

CERN Summer Student Program

Site Mapping in DIRAC

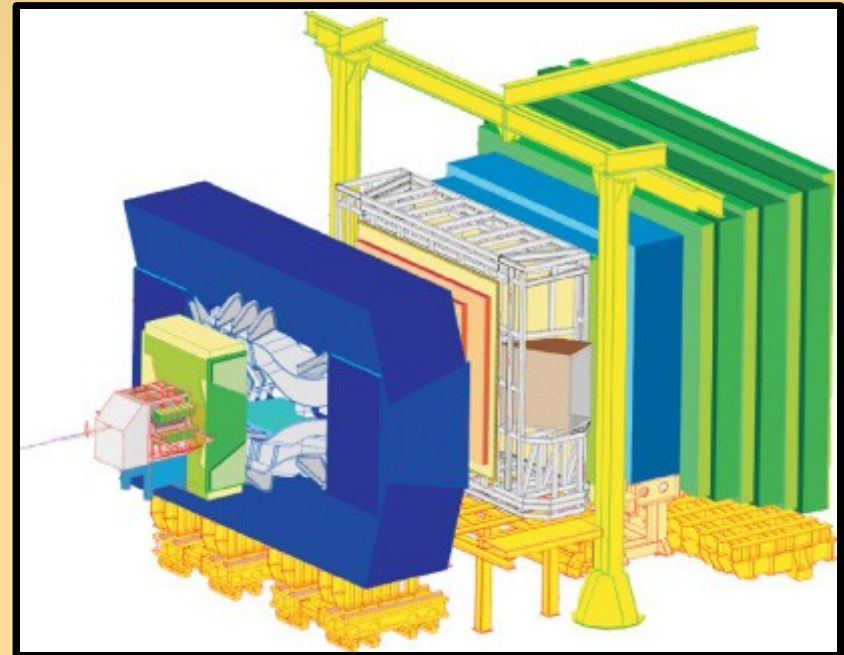
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Dr. Stuart Paterson



- LHCb is a forward, single-arm spectrometer
- It will investigate CP violation and rare decays in B-mesons

Computing Requirements

- Monte Carlo simulation data
- Collision data
- 80 MB/s detector output
- 1 Petabyte/year total

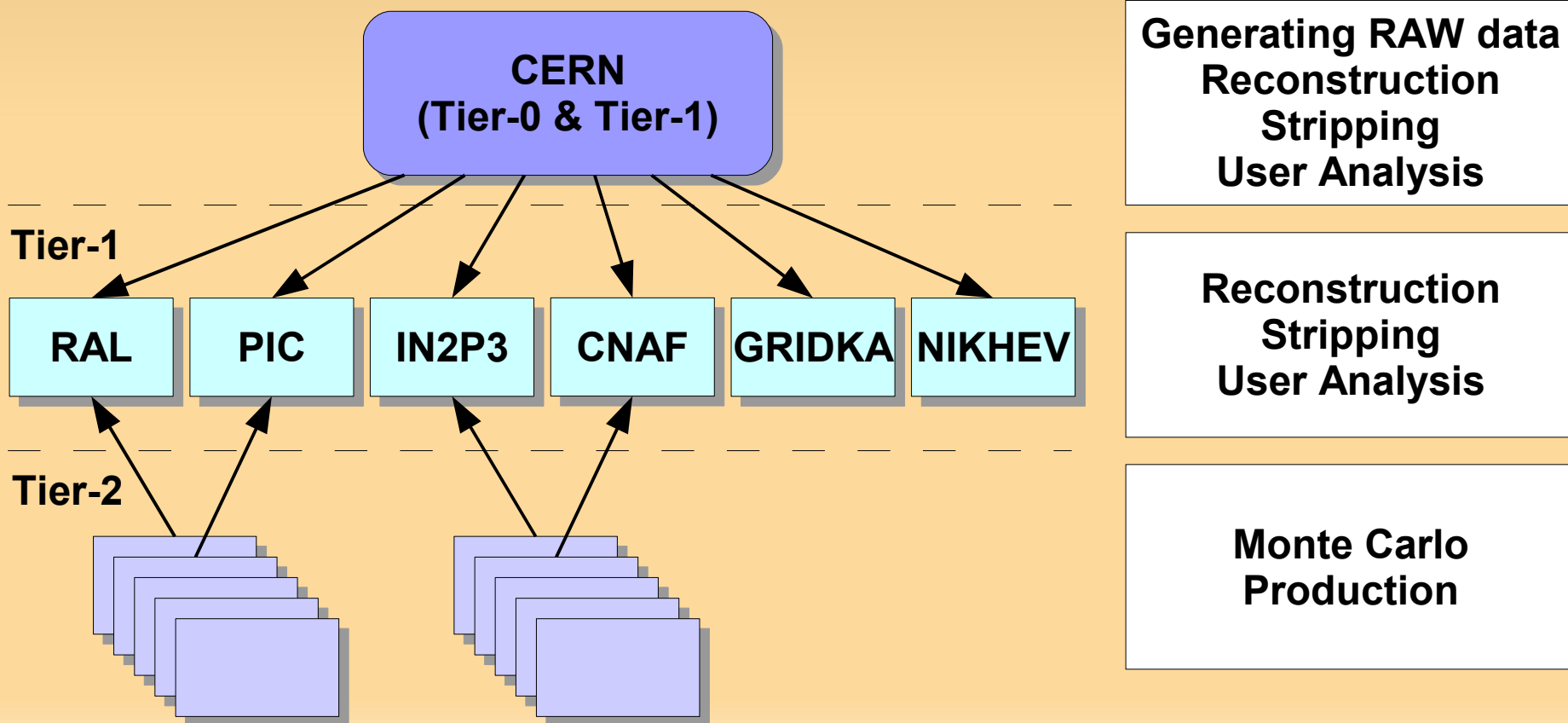


Intensive computing resources required.

Far more than any single computer system can handle.

Decentralized resources – computers on the Grid share resources (e.g., processing power, data storage)

- Scientists can run jobs without thought of where they will actually be executed.
- Job status and output can be monitored.
- Grid paradigm is the necessary solution to handle volume of LHCb data.





DIRAC Overview

DIRAC (Distributed Infrastructure with Remote Agent Control) is the Grid solution for LHCb.

