CMS Dashboard Task Monitoring: A user-centric monitoring view

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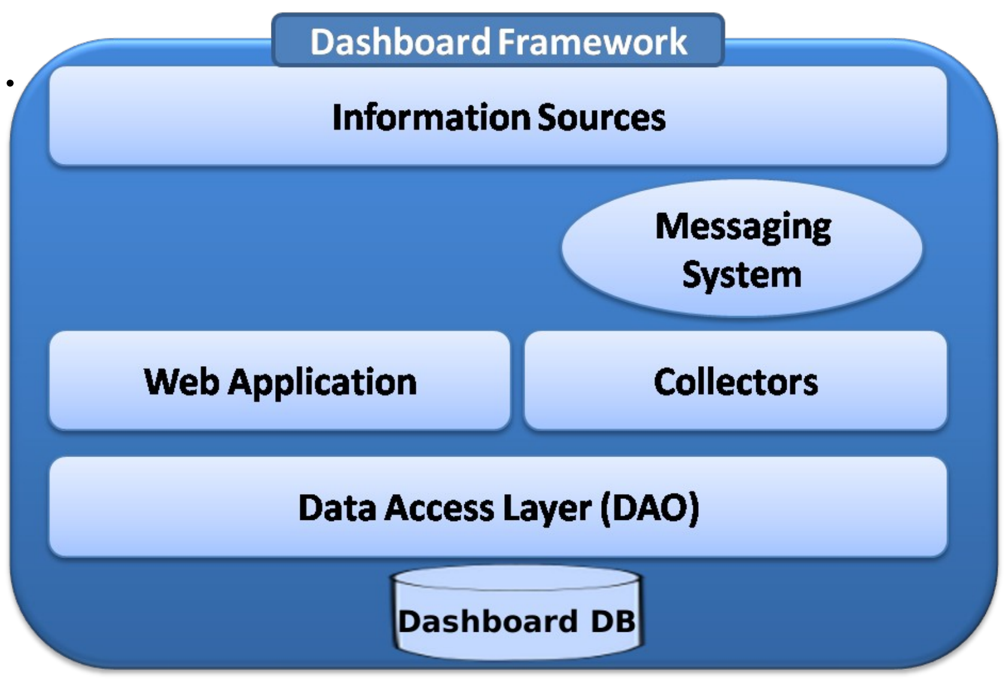
Introduction

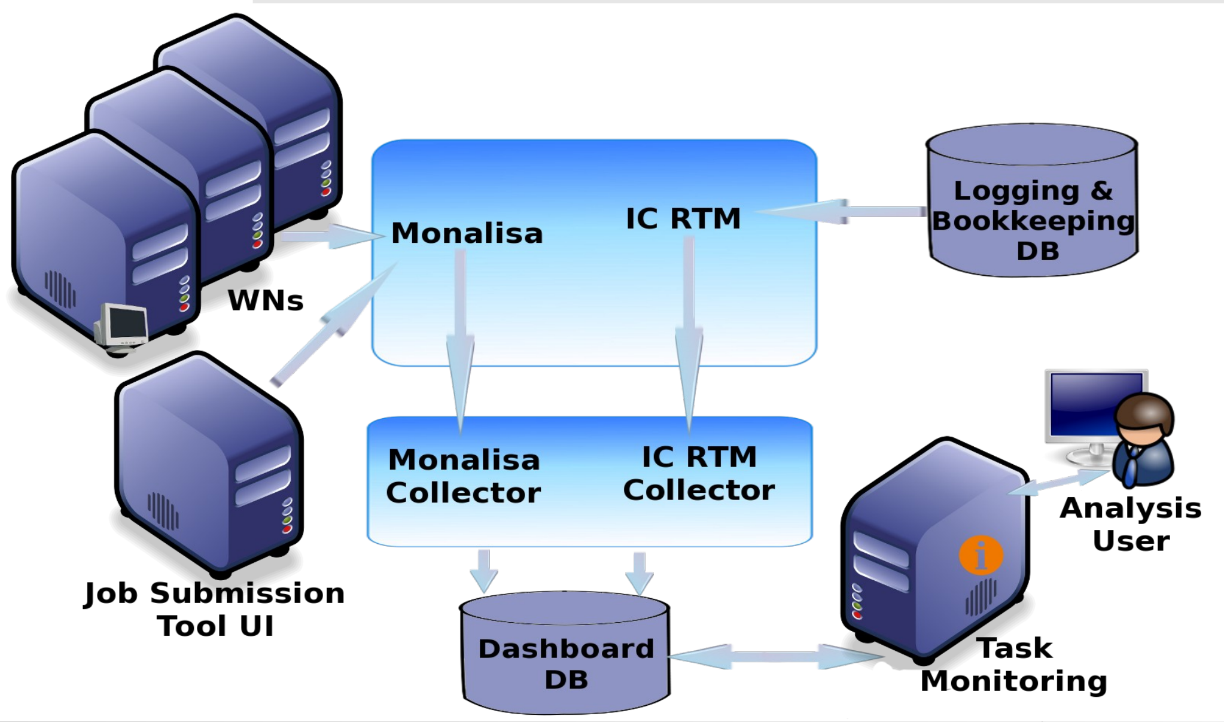
The physicists must be able to monitor the execution status, application and grid-level messages of their tasks that may run at any site within the CMS Virtual Organisation. The CMS Dashboard Task Monitoring project provides this information towards individual analysis users by collecting and exposing a user-centric set of information regarding submitted tasks including reason of failure, distribution by site and over time, consumed time and efficiency. The development was user-driven with physicists invited to test the monitoring application in order to assemble further requirements and identify weaknesses with the application.

