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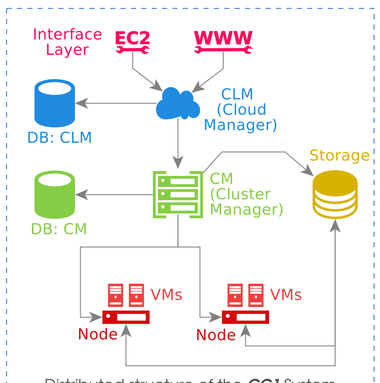
Cloud Computing for Science

The ***CC1*** system delivers complete a Cloud Computing software solution, ready to deploy on any computing infrastructure with Debian-based OS. Distributed structure is supported.

CC1 users are provided with a wide variety of features aiming to facilitate the usage of the computing resources. Those are accessible via convenient web-browser interface.



Distributed structure of the ***CC1*** System

The system delivers on demand ready-to-go VM: requested hardware parameters, specified operating system; all this under user's quota limits. Access to this machine may be defined easily during its creation or later.

The number of ***CC1*** applications is constantly growing. For the past two years it has been extensively used at the Institute of Nuclear Physics PAN (Cracow, Poland). The newest ***Cracow Cloud One*** success is the cooperation with the Belle II project.

CC1 provides a huge variety of features, to name some of them:

Virual machines management
Virtual machines are created and managed via web-browser interface.

Computing farms on demand
Powerfull and ready to go computing farm may be created with a single click.

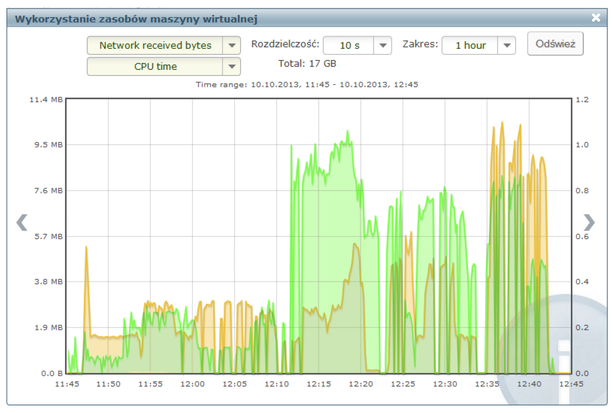
Groups for resources share
Users form groups, within which resources may be shared easily.

Bindable public IP addresses
Limited public IP addresses may be bound to a running VM and released any moment.

Contextualization for OS actions
Some actions on the VM's operating system (eg. password change) may be executed remotely.

Persistent virtual storage
Any data generated via VM may be stored persistently on storage disks.

The system comes equipped with a comprehensible monitoring system. The user may easily look into his CPU usage and consider its economy.



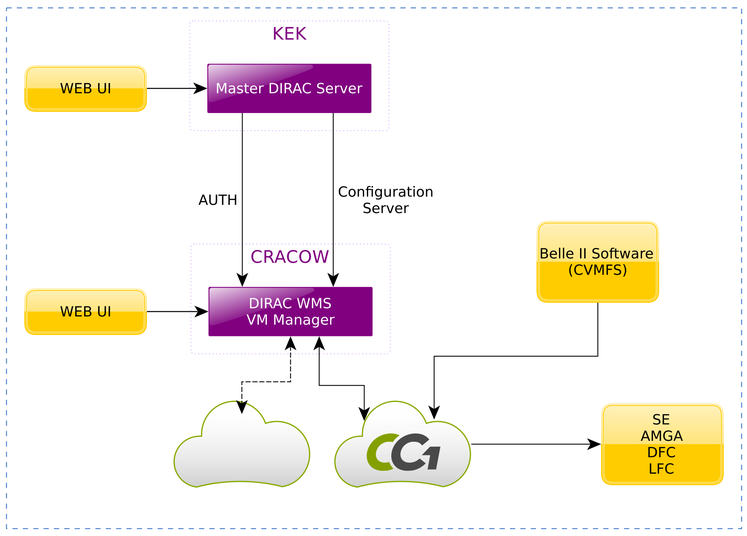
BelleDIRAC with CC1 cloud

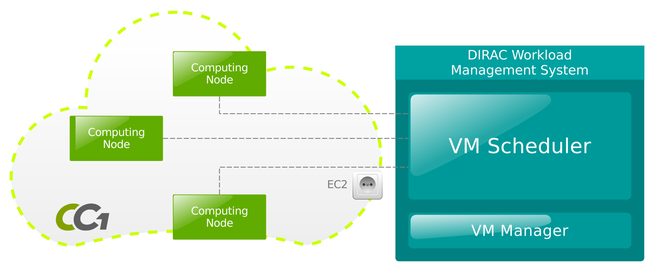
CC1 cloud installation at the Instituite of Nuclear Physics PAN in Krakow can be used to process computation jobs from the DIRAC WMS system. Testing environment has been set up for the Belle II particle physics experiment. The objective was to enable cloud based computations parallel to processing on grids. The DIRAC system chosen as a core component of the distributed computing model for the Belle II is offers computations on different resources like grids and clouds.

