



Enabling Grids for E-scienceE

Grid monitoring from the VO/User perspective.

Dashboard for the LHC experiments

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On behalf of the Dashboard team

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<http://arda.cern.ch>





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Common requirements regarding VO monitoring



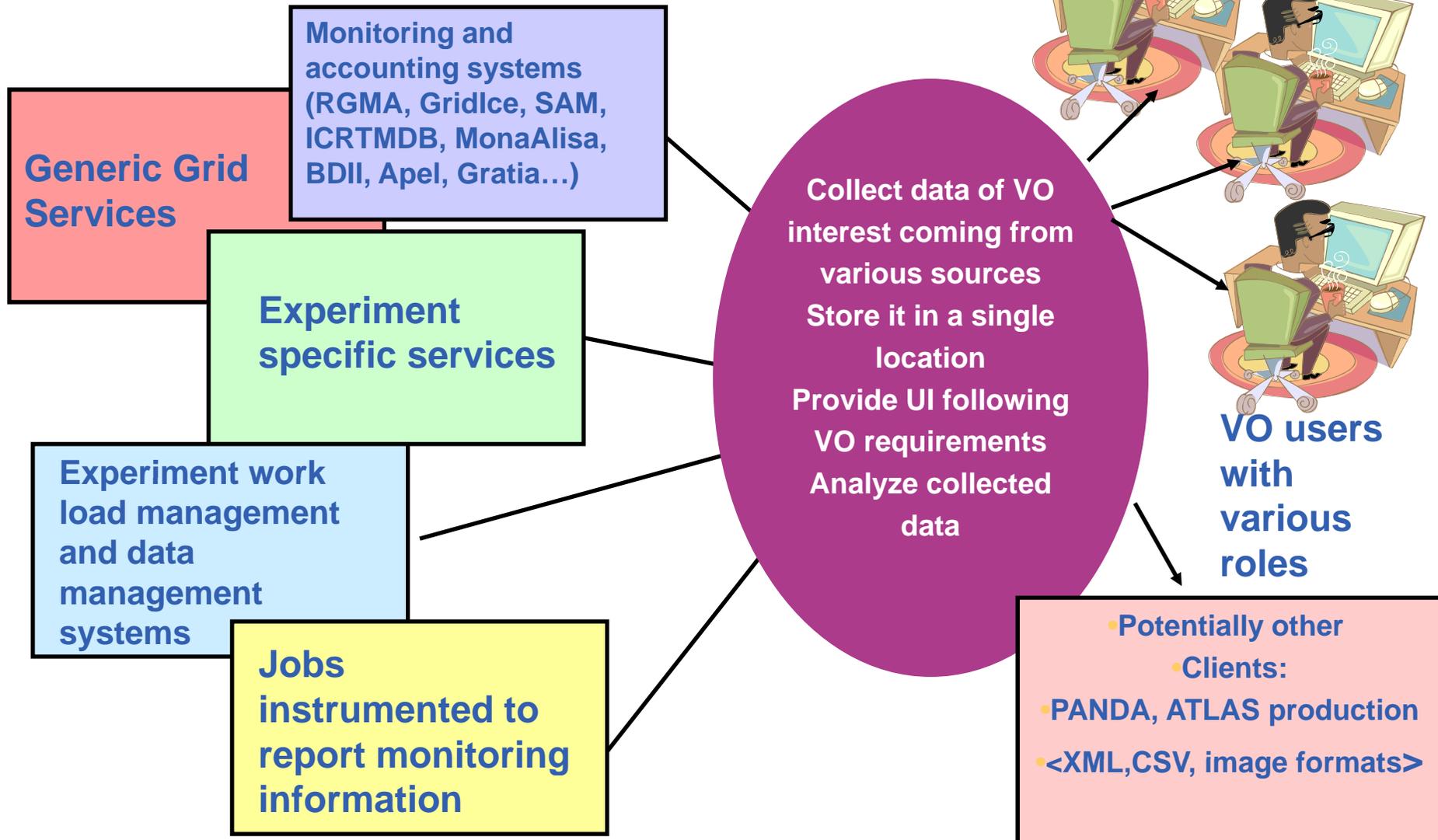
- Should provide transparent and complete picture of the experiment activities on the Grid regardless the underlying infrastructure where the actual job/service is running
- Should combine Grid monitoring data with experiment/application/activity specific information of the VO interest
- Should be able to identify problem of any nature (Grid or application)
- Should satisfy users with various roles (various areas of activities, different scope)
- Should provide high level of flexibility to allow rapid integration with the new requirements
- Scale and perform well



Experiment Dashboard concept

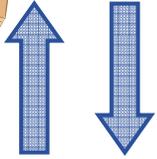


Information sources





Dashboard Framework



Dashboard clients: scripts(pycurl...), cli (optparser + pycurl)
shell based (curl...)