Architecture

The CMS Task Monitoring application is part of the Dashboard framework which is widely used by the four LHC experiments. The Dashboard framework consists of the following components:

- *Data Access Layer:* a set of common methods to communicate to the DB using a common DAO layer.
- *Web Application Layer:* responsible for the HTTP entry point to the data and exposes them in different formats.
- *Collectors Layer:* listens to messages/events coming from the *Messaging Infrastructure*.
- *Information Sources Layer:* sits closely to the services being monitored and listens to interesting events.
- *Messaging System:* an external component used by Dashboard to communicate with the *Information Sources*.

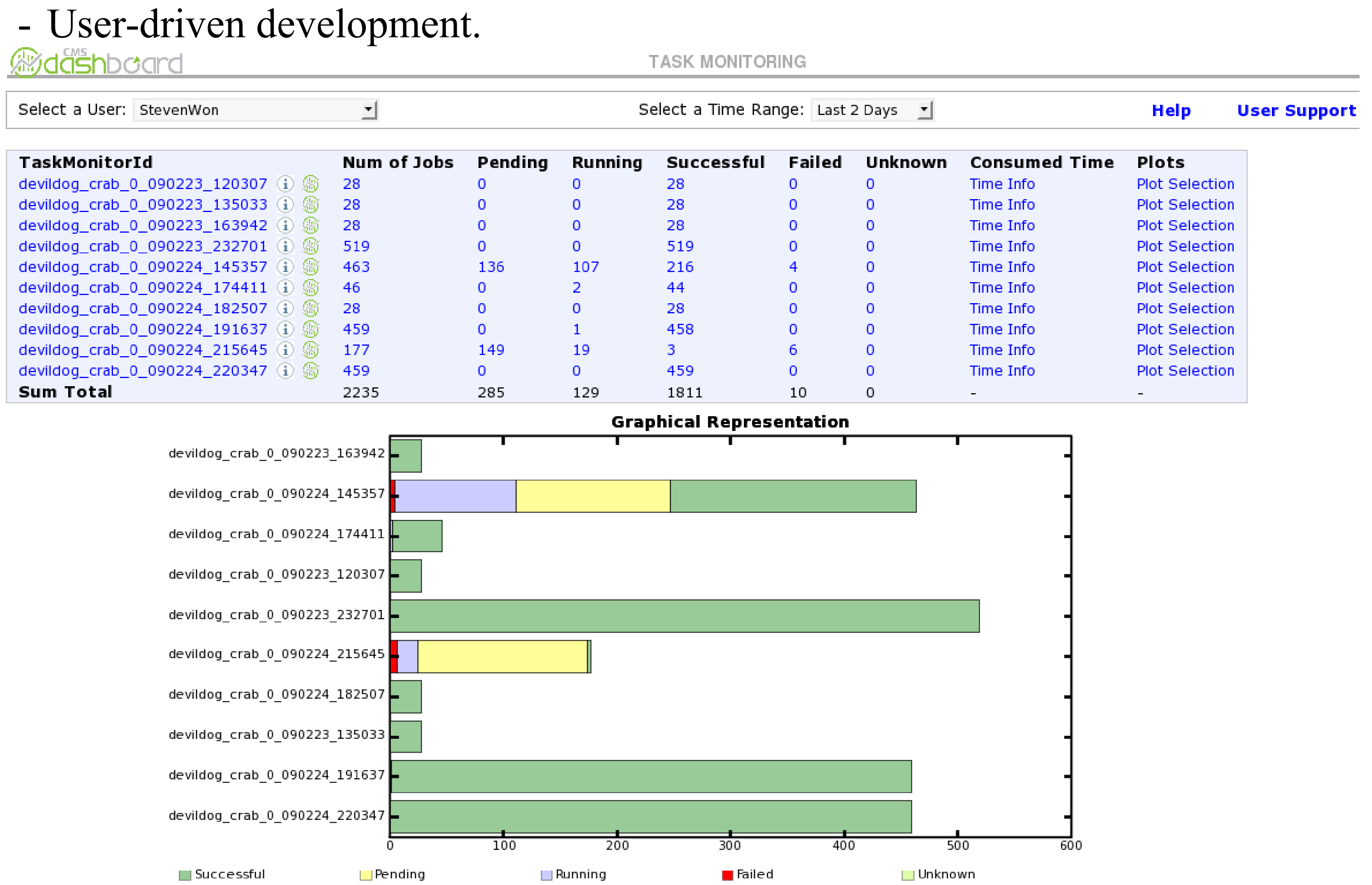




For monitoring, the application is build on top of the Dashboard Job Monitoring system which uses multiple sources of information[1]; the data collectors gather Grid-related information as well as information specific to the application which is run by the users. The Grid-related information is obtained from the Logging and Bookkeeping DB using ICRTM[2]. The application-specific information is gathered throughout the job's lifetime via the MonALISA[3] monitoring system. The job submission tools of the CMS experiment and the job wrappers generated by these tools are instrumented to report meta-information about the user's tasks and the progress of the user's job at the worker node to the MonALISA server.

User View

- Provides monitoring functionality regardless of the *job submission method* or the *middleware platform*.
- Detailed view of the user's tasks including failure diagnostics, processing efficiency and resubmission history.
- Low latency and updates in 'real time' from the worker nodes where the jobs are running.
- User-friendly interface and easy to navigate.
- User-driven development.



Select a User: StevenWon   Select a Time Range: Last 2 Days   Help   User Support

