

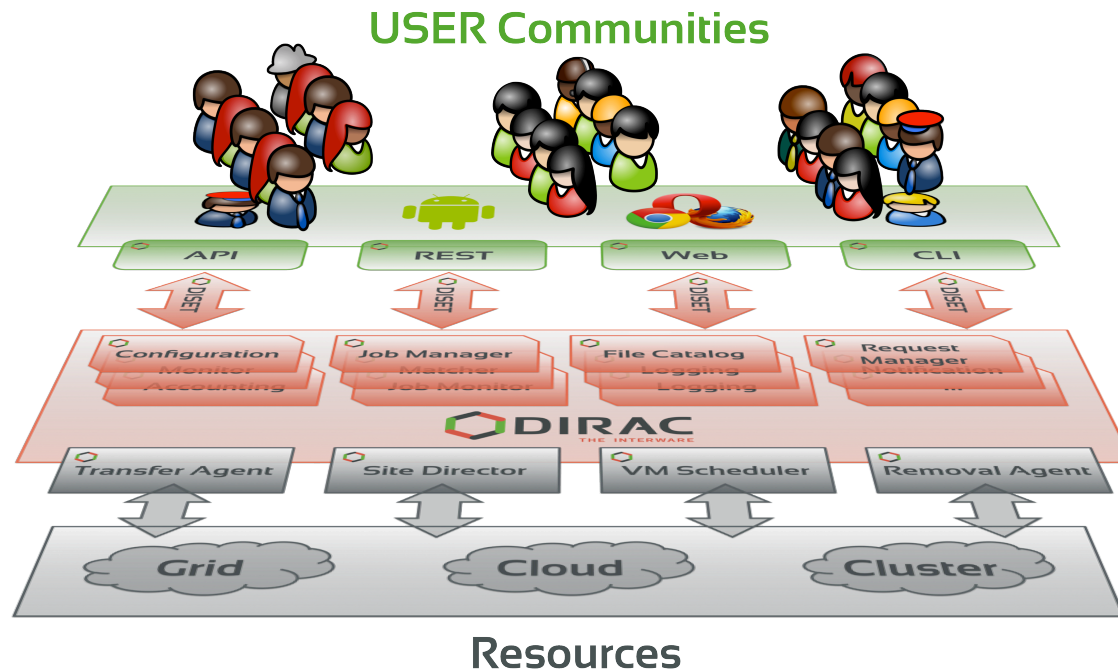
# DIRAC Project

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DIRAC/EGI Meeting, 20 December 2013



- ▶ DIRAC has all the necessary components to build ad-hoc grid infrastructures **interconnecting** computing resources of different types, allowing **interoperability** and simplifying **interfaces**. This allows to speak about the DIRAC *interware*.



- ▶ DIRAC was initially developed for the LHCb High Energy Physics experiment
  - ▶ Several new experiments started to use DIRAC software relying on its proven in practice utility
- ▶ In 2009 the core DIRAC development team decided to generalize the software to make it suitable for any user community.
  - ▶ Separate LHCb specific functionality
  - ▶ Introduce new services to make it a complete solution
  - ▶ Support for multiple small groups by a single DIRAC service
  - ▶ General refurbishing of the code, code management, deployment, documentation, etc

- ▶ LHCb Collaboration, CERN, Switzerland
  - ▶ The largest DIRAC user
  - ▶ Up to 50K simultaneous jobs, ~15PB of data



