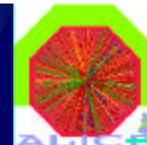




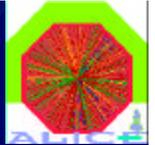
Roberto Barbera  
GRID Activities at ALICE

*T. Anticic (IRB), R.B. (CT), I.J. Bloodworth (B'ham),  
M. Botje (NIKHEF), P. Buncic (CERN),  
F. Carminati (CERN), P. Cerello (TO), G. Chabratova  
(DUBNA), J. G. Contreras (MERIDA), D. Di Bari (BA),  
J. Gosset (SACLAY), M.L. Luvisetto (BO), P. Malzacher  
(GSI), A. Masoni (CA), D. Mura (CA), L. Nellen  
(UNAM), B. Nilsen (OSU), F. Rademakers (CERN), C.  
Rocca (CT), Y. Schutz (SUBATECH), M. Sitta (TO), R.  
Turrisi (PD), D. Vicinanza (SA)*



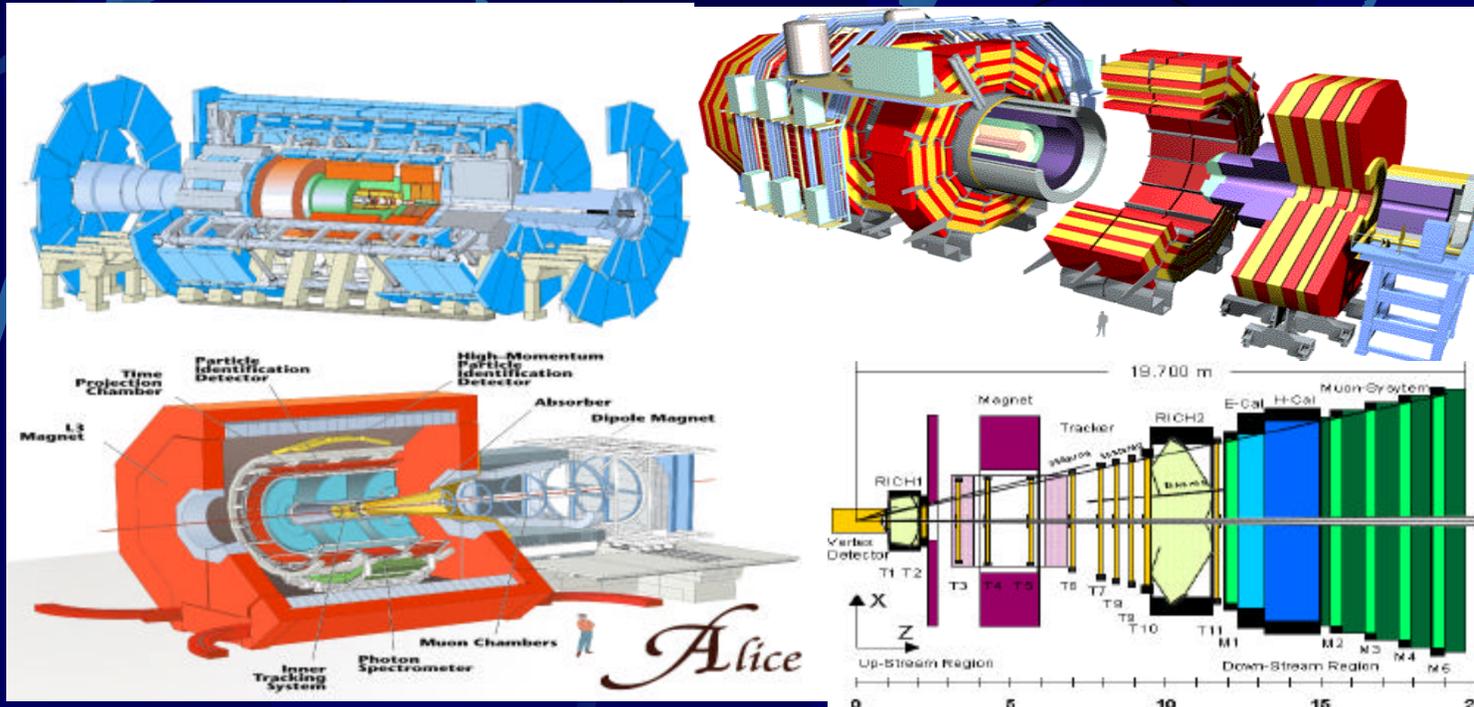
# Outline

- Introduction
- AliRoot and the GRID – Phase I
- AliRoot and the GRID – Phase II
- Possible Root developments