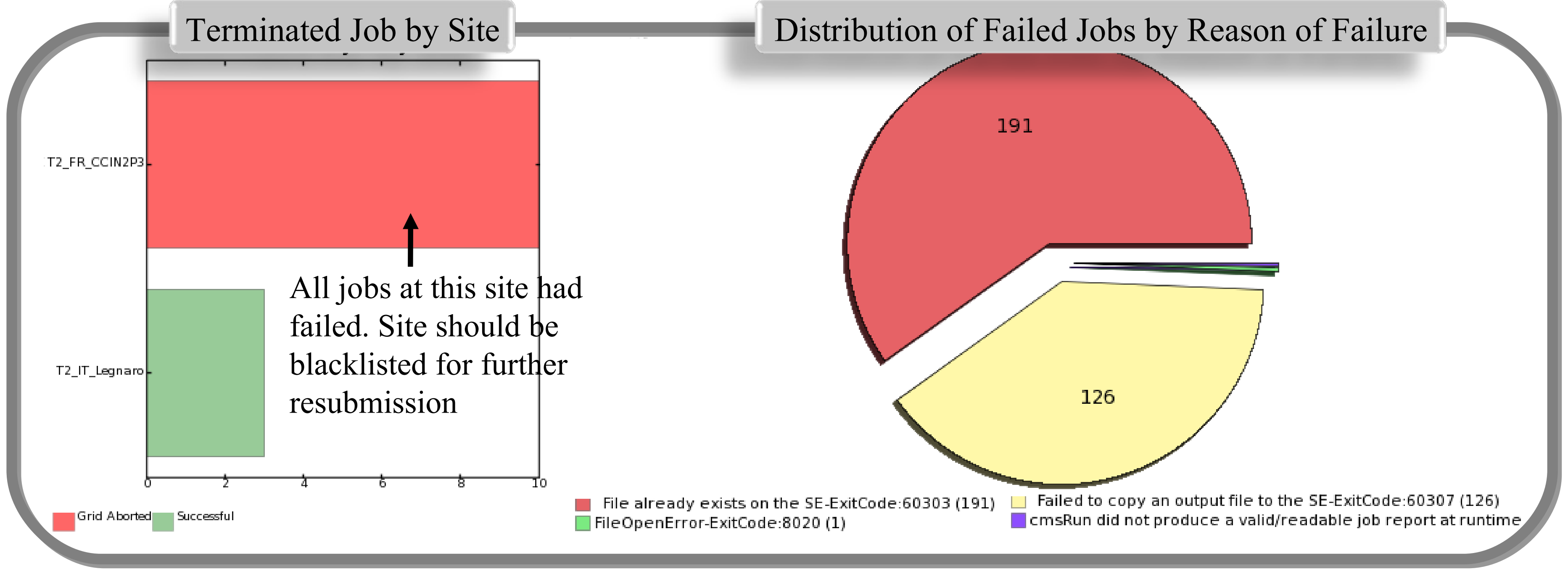
TaskMonitorId	Num of Jobs	Pending	Running	Successful	Failed	Unknown	Consumed Time	Plots
devildog_crab_0_090223_120307	28	0	0	28	0	0	Time Info	Plot Selection
devildog_crab_0_090223_135033	28	0	0	28	0	0	Time Info	Plot Selection
devildog_crab_0_090223_163942	28	0	0	28	0	0	Time Info	Plot Selection
devildog_crab_0_090223_232701	519	0	0	519	0	0	Time Info	Plot Selection
devildog_crab_0_090224_145357	463	136	107	216	4	0	Time Info	Plot Selection
devildog_crab_0_090224_174411	46	0	2	44	0	0	Time Info	Plot Selection
devildog_crab_0_090224_182507	28	0	0	28	0	0	Time Info	Plot Selection
devildog_crab_0_090224_191637	459	0	1	458	0	0	Time Info	Plot Selection
devildog_crab_0_090224_215645	177	149	19	3	6	0	Time Info	Plot Selection
devildog_crab_0_090224_220347	459	0	0	459	0	0	Time Info	Plot Selection
Sum Total	2235	285	129	1811	10	0	-	-

Graphical Representation
devildog_crab_0_090223_163942
devildog_crab_0_090224_145357
devildog_crab_0_090224_174411
devildog_crab_0_090223_120307
devildog_crab_0_090223_232701
devildog_crab_0_090224_215645
devildog_crab_0_090224_182507
devildog_crab_0_090223_135033
devildog_crab_0_090224_191637
devildog_crab_0_090224_220347
0
100
200
300
400
500
600
Successful
Pending
Running
Failed
Unknown

Above you can see a snapshot of the user interface. Clicking on the information link next to the name of the task provides *meta information* such as *input dataset*, *task creation time* and *target CE*. Clicking on the number of jobs corresponding to a given status provides a detailed information of all the jobs of a selected category.