- ▶ Belle II Collaboration, KEK, Japan



- ▶ ILC/CLIC detector Collaboration



- ▶ BES III, IHEP, China

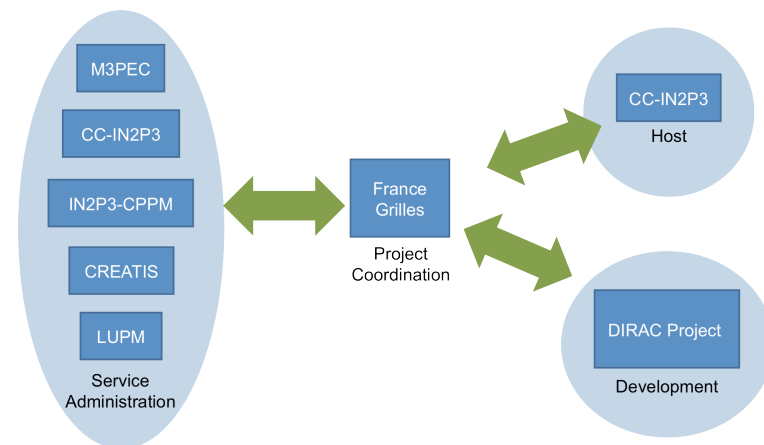


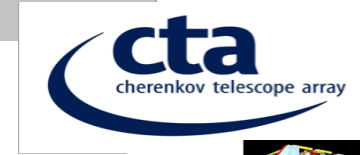
- ▶ CTA



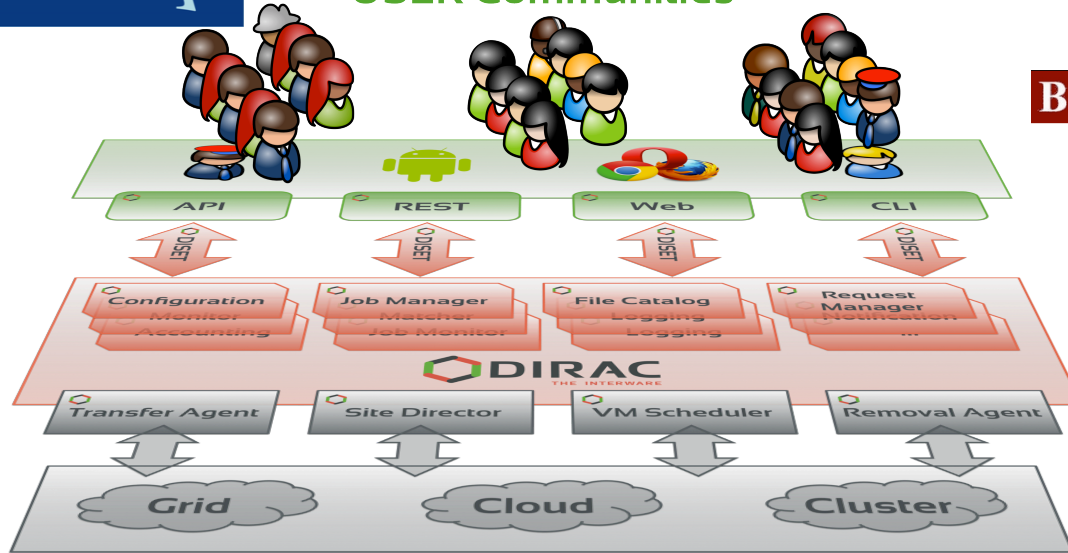
- ▶ DIRAC evaluations by other experiments
  - ▶ LSST, Auger, DayaBay, TREND, GEANT4, ...

- ▶ **DIRAC** services are provided by several National Grid Initiatives: France, Spain, Italy, UK ...
- ▶ Example: France-Grilles DIRAC service
  - ▶ Hosted by the CC/IN2P3
  - ▶ Distributed administrator team
    - ▶ 5 participating universities
  - ▶ 15 VOs, ~100 registered users
  - ▶ In production since May 2012