# ALICE, ATLAS, CMS, LHCb

## Higgs and new particles; Quark-Gluon Plasma; CP Violation

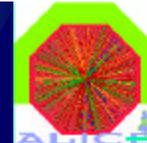


Data written to tape

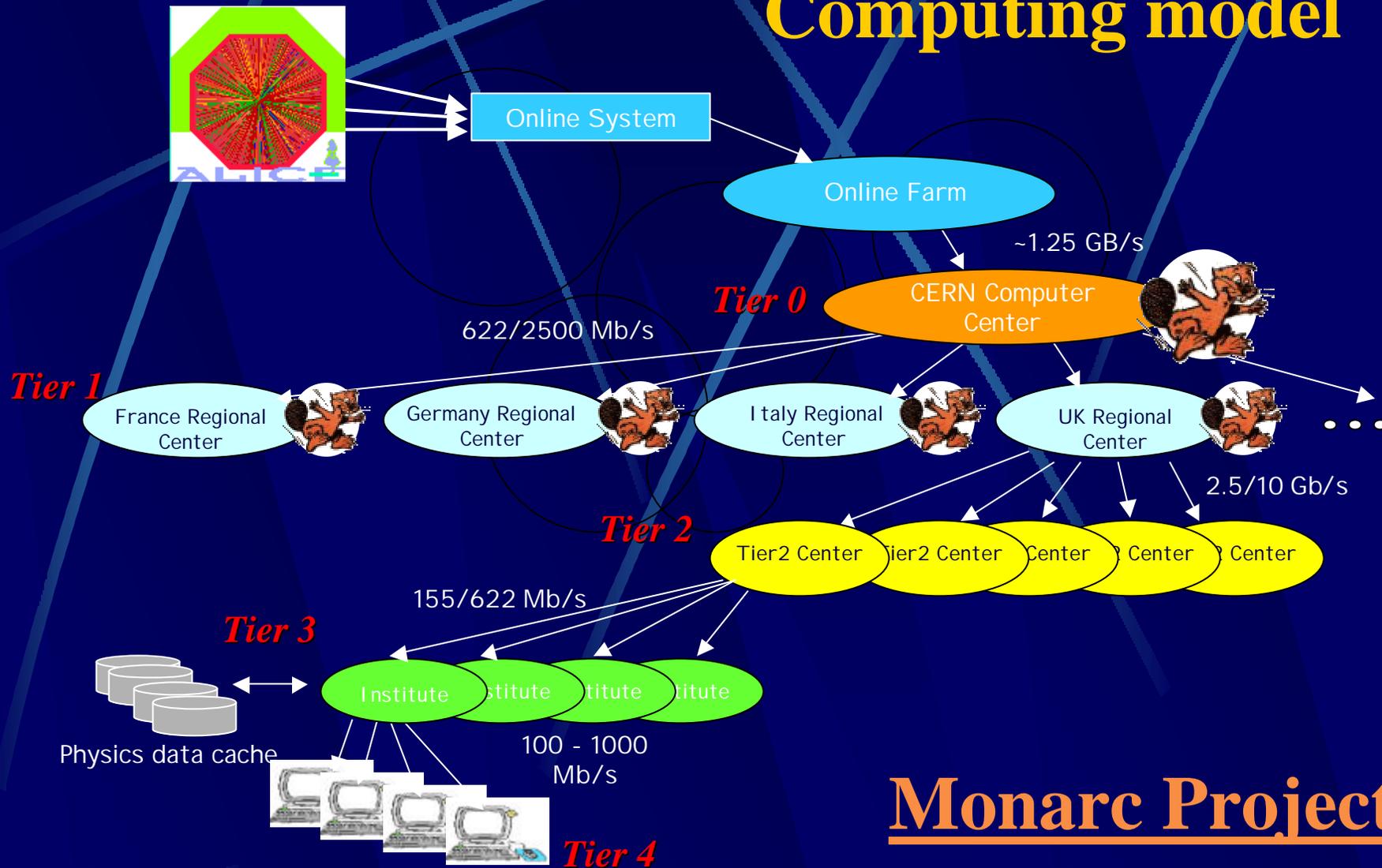
~10 Petabytes/Year and UP  
(1 PB =  $10^{15}$  Bytes)

O(0.1) to O(1)  
(~2010) (~2020 ?)

