service Availability Monitoring : FTS Instance Availability



Gridview: Visualization and Monitoring Tool for LCG - Opera

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Monitoring and Visualization Tool for LCG

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS
Service: Overall
Tier-1 Site: None
Sites for VO: Any
Tier-2 Site: 339, 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 15/3/2007 To: 15/3/2007

Display Graphs Set Defaults

OPS FTS Availability : Current Status

FTS Overall

Individual FTS Instance Availability

(Click on the Graph below to see the SAM test results)

Instance	Availability Status (Last 24 hrs)
ASGC : fts.grid.sinica.edu.tw	1.0 (Green)
BNL : lcg03.usatlas.bnl.gov	1.0 (Green)
CERNPR : prod-fts-ws.cern.ch	1.0 (Green)
CERNPR : tiertwo-fts-ws.cern.ch	1.0 (Green)
CNAF : fts.cr.cnaf.infn.it	0.0 (Red)
FZK : fts-fzk.gridka.de	1.0 (Green)
IN2PCC : ceclegftsprod01.in2p3.fr	0.0 (Red)
KCRC1 : dg08.cc.kek.jp	0.0 (Red)
PIC : fts.pic.es	1.0 (Green)

Service Availability Monitoring : Aggregate T1 Site Availability



Gridview: Visualization and Monitoring Tool for LCG - Opera

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http://gridview.cern.ch/GRIDVIEW/same_index.php

Find in page Find next Voice Author mode Show Images Fit to width 100%

Grid View **Monitoring and Visualization Tool for LCG**

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS

Service: Overall

Tier-1 Site: None

Sites for VO: Any

Tier-2 Site: 339, 340

- Current Status
- Hourly Report
- Daily Report
- Weekly Report
- Monthly Report

From: 15/4/2006 To: 15/3/2007

Display Graphs Set Defaults

New tab Gridview: Visualizatio...

Aggregate Tier-1/0 Site Availability

Hourly Report

(Click on the Graph below to see Site-wise Details)

Daily Report

(Click on the Graph below to see Site-wise Details)

Weekly Report

(Click on the Graph below to see Site-wise Details)

Monthly Report

(Click on the Graph below to see Site-wise Details)

Service Availability Monitoring : Tier-1 Site Availability



Gridview: Visualization and Monitoring Tool for LCG - Opera

File Edit View Bookmarks Widgets Tools Help

New Open Save Print Find Home Panels

http://gridview.cern.ch/GRIDVIEW/same_index.php

Find in page Find next Voice Author mode Show Images Fit to width 30%

Monitoring and Visualization Tool for LCG

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

Tier-1/0 Site Availability : Hourly Report

(Click on the Graph below to see Availability of Individual Services at the Site)

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS

Service: Overall

Tier-1 Site: None

Sites for VO: Any

Tier-2 Site: 339, 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 14/3/2007 To: 15/3/2007

Display Graphs Set Defaults

https://gridview.cern.ch/GRIDVIEW/same_graphs.php?XX=8&Information=SiteDetail&DefVO=15&TestVO=-1&DurationOption=hourly&LComponent=-2&NodeID=-1&TestID=-1&StartDay=14&StartMonth=...

Service Availability Monitoring : Site Detail Availability



Gridview: Visualization and Monitoring Tool for LCG - Windows Internet Explorer provided by CERN

http://gridview.cern.ch/GRIDVIEW/same_index.php

Gridview: Visualization an... x

Monitoring and Visualization Tool for LCG

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS
Service: Overall
Tier-1 Site: CERNPR
Sites for VO: Any
Tier-2 Site: 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 19-1-2007
To: 25-1-2007

Display Graphs
Set Defaults

Sites Abbreviations

W3C HTML 4.01 W3C CSS

Overall Service Availability for site CERNPR : Hourly Report

Individual Service Availability for site CERNPR : Hourly Report

CE availability on 19-01-2007

SE availability on 19-01-2007

SRM availability on 19-01-2007

Service Instance Availability for site CERNPR : Hourly Report

Site Services

(Click on the Graph below to see the SAM test results)