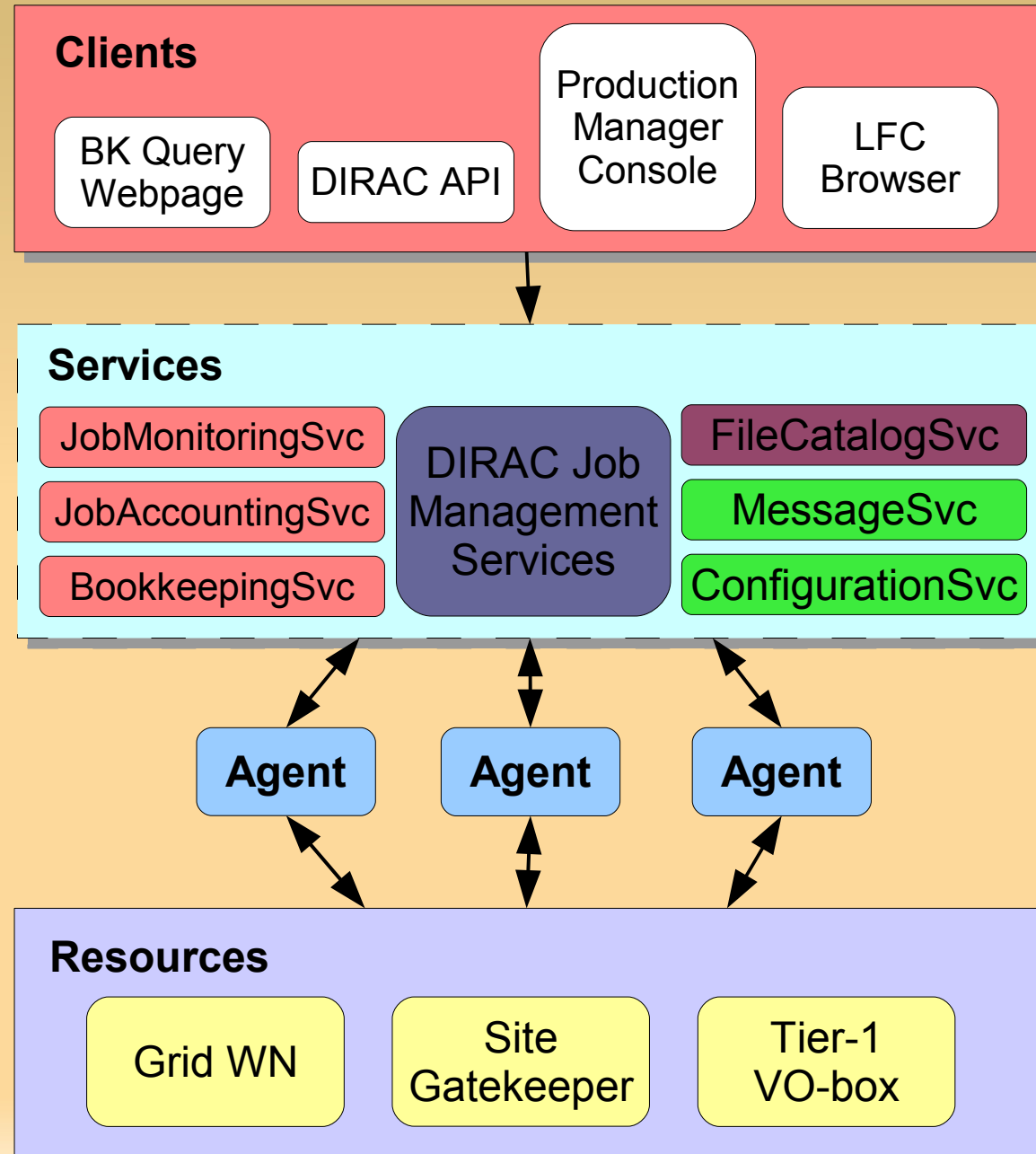
DIRAC aggregates different types of computing resources:

- Individual computers
- Computing sites
- Grids

DIRAC uses a combination of:

- Clients
- Services
- Agents
- Resources

DIRAC is robust, modular, and portable.



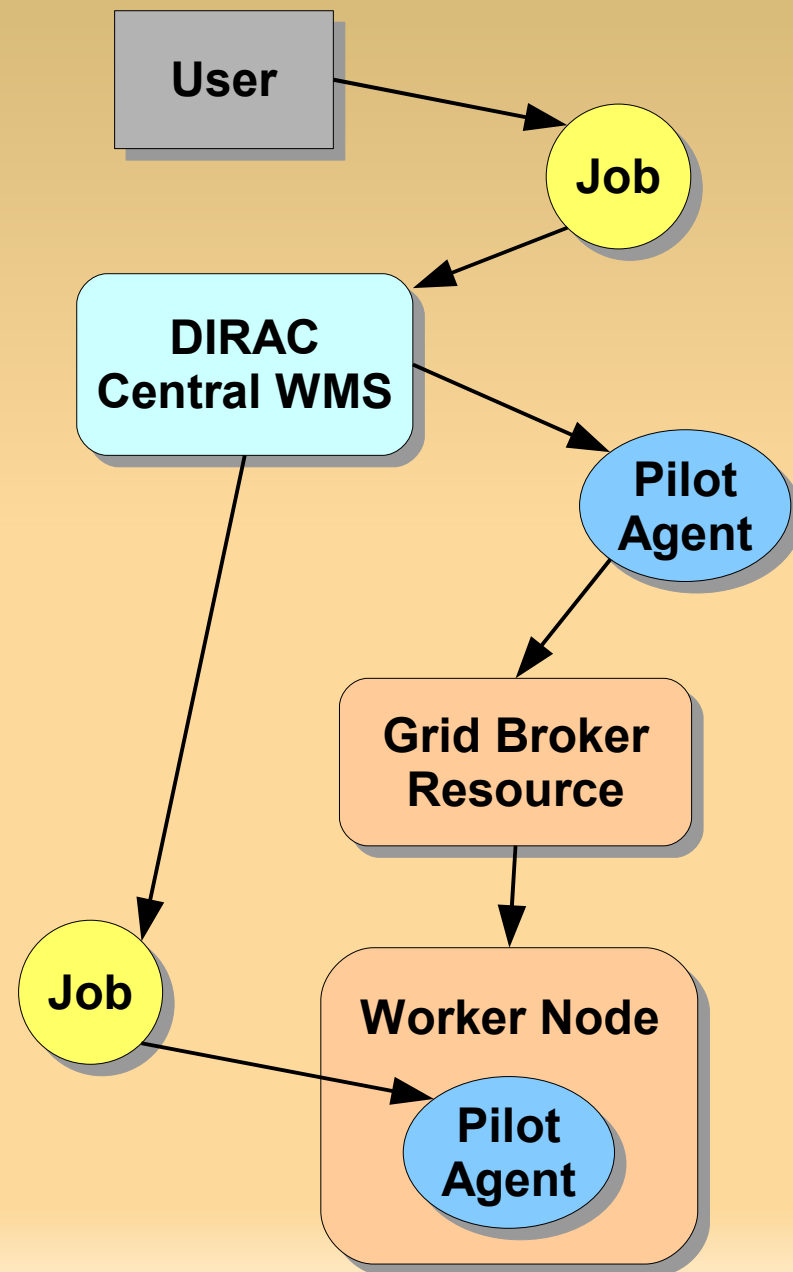
DIRAC uses **pilot agents** to run jobs

- Maximize LCG efficiency
- Minimize load

DIRAC WMS chooses a suitable site (e.g., access to files on LFC)

