Effective administration through gaining the portability of the LHC Computing Grid sites

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Summary: It has been recently proposed that the Grid infrastructure be based on cloud computing. However, there was a lack of generic provisioning tools for huge collaborations that could adequately integrate and automate deployment tasks for the large scale Grid and local experimental systems in the WLCG environments. This poster argues for integrating the concept of a localized LHC Computing Grid in a testing and deployment framework. This approach is allowing the instant construction of both world-wide and localized Grid sites in a scenario based on OpenStack cloud computing and various platforms including physical machines. Further, it enables a new paradigm applicable also to general experiments in physics and computer science.

Background and motivation

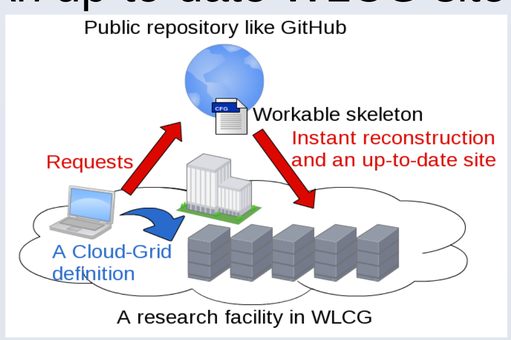
Fundamental problems – You really make all?
- Difficulty of deployments in real Grid systems
- Various Grid services in HEP
- Different skills among physicist, IT and sys admin
- Geographically very far

Old and new technologies - How to merge?
- The gLite, and too many new components in HEP
- Cloud computing and system managements [1], [2], [3], [4]
  - OpenStack, KVM, Vagrant, Puppet, Chef, Cfengine, gLite-Yaim and of course even Bash script...

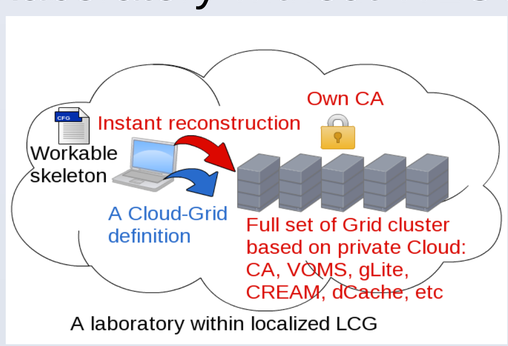
Replicate entire WLCG system? - Not nuts!
- Without having hardware dependency and stress
- ***Portability*** is the key concept