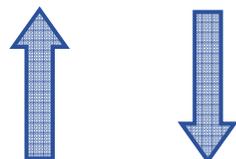
Web application based on Apache + mod python

Multiple output formats: plain text, csv, xml, xhtml

GSI support using gridsite

Web / HTTP Interface

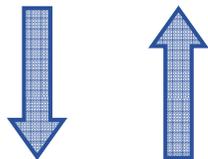
Agents



Agents are running on regular basis.
Collecting data from different sources,
generating/analyzing statistics, managing
alarms

Common configuration and management
and common monitoring mechanism

Data Access Layer (DAO)



DB reading and writing via DAO layer
Connection pooling
Easy to add interface for a different
backend



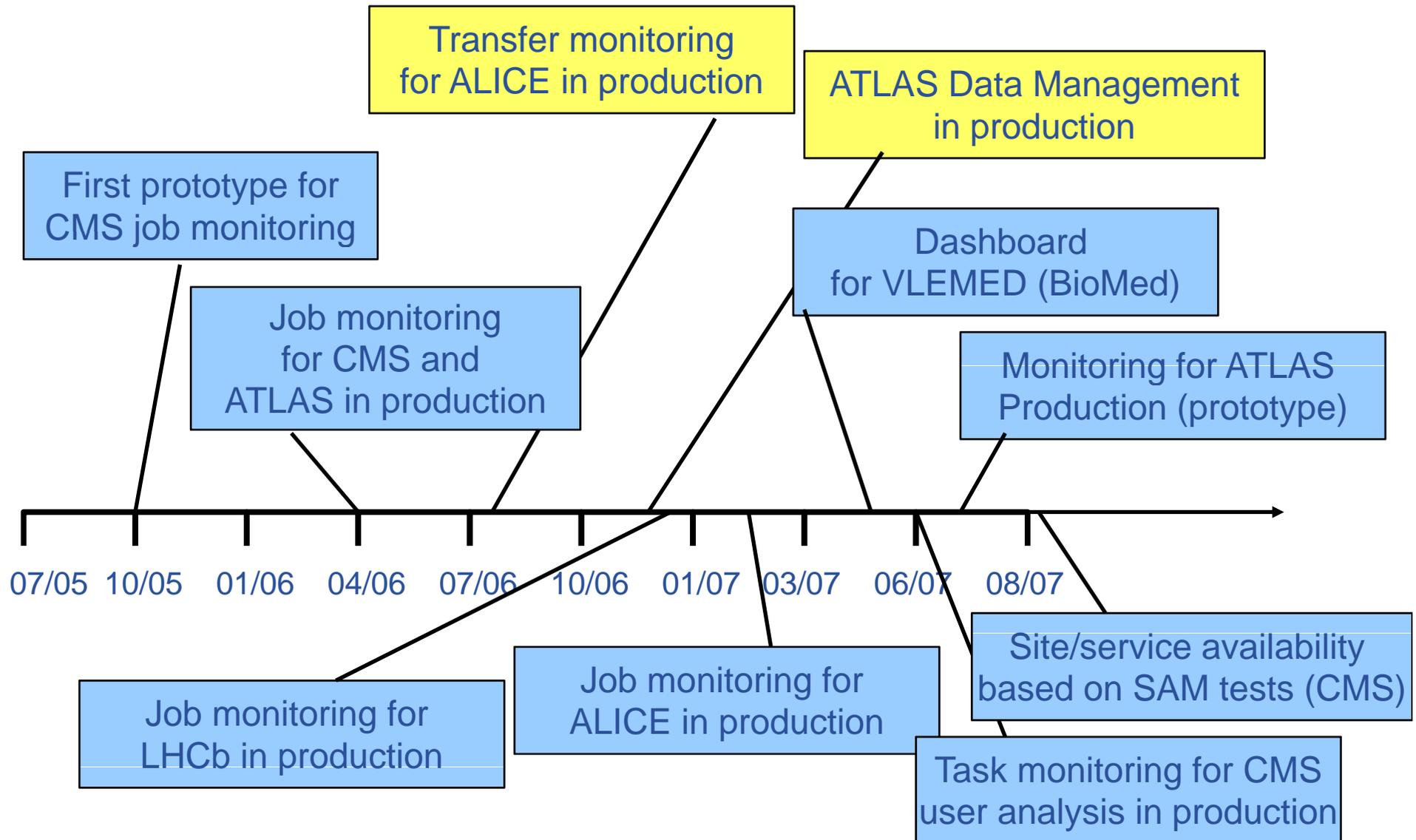
Development team



- *The tool is developed by ARDA (CERN) team in collaboration with MonAlisa (Caltech) developers and participation of ASGC (Taiwan), MSU and JINR (Russia) and LAL (France)*
- *Valuable contribution this year from CERN summer students*