Pilot Agents

- Install & configure DIRAC on the WN
- Can reuse WN for additional jobs



DIRAC is complex

- **Many** sources of data
- Not aggregated
- Need to consolidate data sources

Accounting

StorageUsage

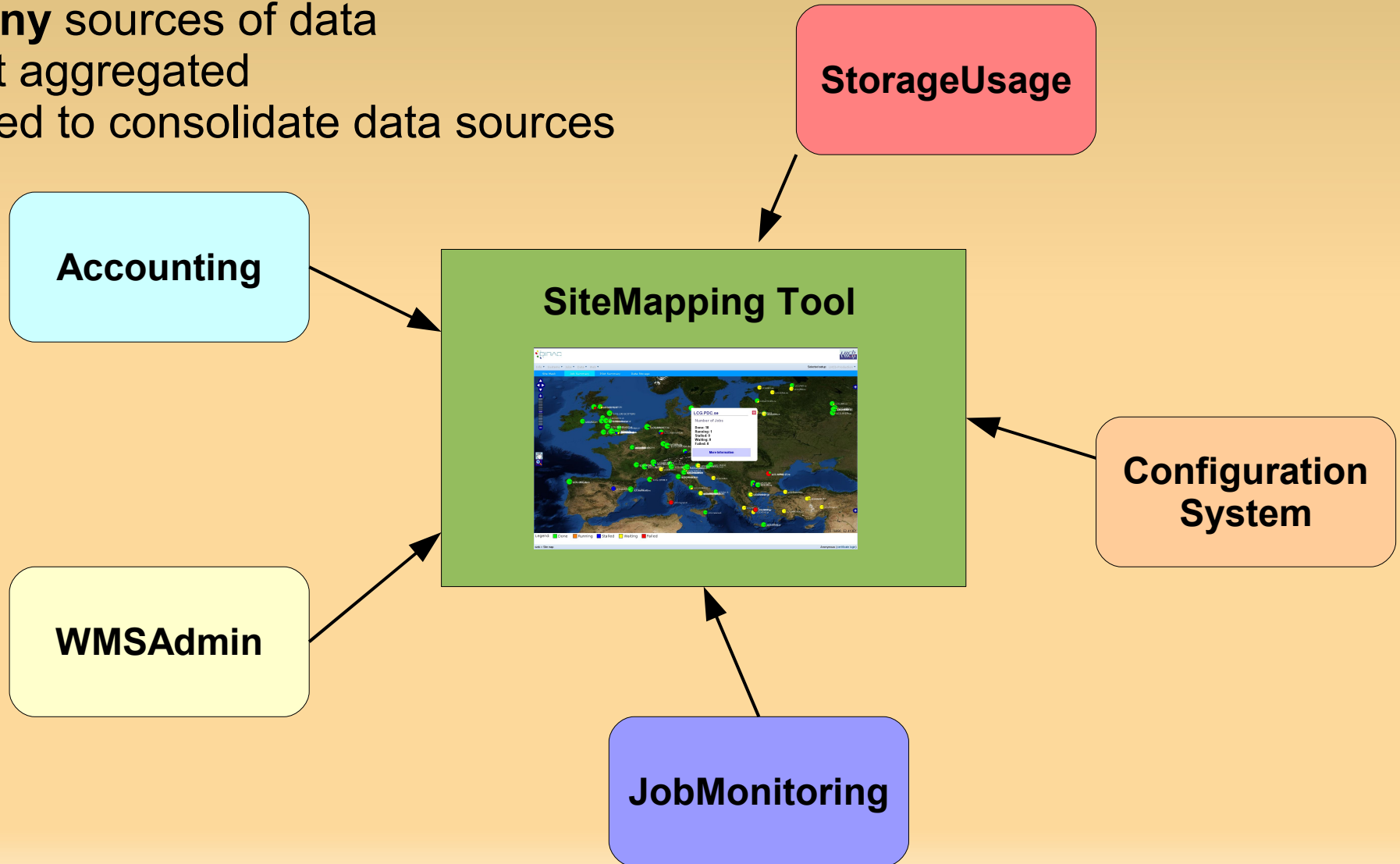
WMSAdmin

**Configuration
System**

JobMonitoring

DIRAC is complex

- **Many** sources of data
- Not aggregated
- Need to consolidate data sources

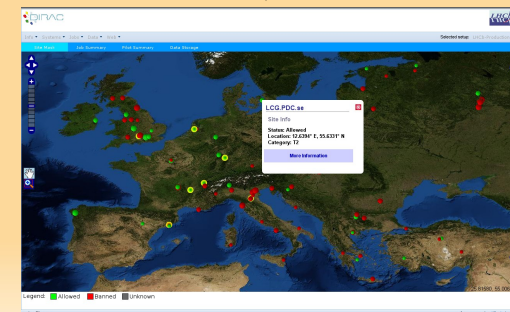
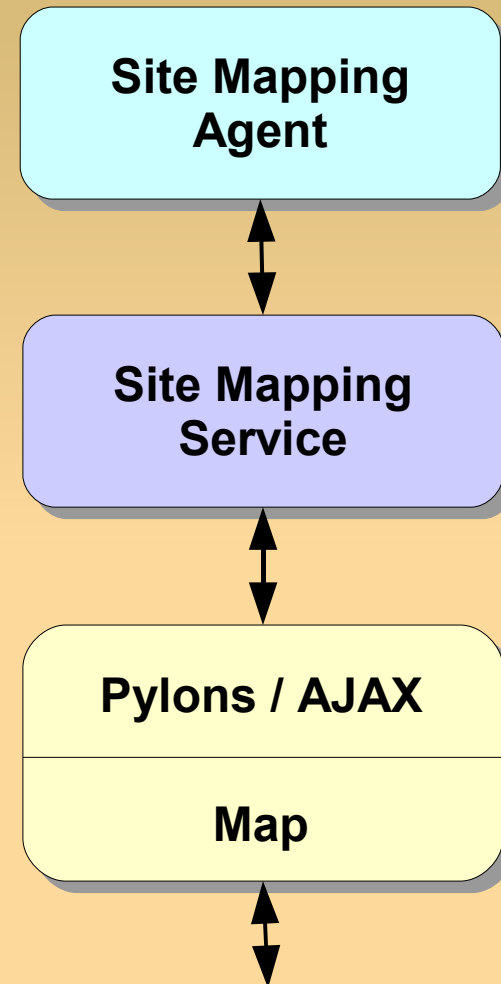