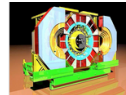




USER Communities



BESIII Experiment



Resources

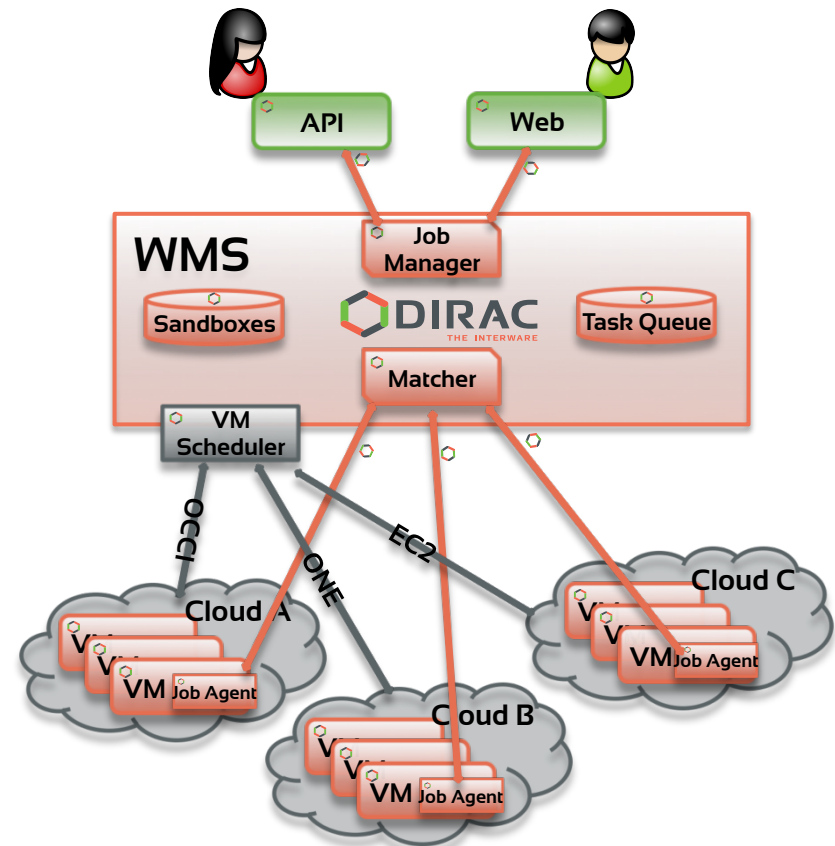


LHCb/WLCG Clouds  
 EGI Fedcloud  
 FG Clouds



- ▶ DIRAC support transparent access to various types of computing resources
  - ▶ Aggregated with a single entry point for the users
- ▶ Full support for grid infrastructures based on different middleware:
  - ▶ **gLite**: EGI, GISELA, etc
  - ▶ **VDT**: OSG
  - ▶ **ARC**: NDGF, RAL, etc

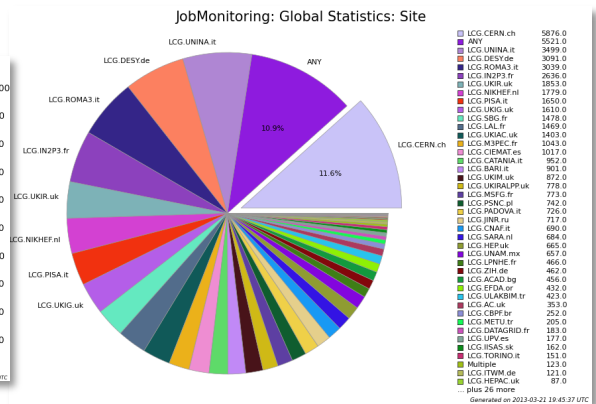
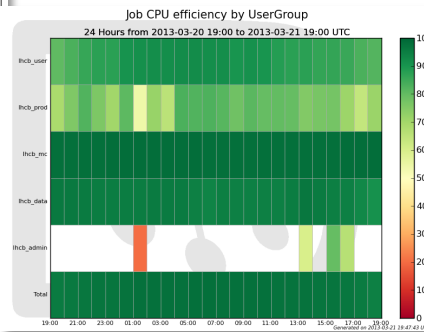
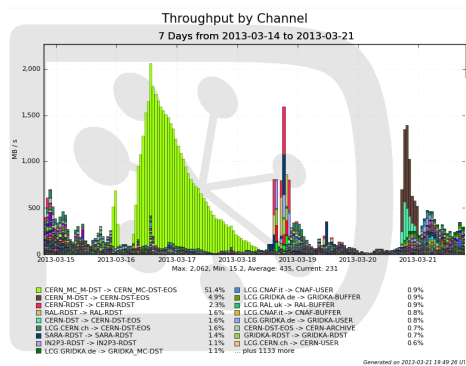
- ▶ VM Scheduler developed for Belle Data Production System
  - ▶ Dynamic VM spawning driven by the user workload
  - ▶ Discarding VMs automatically when no more needed
- ▶ Support for various cloud technologies
  - ▶ Amazon, OCCL, OpenNebula, OpenStack, CloudStack, Stratuslab