CE : ce101.cern.ch

CE : ce102.cern.ch

CE : ce105.cern.ch

CE : ce106.cern.ch

CE : ce107.cern.ch

SE : castorsrm.cern.ch

(2 items remaining) Downloading picture https://gridview.cern.ch/GRIDVIEW/same_graphs.php?GraphName=RB%23pc%23rb115.cern.ch&Inf

start Gridview: Visualizatio... https://gridview.cern... gridview_MWG_253a... gridview_chep gridview CERN Alert Notification 10:43 AM

Service Availability Monitoring : SAM Test Results



Gridview: Visualization and Monitoring Tool for LCG - Windows Internet Explorer provided by CERN

http://gridview.cern.ch/GRIDVIEW/same_index.php

Monitoring and Visualization Tool for LCG
 Data Transfer | Job Status | Service Availability
 (Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

SAM Test Results for site CERNPR

Test Criticality Defining VO : OPS
 (Click on the Test Result Graph to View Details)

Service	Node	Test Name	Test VO	Test Help	Critical	Test Results						
						na	ok	info	note	warn	error	crit
		Availability										
		CE-sft-brokerinfo	OPS	?	Y							
		CE-sft-caver	OPS	?	Y							
		CE-sft-csh	OPS	?	Y							
		CE-sft-job	OPS	?	Y							
		CE-sft-icg-rm	OPS	?	Y							
		CE-sft-softver	OPS	?	Y							
		CE-freecpu	OPS	?	N							
		CE-runjob	OPS	?	N							
	CE-sft-apel	Atlas		?	N							
		DTeam		?	N							
		LHCb		?	N							
		OPS		?	N							

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS
 Service: Overall
 Tier-1 Site: CERNPR
 Sites for VO: Any
 Tier-2 Site: 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 19 1 2007
 To: 25 1 2007

Display Graphs
 Set Defaults

Sites Abbreviations

W3C HTML 4.01 W3C CSS

Local intranet 100%

start Gridview: Visualizatio... https://gridview.cern... gridview_MWG_25Ja... gridview_chep gridview CERN Alert Notification 10:45 AM

Service Availability Monitoring : Detailed Test Results



Gridview: Visualization and Monitoring Tool for LCG - Windows Internet Explorer provided by CERN

http://gridview.cern.ch/GRIDVIEW/same_index.php

Gridview: Visualization and Monitoring Tool for LCG

Monitoring and Visualization Tool for LCG

Data Transfer | Job Status | Service Availability

(Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

Detailed SAM Test Results

Site : CERNPR Node : ce107.cern.ch Service : CE
 Test Name : CE-sft-job Test VO : OPS Test Help : ?
 Critical : Y Criticality Defining VO : OPS

Timestamp	Status ID	Status Info	Test Env	Result Summary	Detail Result
at 08:13:15 on 15/03/2007	10	ok	Test Env		Detail Result
at 09:14:07 on 15/03/2007	10	ok	Test Env		Detail Result
at 10:12:57 on 15/03/2007	10	ok	Test Env		Detail Result
at 11:13:39 on 15/03/2007	10	ok	Test Env		Detail Result
at 12:12:58 on 15/03/2007	10	ok	Test Env		Detail Result
at 13:13:37 on 15/03/2007	10	ok	Test Env		Detail Result
at 14:13:28 on 15/03/2007	50	error	Test Env	LISTMATCHFAILED	Detail Result
at 15:13:10 on 15/03/2007	10	ok	Test Env		Detail Result
at 16:13:00 on 15/03/2007	10	ok	Test Env		Detail Result
at 17:13:42 on 15/03/2007	10	ok	Test Env		Detail Result
at 18:13:37 on 15/03/2007	10	ok	Test Env		Detail Result
at 19:14:53 on 15/03/2007	10	ok	Test Env		Detail Result
at 20:13:26 on 15/03/2007	10	ok	Test Env		Detail Result
at 21:13:18 on 15/03/2007	10	ok	Test Env		Detail Result
at 22:13:05 on 15/03/2007	10	ok	Test Env		Detail Result
at 23:14:16 on 15/03/2007	10	ok	Test Env		Detail Result
at 00:13:24 on 16/03/2007	10	ok	Test Env		Detail Result
at 01:13:37 on 16/03/2007	10	ok	Test Env		Detail Result
at 02:13:34 on 16/03/2007	10	ok	Test Env		Detail Result