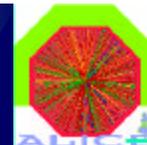
Exabyte (1 EB =  $10^{18}$  Bytes)  
Total for the 4 LHC experiments



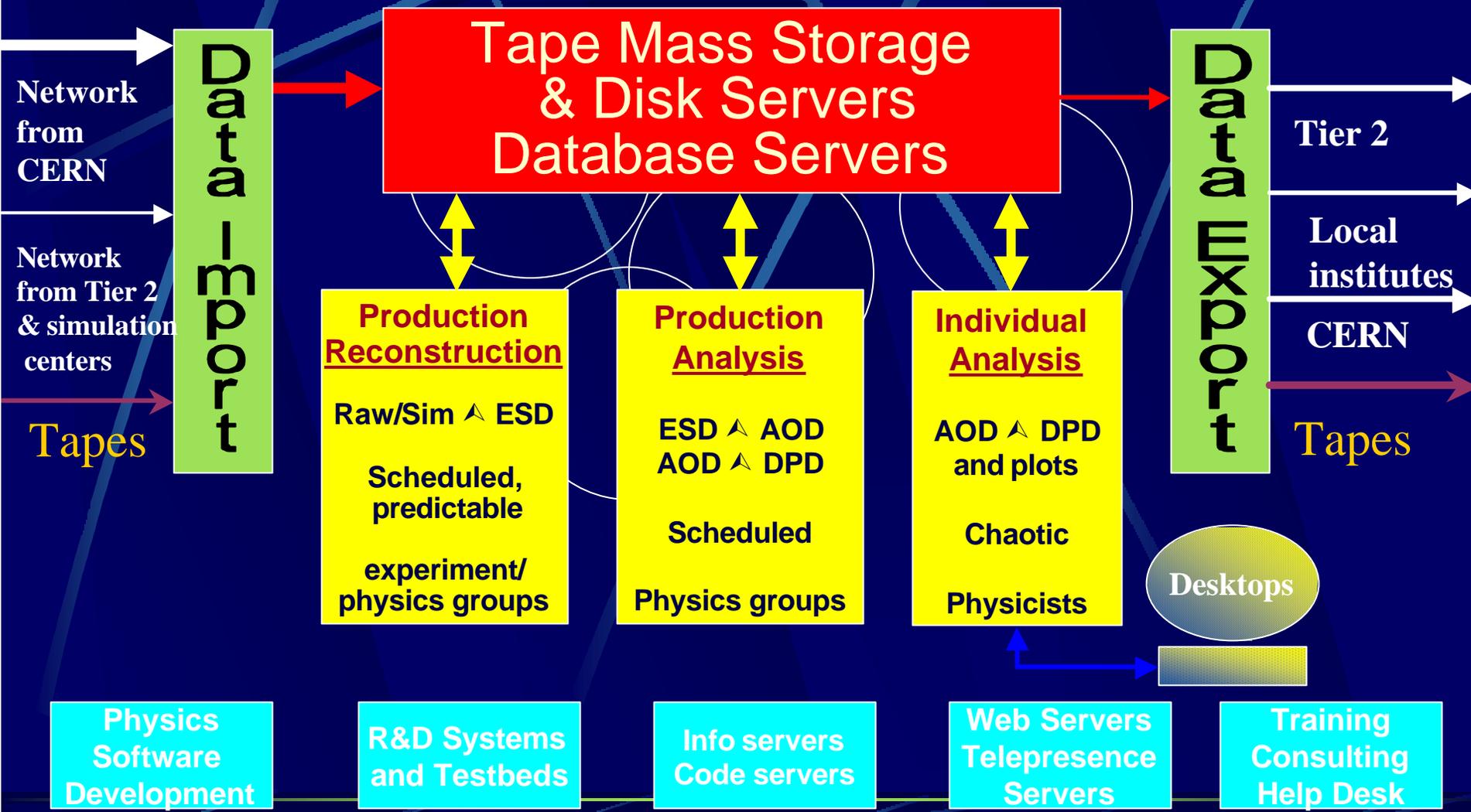
# Computing model

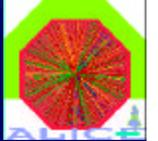