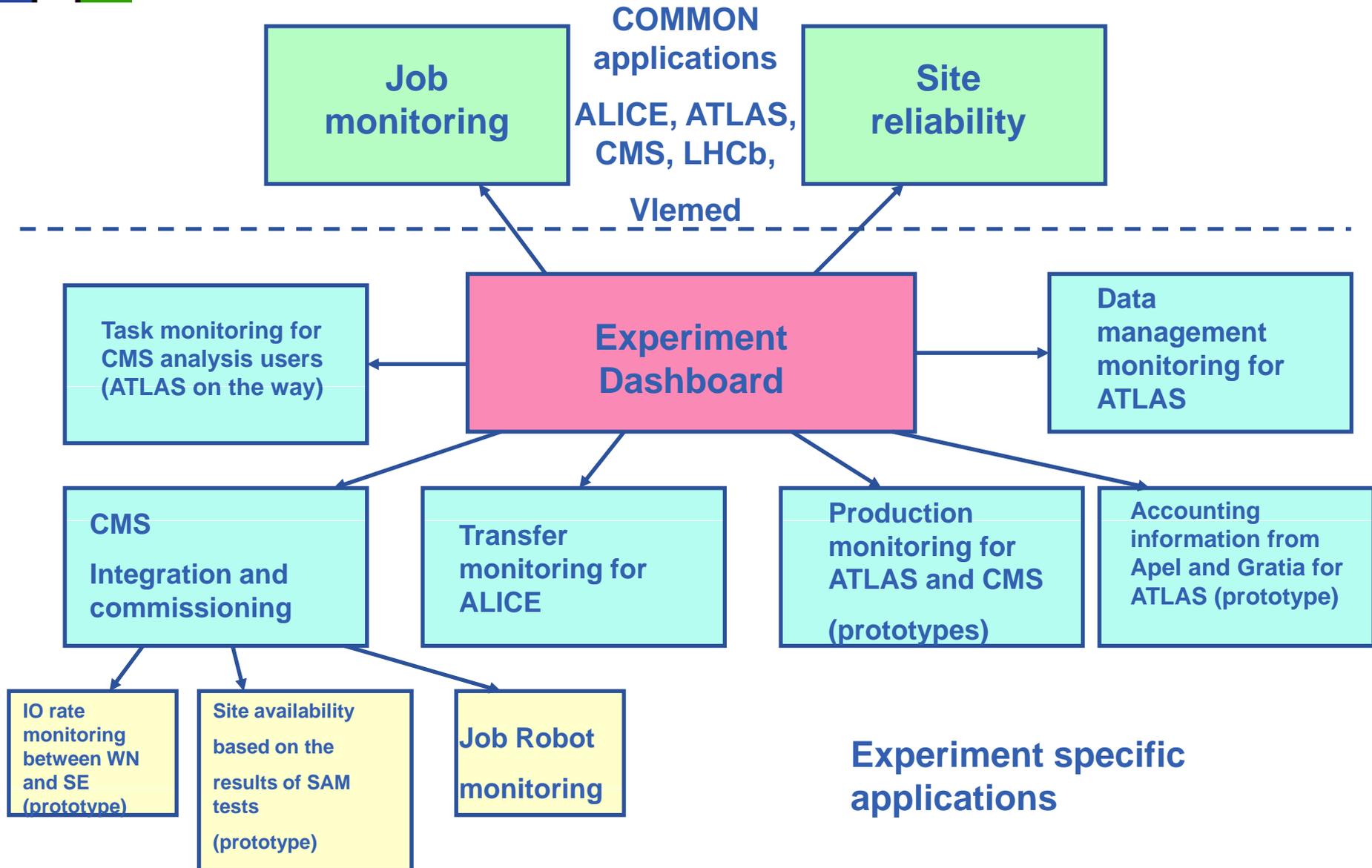


Evolution of the project





Dashboard covers wide range of the activities of the LHC experiments

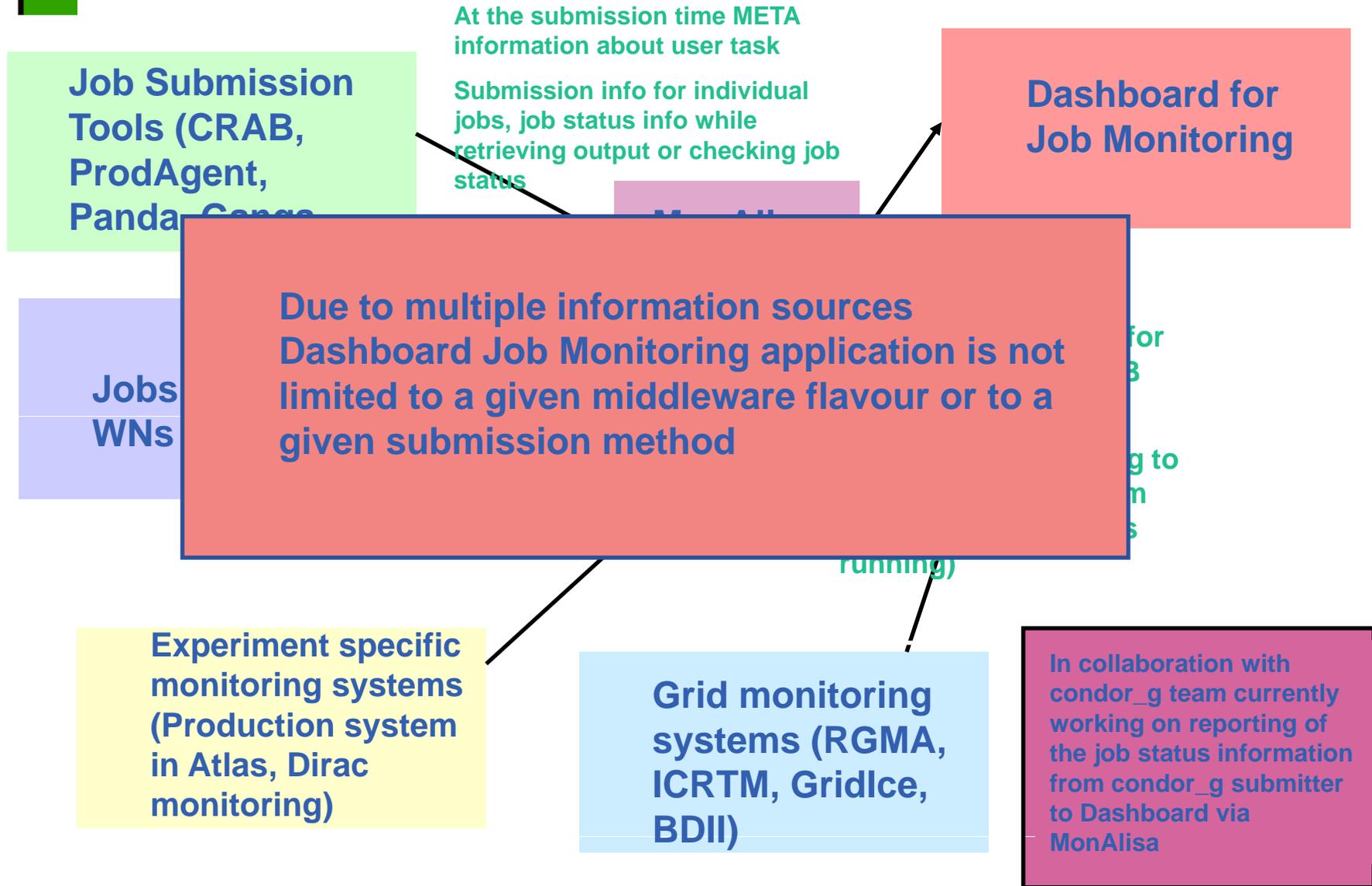




- **What is the status of the jobs**
 - belonging to an individual user/group/VO*
 - submitted to a given site or Grid flavor or via a given resource broker*
 - reading a certain data sample, running a certain application...*
- **If they are pending/running – for how long, where?**
- **If they are finished, whether they failed or ran properly?**