A testbed configured in Krakow has been provided for Belle VO users. To submit jobs using Belle II the software called `basf2` uses system called `gbasf2` originally created for grid sites. Now it is easy to direct jobs to particular clouds by specifying a site name.

```
gbasf2 --swver=build-2013-07-11 --site=DIRAC.cc1.pl -s EvtGenFullSim.py
```

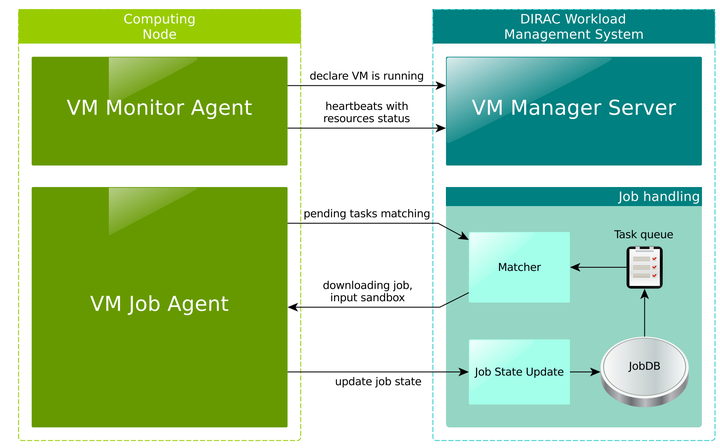
Above example runs Monte Carlo generation on site which is ***CC1*** cloud in this case. The Belle II software is provided by CVMFS online filesystem, as shown in the diagram. The data generated by `gbasf2` are automatically uploaded to a related storage, registered in global LFC catalog and AMGA metadata database, which are important parts of Belle II datahandling system.





Virtual Machines Orchestration.

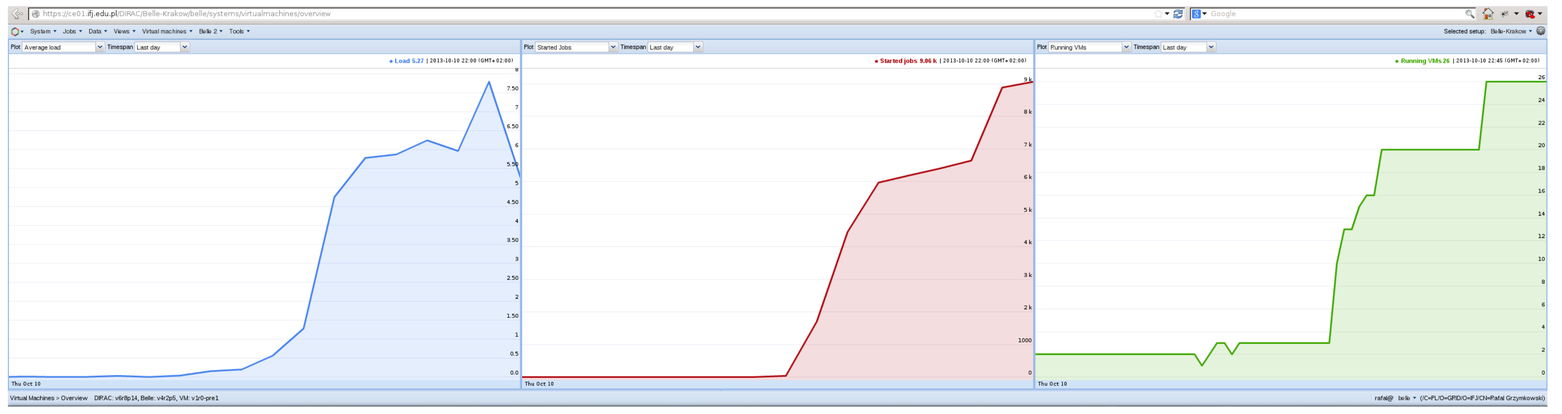
VirtualMachineScheduler on the DIRAC server takes care of controlling computing instances and seting up the jobs receiver. It uses CloudDirector to communicate with clouds by specific API. The CC1 system provides EC2-compatible API for this purpose. EC2 API allows us to inject context data to a computing machine during its start. Context data are used to run JobAgent and VirtualMachineMonitorAgent on computing nodes. Contextualisation is also used to mount the Belle II software by CVMFS filesystem.



