ALEPH analysis preservation

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Aims

* This is a preliminary work on software and data preservation of the ALEPH experiment.

* Fully functional stand-alone ALEPH installation.

* Use cases we wanted to cover:

    * initial integration with a Cloud technology;

    * definition of data distribution policy (Apache/WebDav, StoRM);

    * instantiate interactive machines on demand.

ALEPH environment

Current situation using VirtualBox:

* SLC4 distribution.

* ALEPH environment:
  * SLC4;
  * CERNLIB;
  * ALEPH software;
  * ALEPH data access.

Last native environment of the experiment:

* Linux RedHat 6.2;

* direct acces to CERN tape;

* software installed on AFS - heavy dependences on CERNLIB

SLC4 and CERNLIB

* Why SLC4? It has been used few years ago for published analysis (last known official Aleph analysis use SLC4).

    * Also SLC5 is suitable for this purpose, but for preservation goals it is important to have a certified platform for analysis.

* CERNLIB rpm is available in the SLC4 repository and no problem observed in the coexistence with SLC4 and ALEPH software.

    * The integration of CERNLIB with SLC5 and ALEPH software is more elaborated but not impossible.

AFS

* a local copy of the needed files stored under the `/afs/cern.ch/aleph/` area has been made;

* the system at the moment is totally independent from AFS;

* moreover, it is independent from any network issue (keeping out cloud applications).

* a different choice is represented by CernVM-FS (building a `/cvmfs/aleph.cern.ch/` area):

  * at the moment this is not of primary importance - the software occupy ~hundreds MegaBytes of space.

How the VM was prepared

* SLC4 32 bit;

* CERNLIB available on yum repository;

* software locally copied from `/afs/cern.ch/aleph` ;

* no dependences from AFS and network, a part from DB access.

Data

* CERN currently hosts archival ALEPH data on the Castor storage system:

    * slow and complex access to them.

* We have searched for a solution that guarantees readiness and ease of use :

    * total data + MC for analysis is less than 20 TB: it can be served by a single WebDav instance.

        * plan is to use StoRM resource manager;

        * data have been moved to a current generation disk system at T2_IT_Pisa and served via the WebDav protocol (SL4 supports *davfs2*).

Cloud computing

* A set of virtual machines like this is available on a cloud supplied by the INFN-Bari datacenter for jobs submission, thanks to two italian projects:

    * PRISMA - IaaS and PaaS Cloud Computing infrastructure with completely OpenSource solutions, available for scientific community, business companies and public administrations;

    * ReCaS - development of the Computing infrastructure in the south of Italy, Bari is involved in the construction of a new datacenter with 15k CPUs and 5 PB of storage.

* Such a system is implemented in an OpenStack instance.

Tested software components

* The whole analysis chain has been reproduced:

    * kingal: event generator library;

    * galeph: MC simulation program for the detector;

    * julia: reconstruction program;

    * alpha: physics analysis package.

* Compilation of new analyses and software works - not limited to replaying ancient analyses.