Name	Value
centralSE	lxn1183.cern.ch
submitterDN	/C=CH/O=CERN/OU=GRID/CN=Piotr Nyczzyk 6217

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS
 Service: Overall
 Tier-1 Site: None
 Sites for VO: Any
 Tier-2 Site: 339, 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 16/4/2006
 To: 16/3/2007

Display Graphs
 Set Defaults

Sites Abbreviations

W3C HTML 4.01 ✓ W3C CSS ✓

Service Availability Monitoring : Test output for Debugging



Gridview: Visualization and Monitoring Tool for LCG - Windows Internet Explorer provided by CERN

http://gridview.cern.ch/GRIDVIEW/same_index.php

Gridview: Visualization an... x

Monitoring and Visualization Tool for LCG
[Data Transfer](#) | [Job Status](#) | [Service Availability](#)
 (Version: gridview-3.0.2, Installation Date: Jan 08, 2007)

What do you want ?

- Central Service Availability
- Aggregate Site Availability
- Tier-1 Site Availability
- Tier-2 Site Availability
- Site Detail Availability
- SAM Test Results

Defining VO: OPS
 Service: Overall
 Tier-1 Site: None
 Sites for VO: Any
 Tier-2 Site: 339, 340

Current Status
 Hourly Report
 Daily Report
 Weekly Report
 Monthly Report

From: 23/1/2007 To: 25/1/2007

Display Graphs
 Set Defaults

[Sites Abbreviations](#)

W3C HTML 4.01 W3C CSS

Detailed SAM Test Results

Site : CERNPR Node : ce107.cern.ch Service : CE
 Test Name : CE-sft-job Test VO : LHCb Test Help : ?
 Critical : N Criticality Defining VO : OPS

Timestamp	Status ID	Status Info	Test Env	Result Summary	Detail Result
at 00:09:05 on 23/01/2007	10	ok	Test Env		Detail Result
at 00:13:43 on 23/01/2007	10	ok	Test Env		Detail Result
at 00:42:44 on 23/01/2007	10	ok	Test Env		Detail Result
at 00:58:09 on 23/01/2007	50	error	Test Env	timeout	Detail Result
at 04:55:02 on 23/01/2007	50	error	Test Env	timeout	Detail Result
at 05:13:34 on 23/01/2007	10	ok	Test Env		Detail Result

Generating JDL LHCb file:

```

Executable = "/bin/sh";
Arguments = "-c 'tar xzf testjob.tgz ; export SAME_WORK='pwd'/work ; bin/same-exec -c same.conf -
StdOutput = "testjob.out";
StdError = "testjob.out";
InputSandbox = {"testjob.tgz", "same.conf"};
OutputSandbox = {"testjob.out", "testjob-results.tgz"};
Requirements = other.GlueCEInfoHostName == "ce107.cern.ch";
    
```

Submitting a LHCb job

Local intranet 100%

start Gridview: Visualizatio... https://gridview.cern... gridview_MWG_25Ja... gridview_chep gridview CERN Alert Notification 10:31 AM



- On-going Work in Gridview includes
 - Generation of New Availability Metrics
 - Service Reliability
 - Test Status Summaries (Status over a time interval)
 - Service Status (Over Continuous Time Scale)
 - Providing Standard URL based access to Visual Components in order to enable other tools to integrate them
 - Generation of Site Availability and Reliability Report for WLCG MB



Target Users



- Site Administrators
- VO Administrators
- WLCG Management
- Grid Operations - ROCs/CIC on Duty (COD)
- Experiments



Links



- <https://lcg-sam.cern.ch:8443/sam/sam.py>
- <http://sam-docs.web.cern.ch/sam-docs/>
- http://gridview.cern.ch/GRIDVIEW/same_index.php
- <https://twiki.cern.ch/twiki//bin/view/LCG/GridView>



Thank You