Intuitive site mapping tool

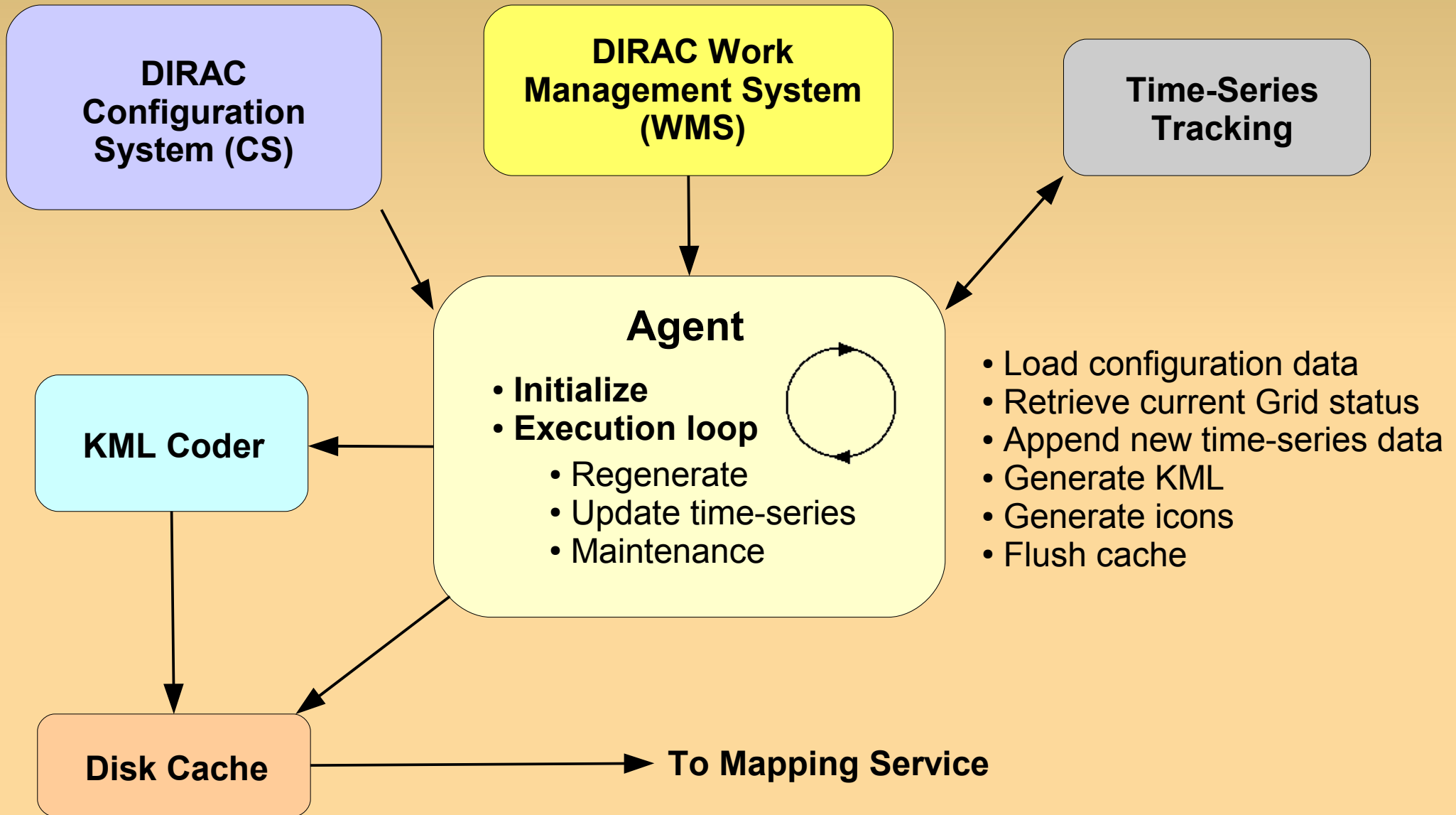
- Map-based system
- Geographical, status-based icons
- Interactive tools for administration
- Up-to-date information
- Small data sizes

Three part system

- Agent – data gathering
- Service – file transfers
- Front-end – interactive display



The Mapping Agent



From Mapping Agent

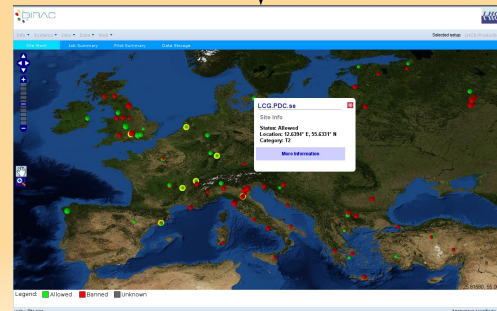
Disk Cache

DIRAC
Configuration
System (CS)

Service

- Initialize
- Service loop
 - Wait for request
 - Transfer binary data

- Load configuration data
- Receive file request
- Find KML / image file
- Transfer data