- **If they failed – why?**



Information flow for job monitoring





Example of Job monitoring UI



DAILY JOB SUMMARY

DEFINE PARAMETERS... Select T2s + T1s + T0... Select Activities... Last Week Sort by Activities Info

SHOW PLOT...

Terminated, Submitted, Pending, Running Jobs

Status of Terminated Jobs

Failed Jobs by Reason

Status of Site Load

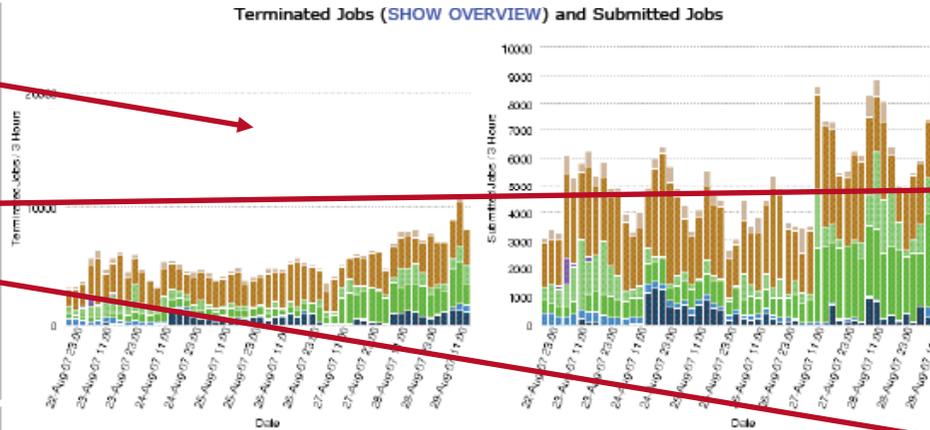
CHOSEN PARAMETERS

Sites: All T2s + T1s + ...

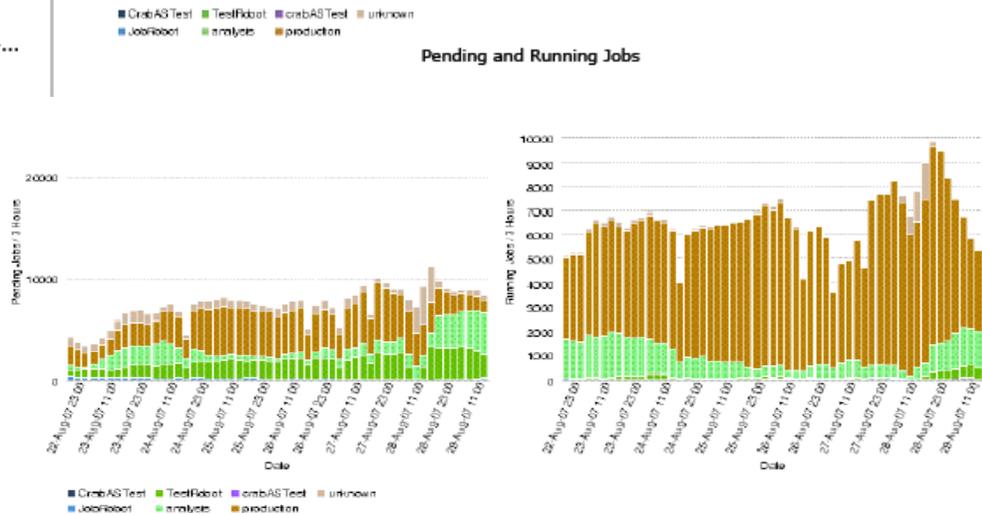
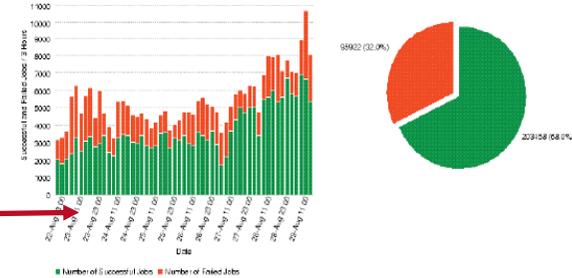
Activities: all