Scenarios

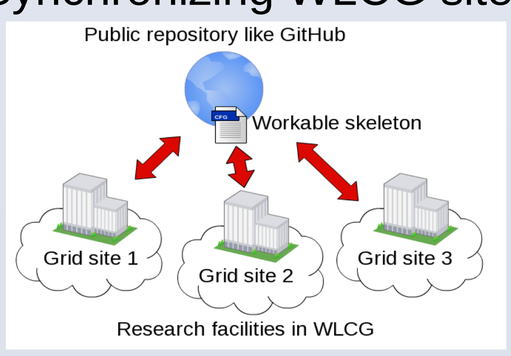
An up-to-date WLCG site



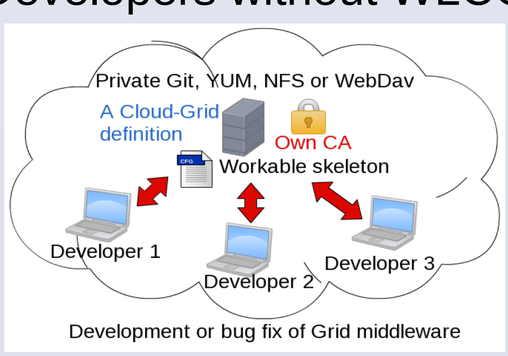
A laboratory without WLCG



Synchronizing WLCG sites



Developers without WLCG



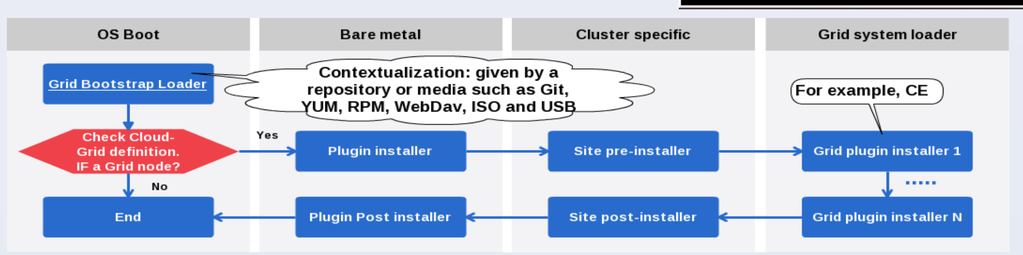
Design and architecture

Vagrant compatible CLI
- More than 50 different Grid systems are defined

Supported utilities
- Puppet, CFEngine and Bash

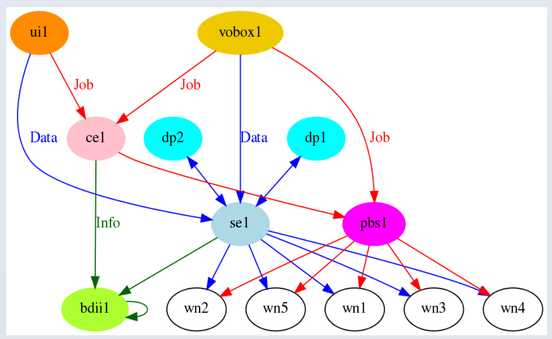
A unified Cloud-Grid definition
- The loosely coupled deployment model of gaining the portability

```
File  Edit  View  Search  Terminal  Help
[gen@germanium32 ~]$ portable-grid
portable-grid [options] <command> [<args>]

   -v, --version      Print the version and exit.
   -h, --help         Print this help.

   -d, --dry          Dry Run

Available commands
  check         Check portable-grid configurations
  show*         Display all guest nodes
  hosts*        Display all guest nodes by /etc/hosts style
  dhcpd*        Display all guest nodes by dhcpd.conf style

  repo          Repository manager
  kick*         Generate kickstart file
  init*         Build boot image file or USB disk
  baremetal     Build a baremetal image for all guest nodes
  boot*         Create guest nodes
  destroy*      Destroy guest nodes

  up            Start existing guest nodes
  halt          Stop existing guest nodes
  reset         Reset existing guest nodes
  inspect       Inspect guest nodes

  skeleton      Generate Cloud-Grid site skeleton

  gui           Launch GUI control window

  ssh*          Connect existing guest node by ssh
  rpm*          Build RPM packages

  help          Display this help

 Report Bugs to <Gen.Kawamura@cern.ch>
[gen@germanium32 ~]$
```



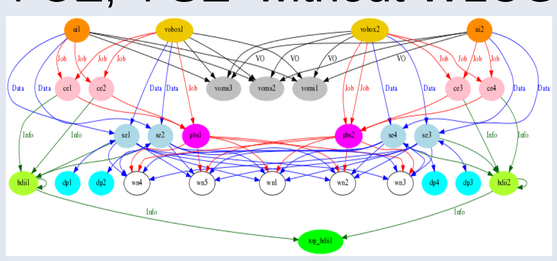
Deployments

1 CE, 1 SE with WLCG env



A traditional site model

4 CE, 4 SE without WLCG



Without a computer-aided tool, hard to build this system already

Conclusion

- The prototype software shows that the way through gaining the portability is very effective approach.
- Some scenarios and their deployment tests result in the relevant performance.
- *Without experience*, the workable Grid systems are easily reconstructed on every platform.

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Reference:

[1] HEP-Puppet: https://github.com/HEP-Puppet
[2] Vagrant: https://www.vagrantup.com
[3] "Implementation of Grid Tier 2 and Tier 3 facilities on a Distributed OpenStack Cloud.", Limosani, Antonio, et al. , Journal of Physics,. Vol. 513. No. 3. IOP Publishing, 2014.
[4] "Using Puppet to contextualize computing resources for ATLAS analysis on Google Compute Engine.", Öhman, Henrik, et al. , Journal of Physics,. Vol. 513. No. 3. IOP Publishing, 2014.