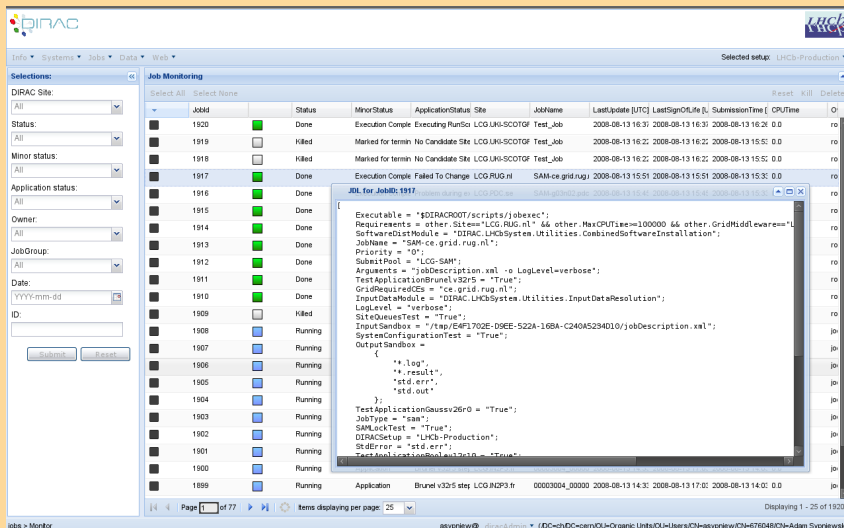
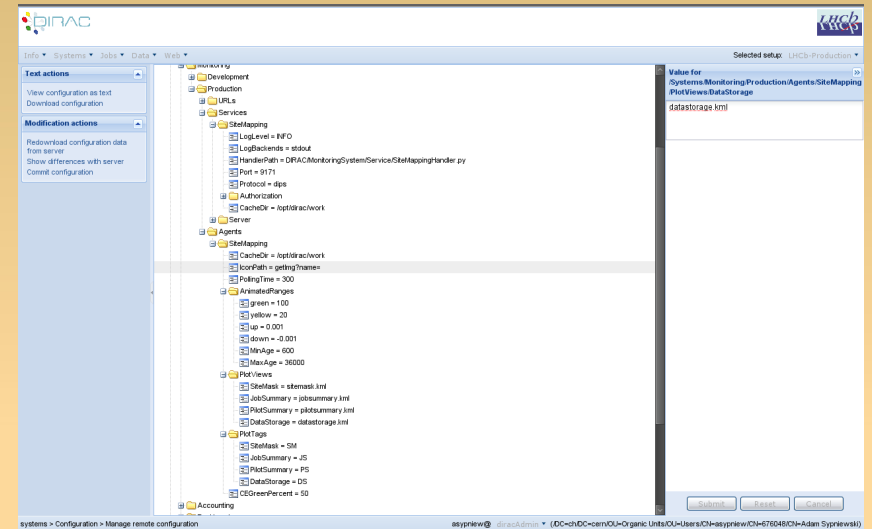




Inside the Map

The Actual Map

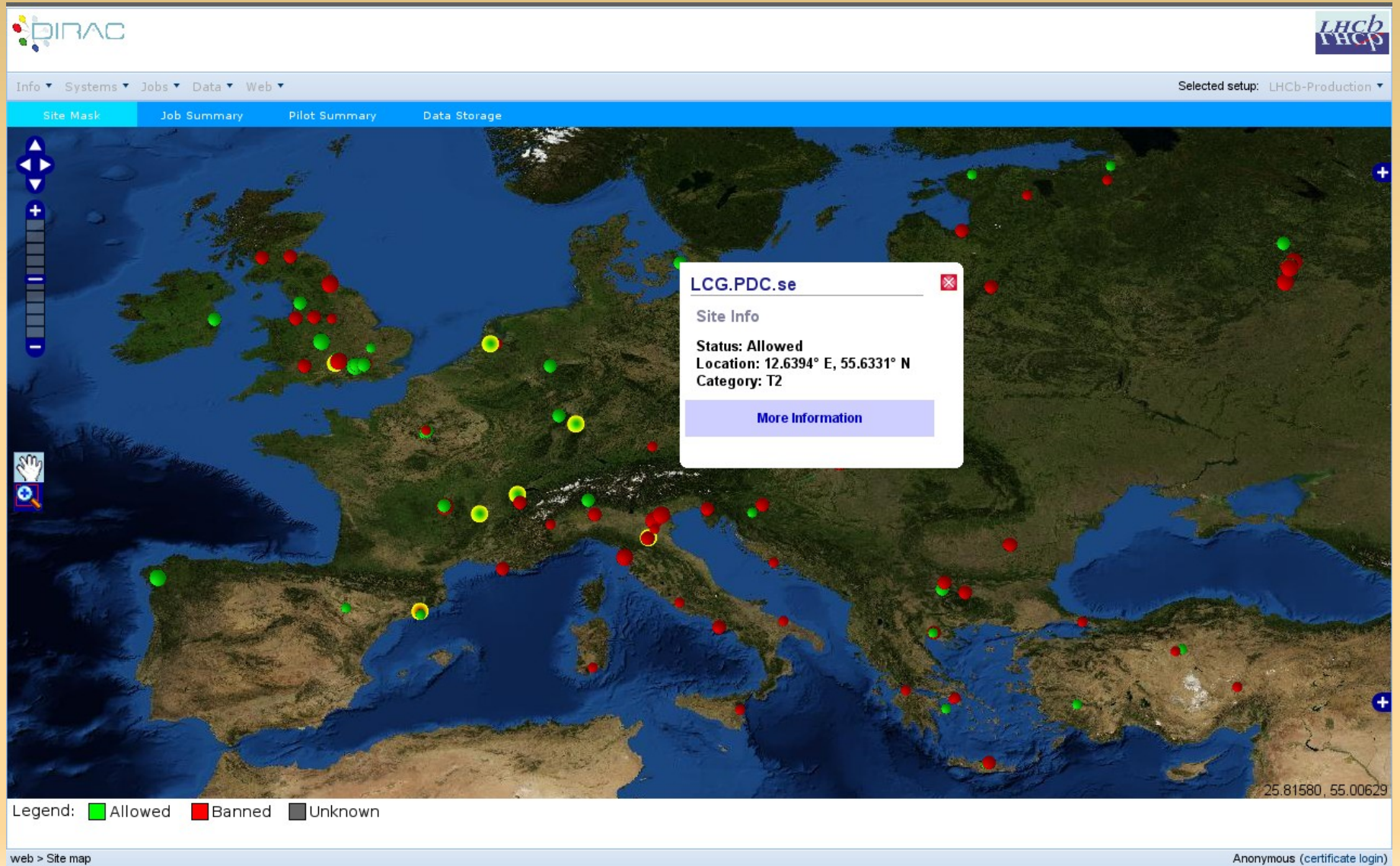
- OpenLayers framework
- Implemented in JavaScript
- Easy to use
- Integrates with existing framework