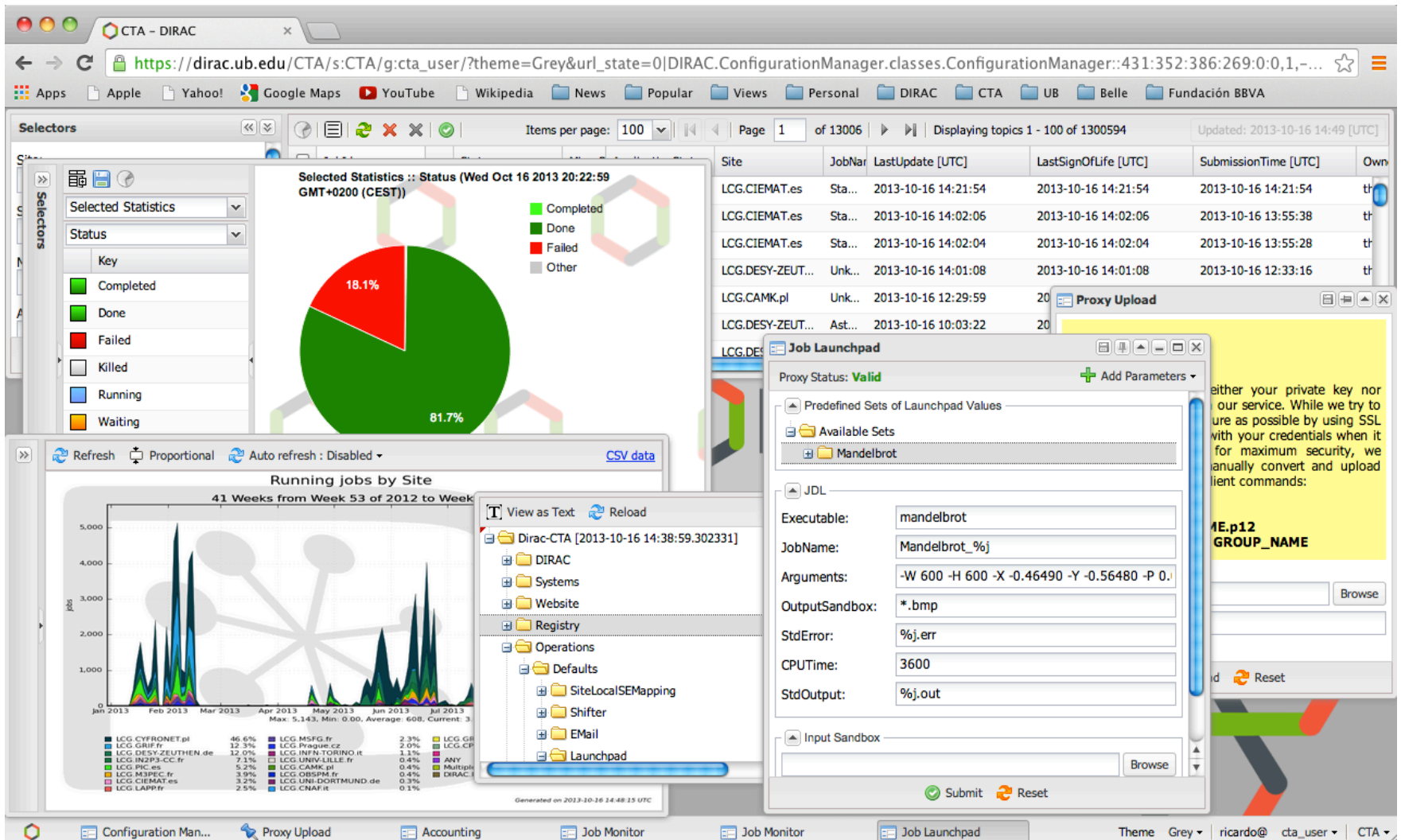


- ▶ **Computing clusters**
  - ▶ Access through SSH tunnel: no grid middleware installation needed on site
  - ▶ Torque/PBS, Condor, LSF, GE, OAR, SLURM
  