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   5800                              I
   5600                              I
   5400                              I
   5200                              I
   5000                             -I
   4800                             II
   4600                             II
   4400                             II
   4200                             II
   4000                             II
   3800                             II-
   3600                             I I
   3400                             I I
   3200                             I I
   3000                             I I
   2800                             I I
   2600                            -I I
   2400                            I  I
   2200                            I  I
   2000                            I  I-
   1800                            I   I
   1600                            I   I
   1400                           -I   I
   1200                            I    I-
   1000                            I    I
    800                           -I    I-
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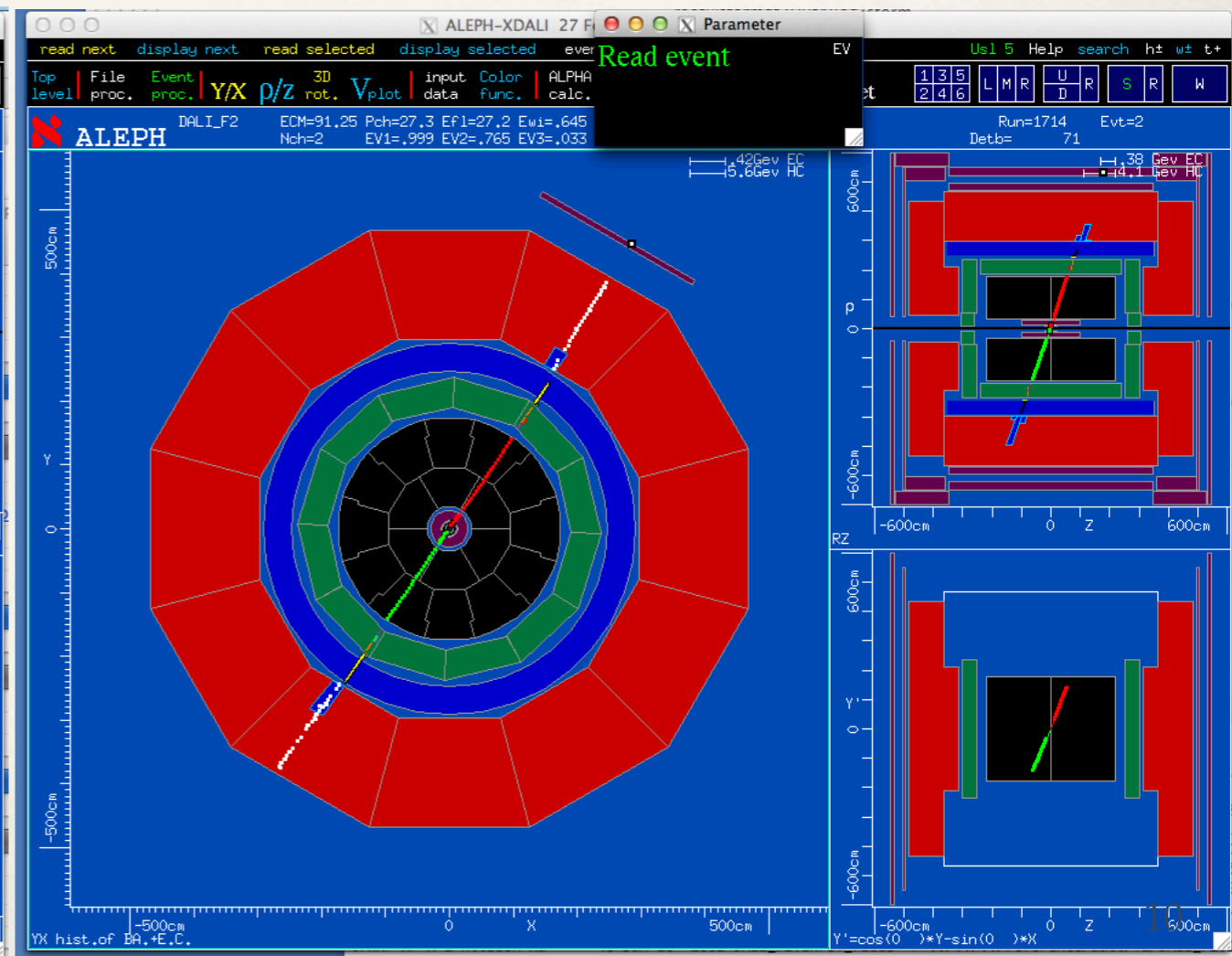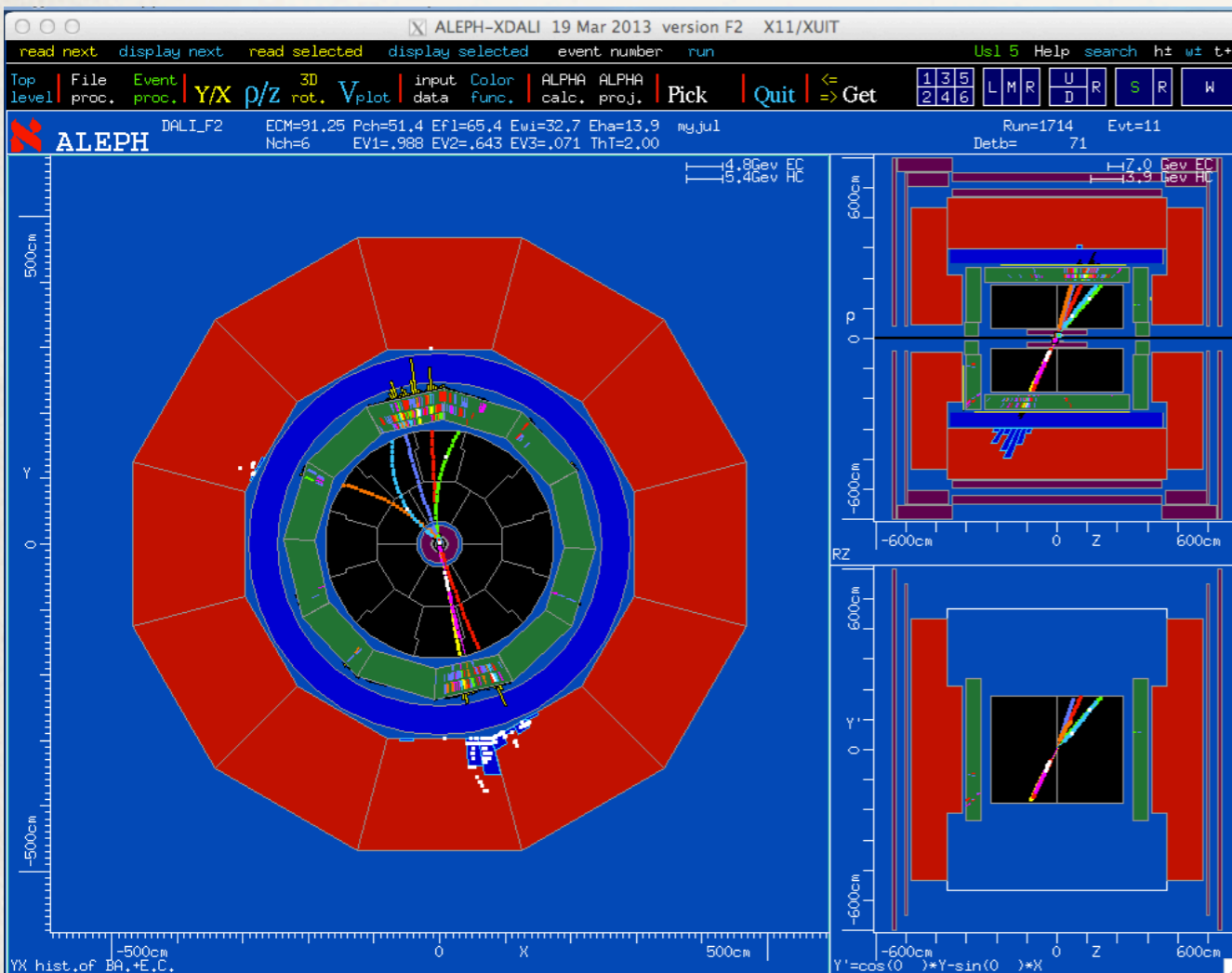
Tested software components