Pylons & AJAX

- Interface between map and service to retrieve KML & image data

View: Site Mask



The screenshot displays the DIRAC web interface for the 'Site Mask' view. The top navigation bar includes 'Info', 'Systems', 'Jobs', 'Data', and 'Web'. The 'Selected setup' is 'LHCb-Production'. The main content area shows a satellite map of Europe with numerous colored markers representing different sites. A pop-up window for 'LCG.PDC.se' is open, displaying the following information:

LCG.PDC.se

Site Info

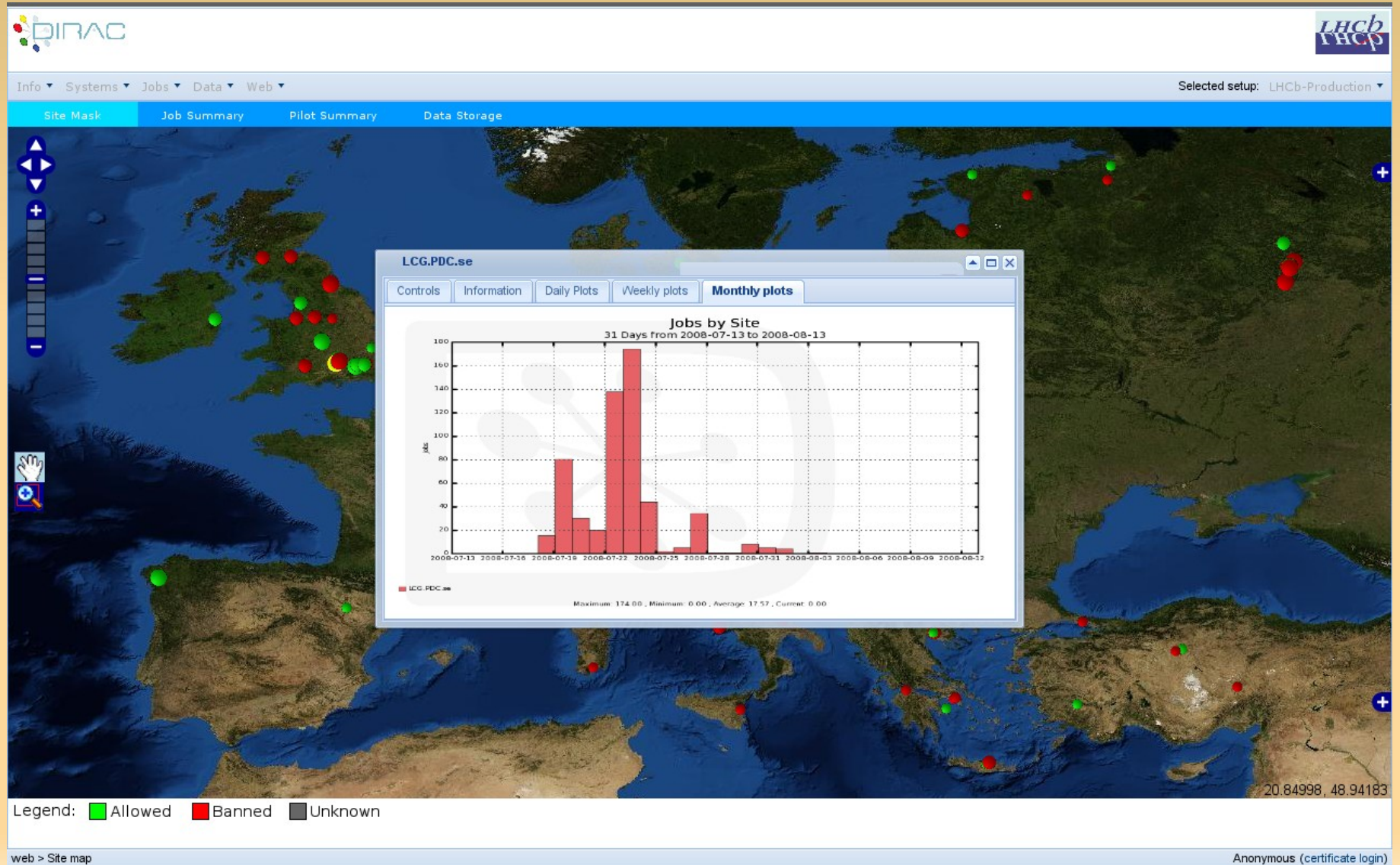
Status: Allowed
Location: 12.6394° E, 55.6331° N
Category: T2

[More Information](#)

Legend: ■ Allowed ■ Banned ■ Unknown

web > Site map Anonymous (certificate login)

View: Site Mask





The screenshot displays the DIRAC web interface for the 'Site Mask' view. The top navigation bar includes 'Info', 'Systems', 'Jobs', 'Data', and 'Web'. The 'Selected setup' is 'LHCb-Production'. The main content area shows a world map with colored markers representing site status: green for 'Allowed', red for 'Banned', and grey for 'Unknown'. A pop-up window titled 'LCG.PDC.se' is open, showing a histogram of 'Jobs by Site' for the period '31 Days from 2008-07-13 to 2008-08-13'. The histogram shows a peak in job counts around July 22, 2008. The legend at the bottom indicates the site status markers.