Job processing on Virtual Machines

Once the computing machine is configured and running, it periodically sends heartbeats and the level of resources consumption to the DIRAC WMS. This information helps to halt a VM if a load is below a threshold. Meanwhile JobAgent is trying to match a pending job from the Task Queue system to process it. JobAgent is responsible also for updating job state in DIRAC WMS Jobs database. All of these tasks can be monitored though

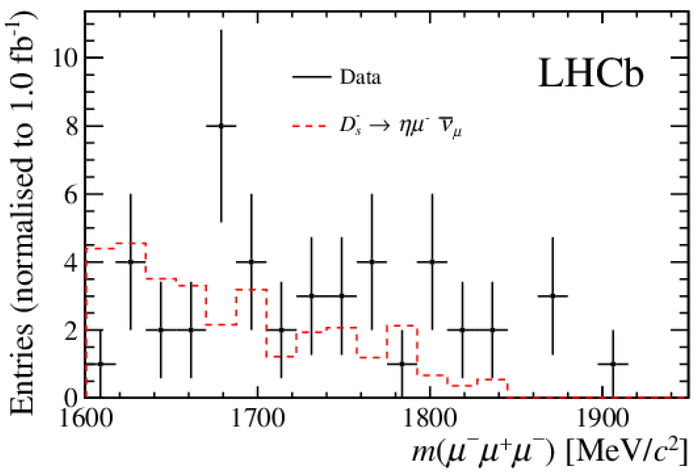
VMDIRAC provides a general monitoring of cloud resources and jobs started on cloud. On charts in the DIRAC Web Portal we can see how Virtual Machine Scheduler reacts to a node load level. Also we can find different charts for a particular computing node in VMDIRAC web extension.



Searches for LFV and LNV Decays at LHCb

Marcin Chrząszcz , on behalf of the LHCb collaboration, Proceedings of CKM 2012, the 7th International Workshop on the CKM Unitarity Triangle, University of Cincinnati, USA, 28 September - 2 October 2012, arXiv:1301.2088v1 (hep-ex)

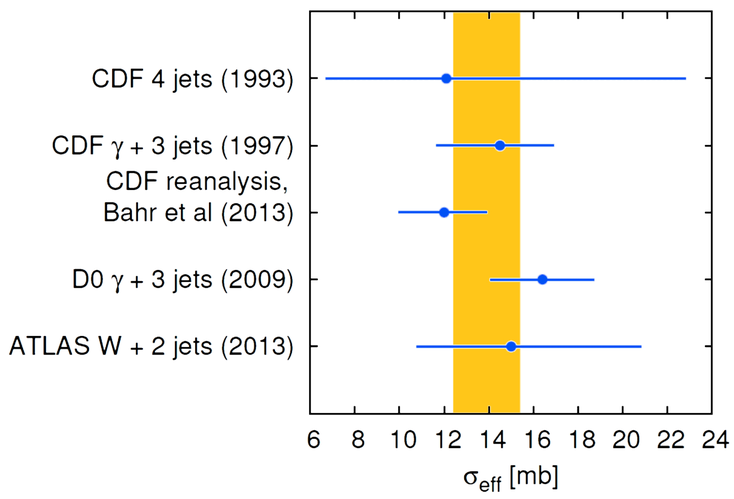
The search for lepton flavor violation (LFV) is being studied in LHCb experiment. The tau lepton decay into three muons is one of the interesting decay channels to look for LFV. The precise knowledge of the background is crucial to obtain good estimation of upper limit for branching fraction of the decay (or to observe LFV effect). The picture presents the distributions of invariant mass of three muons for data (points



Extracting sigma_effective from the CDF gamma+3jets measurement

M. Bähr, M. Myska, M. H. Seymour, and A. Siódmok, JHEP 1303 (2013) 129

The CDF measurement used a non-standard definition of sigma effective which makes this important quantity not suitable for comparisons with other measurements or as input for theoretical calculations. In this publication authors re-analyzed CDF's event definition to provide correction to this problem. The result provides the most accurate measurement of sigma effective to date.



How to get it

We warmly reccomend having a try with CC1 system. Its demo version is available on the project website, with all the details. One may also find there User and Administrator Guide, as well as installation HOWTO. For any deployment support do not hestitate to contact us.

cc1@cloud.ifj.edu.pl

http://cc1.ifj.edu.pl

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