Time Range: Last Week

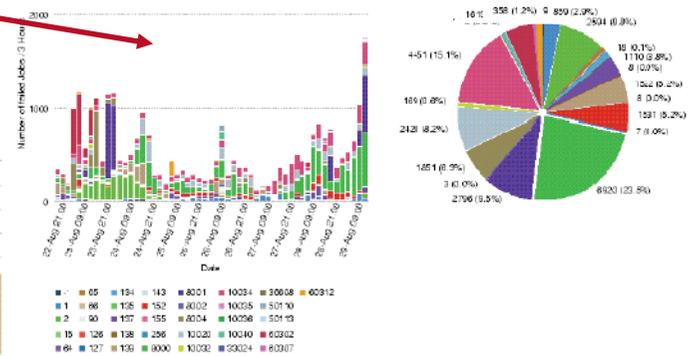
Sort by: Activities



Number of Successful and Failed Jobs (Show Percentage of Successful Jobs)



Distribution of failed Jobs by Application Error Codes (Show Pie Plot)



Show URLs

Show URLs



Monitoring of the analysis tasks for the CMS users

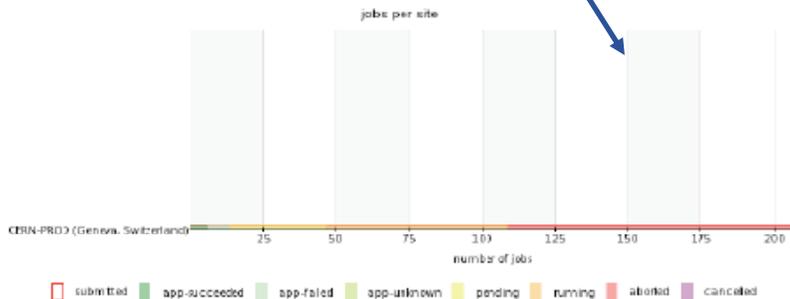


TASK MONITORING

Select a User: Select a Time Range: Plot... [Info](#)

TaskMonitorId	Num of Jobs	Pending	Running	Successful	Failed	Terminated with appl unknown
hinzmann_crab_0_070823_104936	195	34	63	6	92	0
hinzmann_crab_0_070823_052937	30	0	5	18	6	1
hinzmann_crab_0_070823_052938	21	0	0	0	21	0
hinzmann_crab_0_070823_052939	21	0	0	0	21	0
hinzmann_crab_0_070823_052940	11	0	0	11	0	0
hinzmann_crab_0_070823_052941	11	0	0	0	0	0

Meta information about task
 Detailed info about all jobs of a given group
 Distribution of jobs of a given group by Site, CE or RB



Select a User: Select a Time Range: Plot... [Info](#)

Task: [hinzmann_crab_0_070823_104936](#) All Jobs [Back to all Tasks](#) [This Task](#)

SchedulerJobId	EventRange	Submission Attempts	Site	Submitted	Started	Finished
https://rb119.cern.ch:9000/41c1Ha54ukV4shWInFayw	1	1	CERN-PROD	2007-08-23 08:33:27	2007-08-23 08:38:30	2007-08-23 21:03:04
https://rb122.cern.ch:9000/s7T-g3BSCWX2HzQzR1C66g	2	1	CERN-PROD	2007-08-23 08:55:09	2007-08-23 08:58:19	2007-08-23 11:45:40
https://rb107.cern.ch:9000/ft5hTEB9a2EqmkkB9gQ	3	3	CERN-PROD	2007-08-27 04:15:00	unknown	unknown
https://rb122.cern.ch:9000/c/mGX394zbarVMbzru/4g	4	4	CERN-PROD	2007-08-27 04:15:16	unknown	unknown
https://rb122.cern.ch:9000/YVC63mVHS7-FX49sRjw9HA	5	1	CERN-PROD	2007-08-23 08:57:53	2007-08-23 08:58:54	2007-08-24 18:52:08
https://rb107.cern.ch:9000/HlunRwLzEIQ6jrkB/Wvi3y	6	3	CERN-PROD	2007-08-27 04:15:31	unknown	unknown
https://rb122.cern.ch:9000/yYdvdH0pBSGc9R9QdTAg	7	1	CERN-PROD	2007-08-23 08:57:53	2007-08-23 09:00:13	2007-08-24 17:59:52
https://rb122.cern.ch:9000/fWGUkj4BTz3DrI1hA1T6mQ	8	3	CERN-PROD	2007-08-27 04:18:51	unknown	unknown
https://rb122.cern.ch:9000/Kd0-QeP2I7sFSX_w7OrrCEw	9	1	CERN-PROD	2007-08-23 08:57:19	2007-08-23 09:00:14	2007-08-24 17:04:47
https://rb107.cern.ch:9000/1U3vPCC1c790pDLm50s3vA	10	1	CERN-PROD	2007-08-23 08:57:37	2007-08-23 09:00:53	2007-08-24 06:19:19



Site Reliability Application



- **‘Site of the day’:**
 - daily report on number of successful/failed job attempts (submission via RB)
- **Site performance**
 - Evolution of a site over a period of time
- **Error list (Grid errors related to job processing by RB)**
 - Most Common list of error messages, with pointers to documentation
 - Evolution of the error over time
- **Waiting time**
 - Time that users have to wait from the moment they submit the job until they get the results back
- **Aggregated reports:**
 - Automatic monthly reports
 - Multi VO reports

For more details about Job Reliability Application see “Grid reliability” presentation of Pablo Saiz