Legend: ■ Allowed ■ Banned ■ Unknown

Maximum: 174.00, Minimum: 0.00, Average: 17.57, Current: 0.00

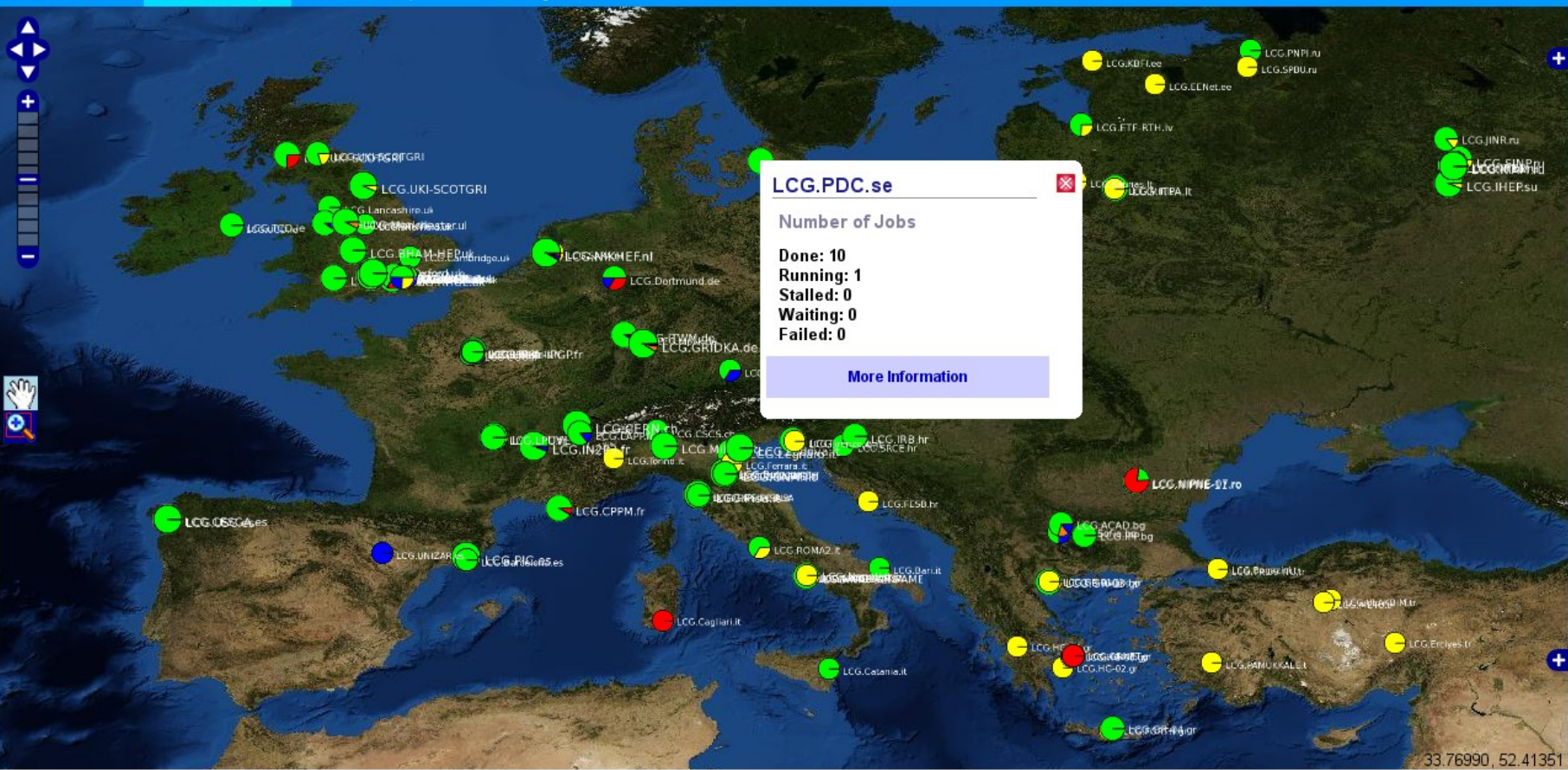
web > Site map Anonymous (certificate login)

View: Job Summary

Info ▾ Systems ▾ Jobs ▾ Data ▾ Web ▾
Selected setup: LHCb-Production ▾

Site Mask
Job Summary
Pilot Summary
Data Storage



LCG.PDC.se ✕

Number of Jobs

Done: 10

Running: 1

Stalled: 0

Waiting: 0

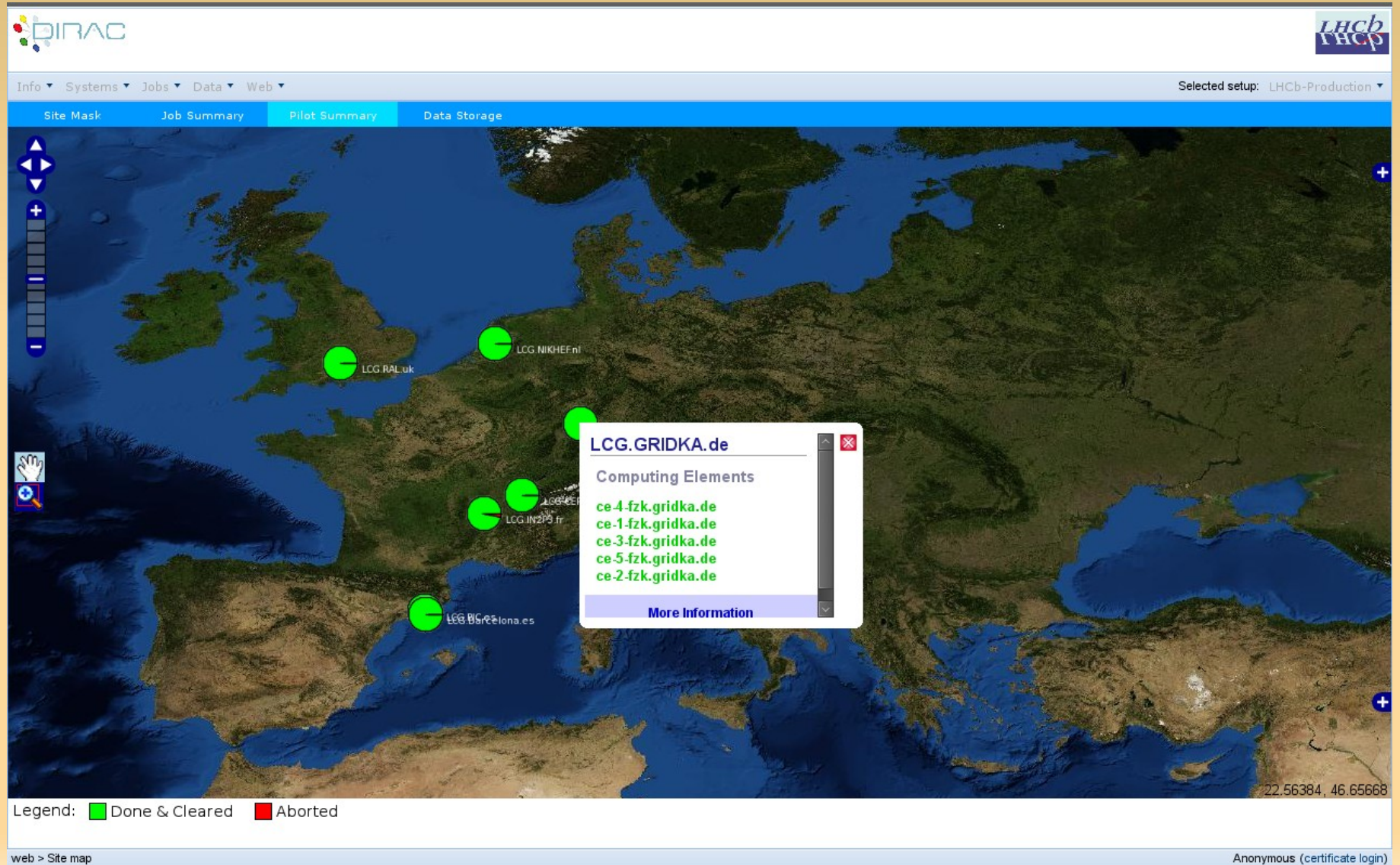
Failed: 0

[More Information](#)