- ▶ **Volunteer computing**
  - ▶ IDGF
  - ▶ BOINC

- ▶ Security infrastructure
  - ▶ Digital certificate authentication
  - ▶ Single and Multi-Community portal
- ▶ WMS – pilot based management of user jobs
  - ▶ Job submission, monitoring, retrieval
  - ▶ Intra-Community groups and users policies
  - ▶ Automated data driven workflows
- ▶ Accounting
  - ▶ CPU and storage resources consumption, data transfers



- ▶ **Web Portal**
  - ▶ Support of most of the user tasks ( jobs, data, monitoring, management )
  
- ▶ **DIRAC RESTful interface**
  - ▶ Language neutral
  - ▶ Suitable for application portals
    - ▶ JSAGA plugin
  
- ▶ **Other interfaces include**
  - ▶ Extensive Python API
  - ▶ A rich set of command line tools ( >200 commands )



The screenshot displays the DIRAC web portal interface, showing various monitoring and configuration tools. The browser address bar indicates the URL: `https://dirac.ub.edu/CTA/s:CTA/g:cta_user/?theme=Grey&url_state=0|DIRAC.ConfigurationManager.classes.ConfigurationManager::431:352:386:269:0:0,1,-...`

**Selected Statistics :: Status (Wed Oct 16 2013 20:22:59 GMT+0200 (CEST))**

Key:

- Completed (Green)
- Done (Dark Green)
- Failed (Red)
- Other (Grey)

Selected Statistics: 81.7% Completed, 18.1% Failed

**Running jobs by Site**

41 Weeks from Week 53 of 2012 to Week 3 of 2013

Max: 5,143, Min: 0.00, Average: 608, Current: 3

Site	Percentage
LCG.CYFRONET.pl	46.6%
LCG.GRIF.fr	12.3%
LCG.DESY-ZEUTHEN.de	12.0%
LCG.IN2P3-CC.fr	7.3%
LCG.PIC.es	5.2%
LCG.M3PFC.fr	3.9%
LCG.CIEMAT.es	3.2%
LCG.LAPP.fr	2.5%
LCG.MSFG.fr	2.3%
LCG.Prague.cz	2.0%
LCG.INFN-TORINO.it	1.1%
LCG.UNIV-LILLE.fr	0.4%
LCG.CAMK.pl	0.4%
LCG.OBSPM.fr	0.4%
LCG.UNI-DORTMUND.de	0.3%
LCG.CNAF.it	0.1%
LCG.GR	0.1%
LCG.CP	0.1%
ANY	0.1%
Multiple	0.1%
DIRAC	0.1%

**Job Launchpad**

Proxy Status: **Valid**

Predefined Sets of Launchpad Values

- Available Sets
- Mandelbrot

JDL

Executable: mandelbrot

JobName: Mandelbrot\_%j

Arguments: -W 600 -H 600 -X -0.46490 -Y -0.56480 -P 0.

OutputSandbox: \*.bmp

StdError: %j.err

CPUtime: 3600

StdOutput: %j.out

Input Sandbox: [Empty]

Submit Reset

either your private key nor our service. While we try to be as possible by using SSL with your credentials when it for maximum security, we manually convert and upload client commands:

**ME.p12 GROUP\_NAME**

Reset

Configuration Man... Proxy Upload Accounting Job Monitor Job Monitor Job Launchpad Theme Grey ricardo@ cta\_user CTA

- ▶ DIRAC provides a robust general purpose framework for building distributed computing systems
- ▶ It provides transparent user-friendly access to various types of computing and storage resources
- ▶ DIRAC helps users to get started in the world of distributed computing and discover its full potential