Data Management Monitoring for ATLAS



- Tied to the ATLAS Distributed Data Management (DDM) system

- Used s
enviro

- Data sc

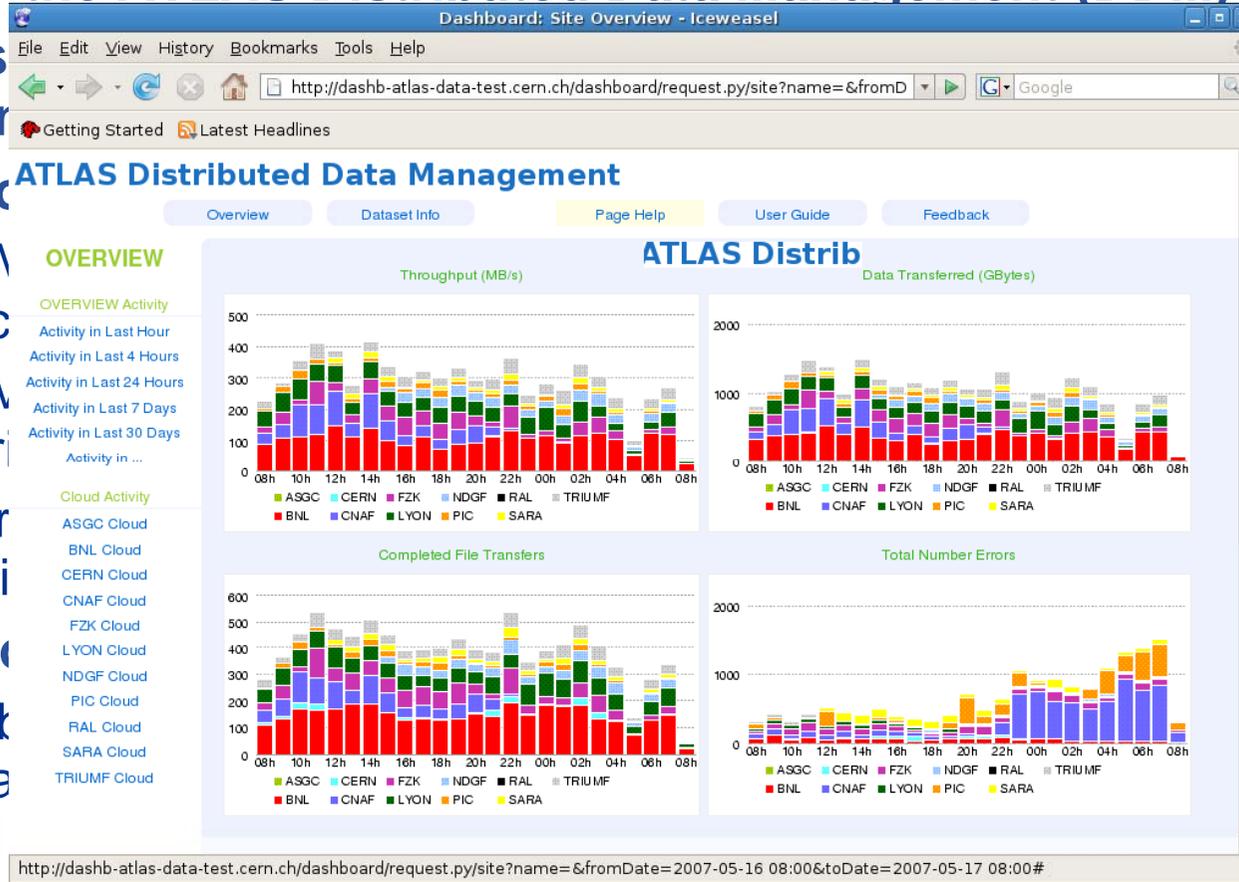
- DDM
- plac

- SAM
- fabr

- Stor
- avai

- Views

- Glob
- data
- and



er and
e grid
uding other

files /
rs (transfer

For more details about ATLAS Data Management Monitoring see Thursday presentation of Ricardo Rocha



Integration and commissioning for CMS (1)



Site and service availability based on the results of SAM tests

(Prototype)

Results of SAM tests are imported in real time to the dashboard DB

Service and site availability are calculated according the experiment's requirements