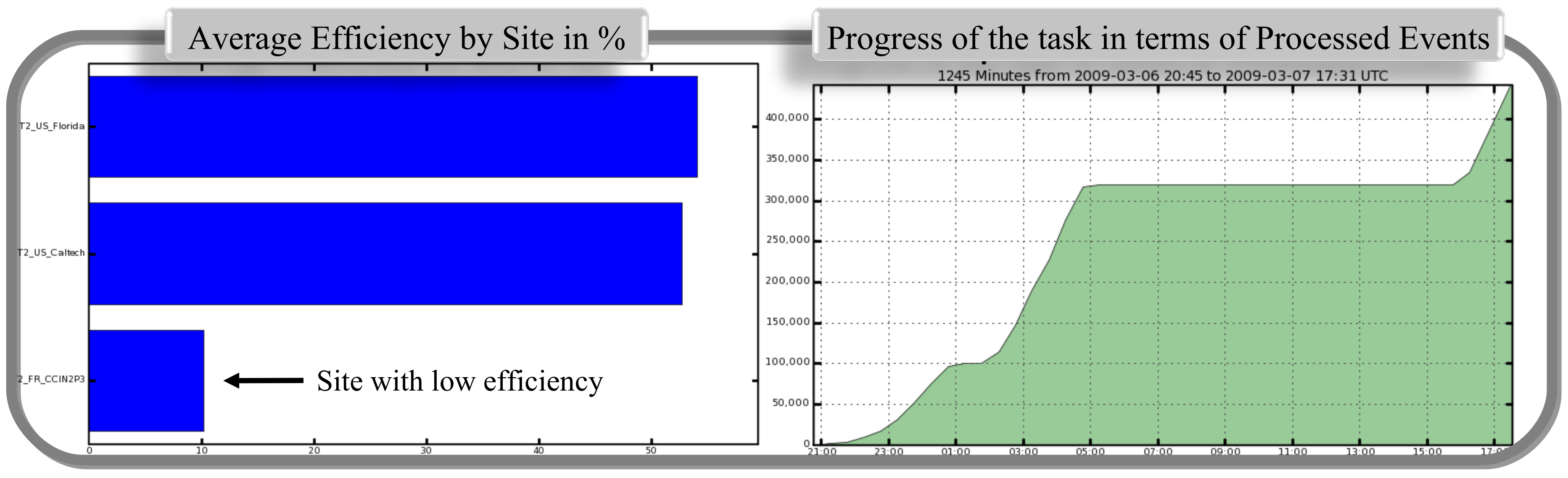
Graphical Plots

The application offers a wide-variety of graphical plots that will visually assist the user to understand the status of the task. A selection of plots are shown below:


Terminated Job by Site

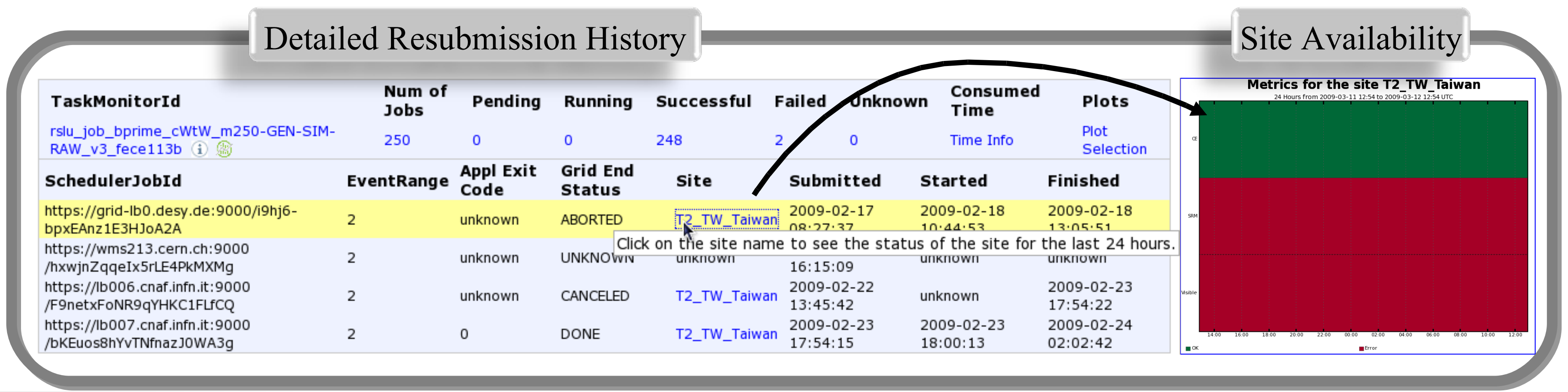
All jobs at this site had failed. Site should be blacklisted for further resubmission