- Interactive use - the system is suitable for interactive analysis.

- All the previous functionalities, plus the event display and PAW works.

Applications

* The solution can be used to reproduce published analysis and completely new studies.

* The solution includes a complete development environment, where software components at any step can be modified, recompiled, debugged.

* The whole software stack is available, for data and MC sets, for interactive and batch processing.

Conclusions

✤ Installed a SLC4 with fully ALEPH environment available:

   ✤ no dependency from AFS and network issues.

✤ Cloud computing for job submission is possible via an OpenStack instance hosted by the Bari datacenter.

✤ Data and MC are available in a current generation disk system.

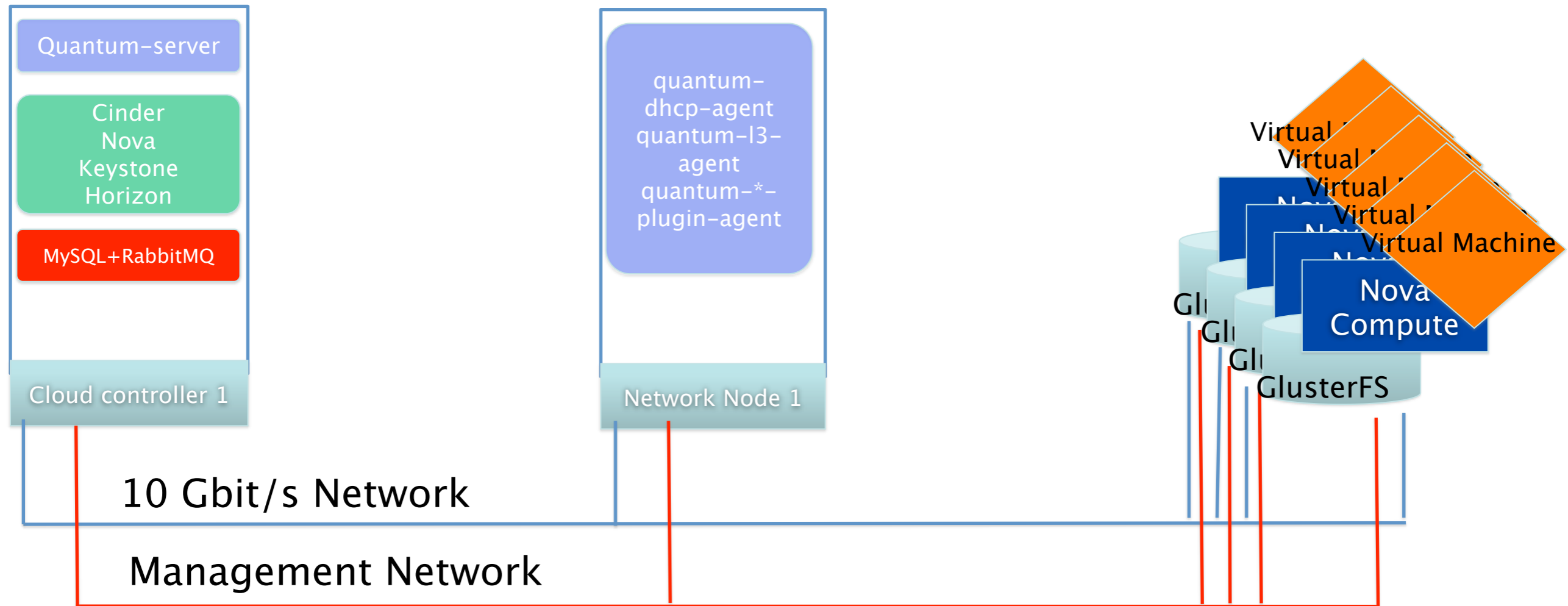   ✤ They can be served by a single WebDav instance.

Conclusions

* The whole ALEPH analysis chain has been reproduced:

    * the machine is ready and available for interactive usage, ancient analysis can be reproduced and new ones are possible;

    * software components at any steps can be modified;

    * interactive and batch processing are possible.

* Knowledge and bit preservation services developed by european projects will be investigated (SCIDIP-ES, EUDAT) .

Backup

IaaS Open Source: current situation (INFN testbed)

Quantum–server

Cinder
Nova
Keystone
Horizon

MySQL+RabbitMQ

Cloud controller 1

quantum–dhcp–agent
quantum–l3–agent
quantum–*–plugin–agent

Network Node 1

Virtual Machine
Virtual Machine
Virtual Machine
Virtual Machine
Virtual Machine

Nova Compute

GlusterFS

10 Gbit/s Network

Management Network

- ➤ 11 server
- ➤ 264 CPU/Core
- ➤ 880 GB RAM
- ➤ 66TB HDD (DAS) 7.2K rpm

- ➤ 1 Manager Node (24 Core, 80GB Ram, 6dischi, 10Gbit/s)
- ➤ 1 Network Node (24 Core, 80GB Ram, 6dischi, 10Gbit/s)
- ➤ 10 Gbit/s on Wide-Area-Network
- ➤ 250 Public IP addresses AVAILABLE