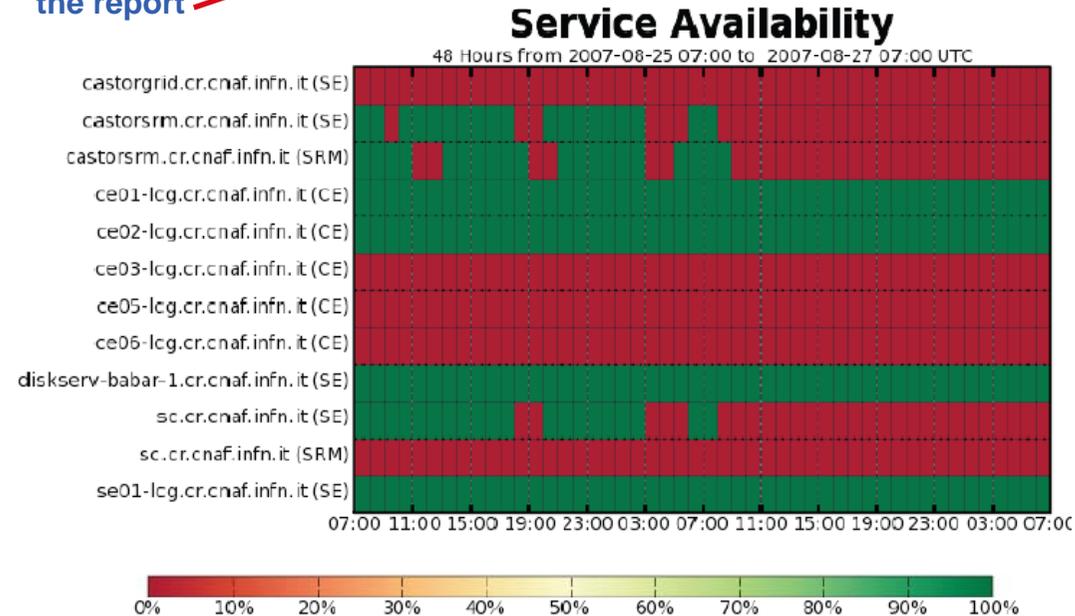
SAM VISUALIZATION

Summary View of latest Results

Historical Summary View

View	Time Range	Sites	Service Types
Service Availability	Last 48 Hours	All Sites	VO critical
		INFN-LNL-2 infn-napoli-cms INFN-PADOVA INFN-PISA INFN-ROMA1-CMS infn-roma2 INFN-T1	Select All CE SE SRM

Select site or set of sites and service types to be included in the report





Integration and commissioning for CMS (2)



Monitoring of the I/O rate between WN and SE

(Prototype)

Currently only analysis and JobRobot jobs are reporting I/O rate to the dashboard



Show URLs

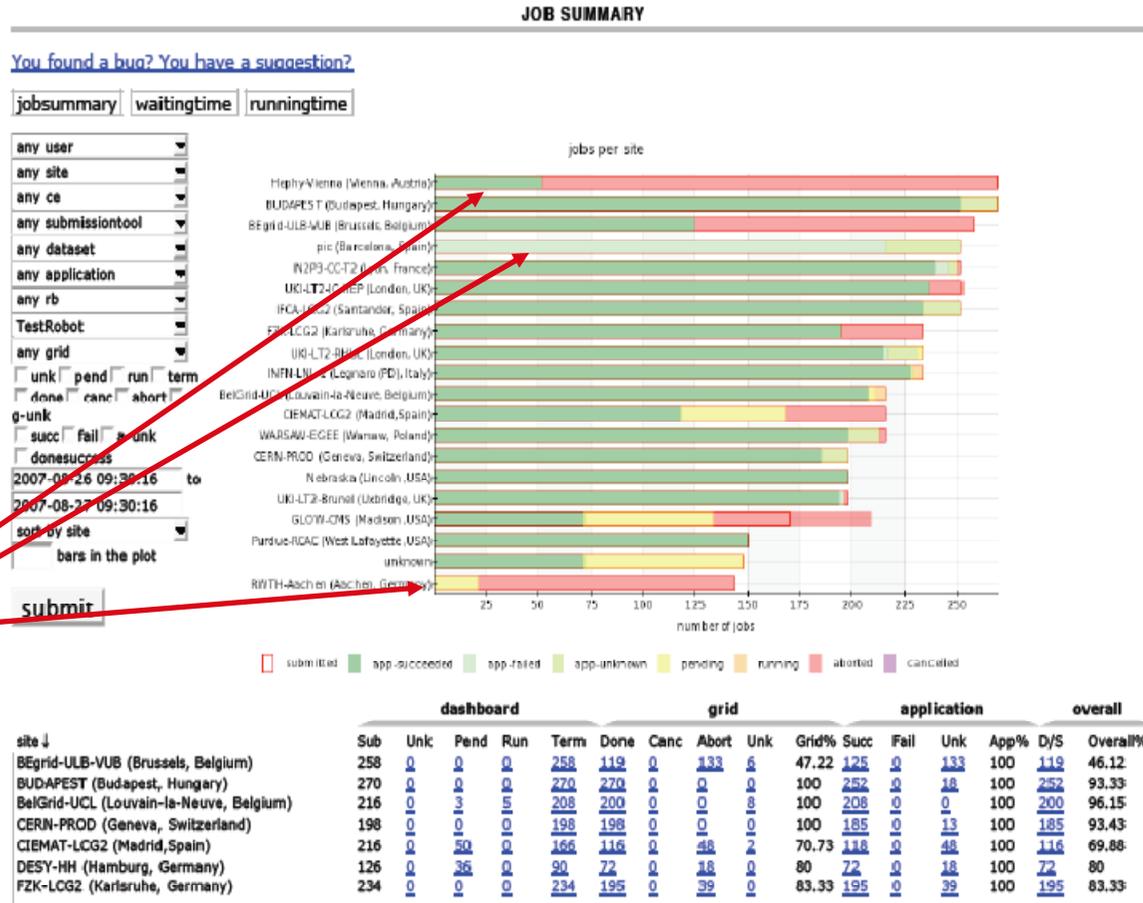


Integration and commissioning for CMS (3)



Monitoring of the
Job Robot jobs using
Dashboard interactive UI

Sites having
troubles





Monitoring for the production systems of ATLAS and CMS



- In case of ATLAS, Dashboard will provide a user interface to the monitoring data stored in the ATLAS production DB. UI is in active development phase. First prototype is available.
- In case of CMS, Dashboard DB is used as a central repository for monitoring data . Dashboard Collector for monitoring information from CMS ProdAgent instances is in production. UI interface to the central monitoring repository is being developed.