Distribution of Failed Jobs by Reason of Failure


Average Efficiency by Site in %

Site with low efficiency

Progress of the task in terms of Processed Events


Detailed Resubmission History

TaskMonitorId	Num of Jobs	Pending	Running	Successful	Failed	Unknown	Consumed Time	Plots
rslu_job_bprime_cWtW_m250-GEN-SIM-RAW_v3_fece113b	250	0	0	248	2	0	Time Info	Plot Selection

SchedulerJobId	EventRange	Appl Exit Code	Grid End Status	Site	Submitted	Started	Finished
https://grid-lb0.desy.de:9000/i9hj6-bpxEAnz1E3HJoA2A	2	unknown	ABORTED	T2_TW_Taiwan	2009-02-17 08:27:37	2009-02-18 10:44:53	2009-02-18 13:05:51
https://wms213.cern.ch:9000/hxwjnZqqeIx5rLE4PkMXMg	2	unknown	UNKNOWN	unknown	16:15:09	unknown	unknown
https://lb006.cnaf.infn.it:9000/F9netxFoNR9qYHKC1FLfCQ	2	unknown	CANCELED	T2_TW_Taiwan	2009-02-22 13:45:42	unknown	2009-02-23 17:54:22
https://lb007.cnaf.infn.it:9000/bKEuos8hYvTNfnazJ0WA3g	2	0	DONE	T2_TW_Taiwan	2009-02-23 17:54:15	2009-02-23 18:00:13	2009-02-24 02:02:42

Click on the site name to see the status of the site for the last 24 hours.

Site Availability

Metrics for the site T2_TW_Taiwan
24 Hours from 2009-03-11 12:54 to 2009-03-12 12:54 UTC
CE
SRM
Visible
OK
Error

User Feedback

200 analysis users were contacted in order to collect feedback and assemble further requirements. 50 users replied and provided very positive feedback:

- *'A nice surprise to see this tool live and working!'*
- *'It's easy to navigate and provides useful information regarding failed jobs'*
- *'The monitoring tool is great! I'll now investigate why most of my jobs are failing'*
- *'Perfect! It even updates in real-time! It is particularly nice to be able to see how many events were processed'*
- *'Indeed very helpful tool to monitor the progress of my grid activities'*
- *'Excellent! It has low latency & excellent plots with clear labels. I'm surprised that it also supports the condor scheduler. Thanks for making this happen'*

References

[1] J. Andreeva et al. 'Experiment Dashboard: the monitoring system for the LHC experiments'. In GMW'07: Proceedings of the 2007 workshop on Grid monitoring, ACM

[2] Imperial College Real Time Monitoring (ICRTM), http://gridportal.hep.ph.ic.ac.uk/rtm/

[3] Monitoring Agents Using a Large Integrated Services Architecture (MonALISA), http://monalisa.cern.ch/monalisa.html

[4] Dashboard Production Server Statistics, http://lxarda18.cern.ch/awstats/awstats.pl?config=lxarda18.cern.ch

Conclusion

While the existing monitoring tools are coupled to a specific middleware, Task Monitoring provides monitoring functionalities regardless of the job submission method or the middleware platform offering a complete and detailed view of the user's tasks including failure diagnostics, processing efficiency and resubmission history. The monitoring tool has become very popular among the CMS users. According to our web statistics[4], more than 100 distinct analysis users are using it for their everyday work. Close collaboration with several CMS users resulted in the tool being focused on their exact monitoring needs.

dashboard.cern.ch/cms   www.brunel.ac.uk/about/acad/sed