Legend: ■ Done ■ Running ■ Stalled ■ Waiting ■ Failed

web > Site map
Anonymous (certificate login)

View: Pilot Summary



The screenshot displays the DIRAC web interface for the Pilot Summary view. The top navigation bar includes 'Info', 'Systems', 'Jobs', 'Data', and 'Web'. The 'Selected setup' is 'LHCb-Production'. The main content area shows a map of Europe with several green circular markers indicating 'Done & Cleared' sites. A pop-up window for 'LCG.GRIDKA.de' is open, listing five computing elements: ce-4-fzk.gridka.de, ce-1-fzk.gridka.de, ce-3-fzk.gridka.de, ce-5-fzk.gridka.de, and ce-2-fzk.gridka.de. A legend at the bottom left identifies green as 'Done & Cleared' and red as 'Aborted'. The bottom status bar shows 'web > Site map' and 'Anonymous (certificate login)'.

DIRAC

LHCb
LHCb

Info Systems Jobs Data Web Selected setup: LHCb-Production

Site Mask Job Summary Pilot Summary Data Storage

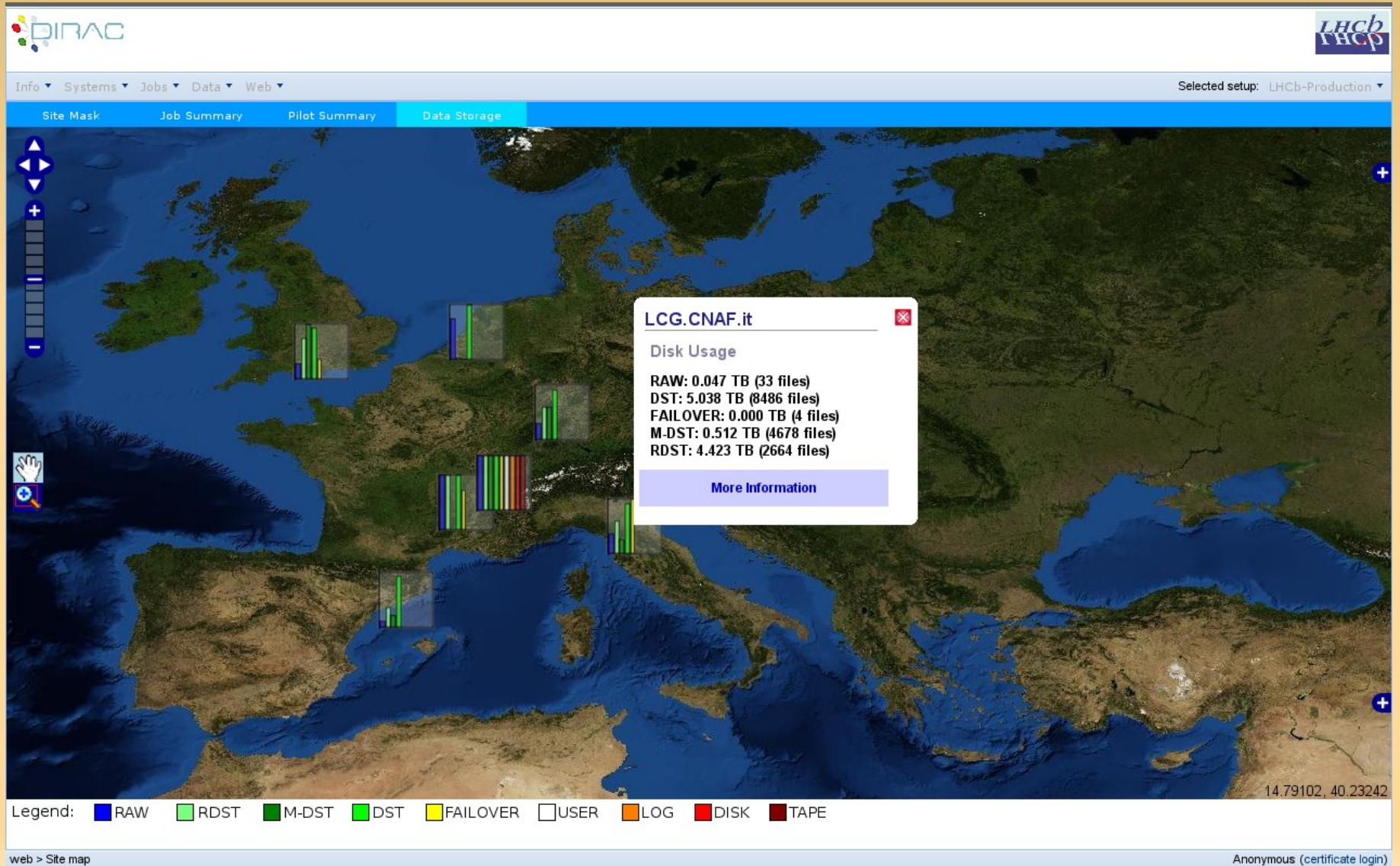
LCG.RAL.uk LCG.NIKHEF.nl LCG.GRIDKA.de LCG.IN2P3.fr LCG.BGCI.lona.es

LCG.GRIDKA.de
Computing Elements
ce-4-fzk.gridka.de
ce-1-fzk.gridka.de
ce-3-fzk.gridka.de
ce-5-fzk.gridka.de
ce-2-fzk.gridka.de
More Information

Legend: Done & Cleared Aborted

web > Site map Anonymous (certificate login)

View: Data Storage





In Conclusion

Comments

- Learned about Grid computer
- Understand the intricacies of DIRAC
- Had fun with lots of languages
- Created a useful tool for shifters and site administrators

Special Thanks To:

- Stuart Paterson, Andrew Smith
- Adrian Casajus, Matvey Sapunov, Andrei Tsaregorodtsev
- Homer Neal, Jean Krisch, Myron Campbell, Jeremy Herr
- Ingrid Schmid, Virginie Blondeau, Catherine Nederman

Thanks for listening!