ATLAS production UI (prototype)



ATLAS Production system

Overview

User Guide

Feedback

OVERVIEW

view

by grid

by cloud (not avail.)

by executortype

by executor

by site

by cluster

by task

select executortype

panda

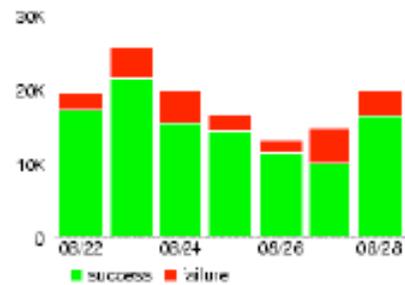
Cronus

Dulcinea

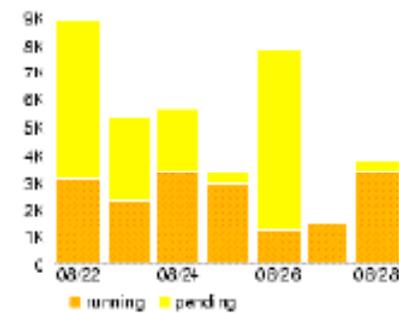
LCG-DQ

CondorG

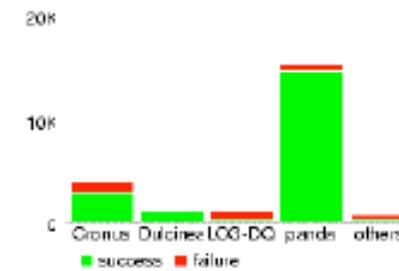
jobs last seven days



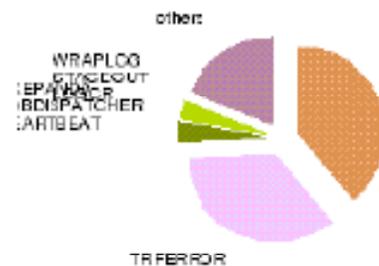
queued jobs last seven days



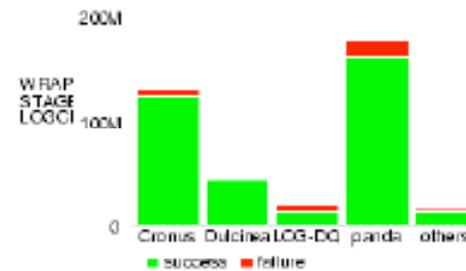
jobs (last 24h)



errors (jobs, last 24h)



walltime (seconds, last 24h)





ATLAS accounting information



ATLAS ACCOUNTING DATA

Data to Graph: CPU Time As Function of: Cloud Start Date: 1-2007 End Date: 8-2007

Select Source:

[text/csv](#)

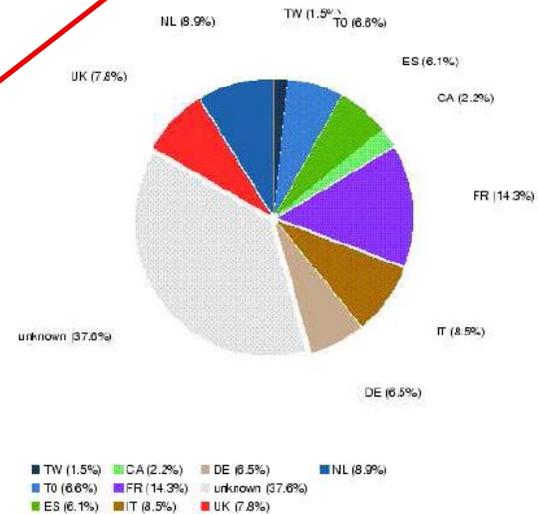
[text/xml](#)

Number of days: 242

Cloud	SUMCPU [hrs]	%
TW	365107	1.49%
T0	1618576	6.62%
ES	1479063	6.05%
CA	542829	2.22%
FR	3501930	14.33%
IT	2083687	8.53%
DE	1583025	6.48%
unknown	9132879	37.58%
UK	1895808	7.76%
NL	2184543	8.94%
Total:	24437447	100

SUMCPU per Cloud

SUMCPU per Group
Total SUMCPU: 24437447.0
From January 2007 to August 2007



from January 2007 to August 2007

Information is retrieved from Apel and Gratia

UI allows to show data taking into account experiment topology



Experiment Dashboard plans



- **Implementation**

Important schema modification is required to support pilot jobs. It will cause modification in the data feeding part and user interface

Secure access where relevant (X509 authentication)

- **Improvement of data completeness and reliability**

Enabling of reporting of job status information from condor_g (on the way)

- **Development of the new applications**

Monitoring for production systems of ATLAS and CMS

Service availability based on sanity check reports sent by the experiment jobs (LHCb)

- **Improvement of effectiveness for troubleshooting**

Analyzing of information about failures (Grid and application)

Decoupling application failures caused by the error in the user code from the failures caused by the problems of the Grid services

Collecting troubleshooting recipes, making them available at the dashboard UI

Correlating where relevant failures with the results of the SAM tests



Conclusions



- Experiment Dashboard is used by all 4 LHC experiments and evolving very fast to match their requirements
- Job Monitoring and Site Reliability applications are in production for VLEMED VO outside LHC community
- The tool proved to provide reliable and useful VO-oriented monitoring data, with needed level of details, available in various formats.

Try it !

<http://dashboard.cern.ch>



Acknowledgement



We would like to thank

Massimo Lamanna, Stefano Belforte and Iosif Legrand.

Without their support and guidance the project wouldn't start and wouldn't progress;

Our collaborators in Taiwan, Russia and France for their valuable contribution;

ORACLE support team for excellent DB support and useful advices;

SAM, ICRTM, RGAMA, Gridlce, Condor_g, EIS, Gratia and Apel teams for fruitful collaboration and prompt responses to our requests;

Developers of job submission tools and production systems of the LHC experiments for their contribution and LHC user community for useful feedback.