## Monarc Project

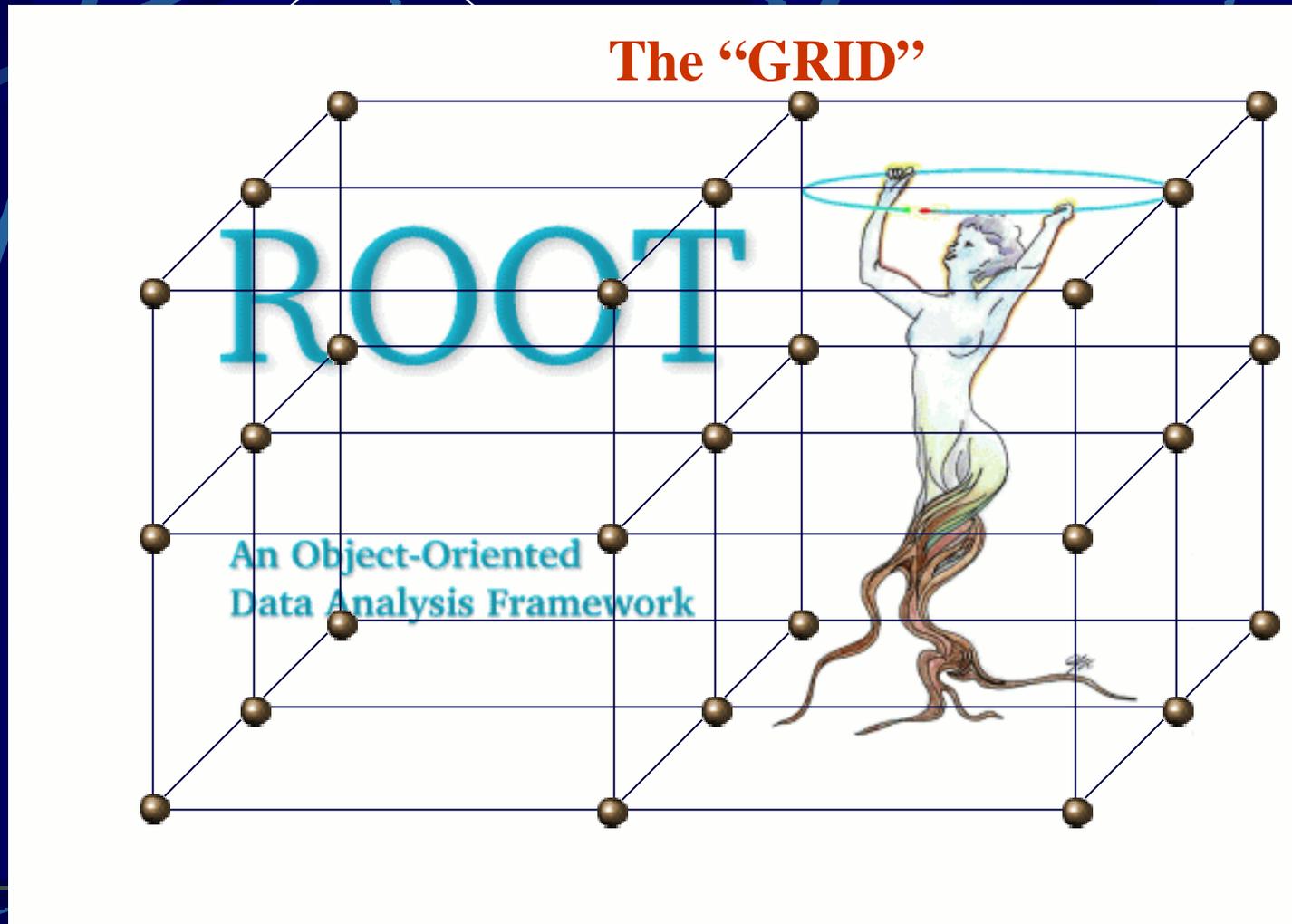


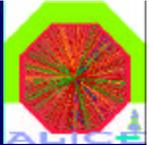
# Typical work flow at a Tier-1





# AliRoot and the GRID – Phase I: Production





# The ALICE testbed for Phase I

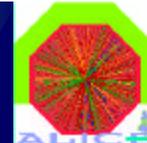
Lyon

OSU/C

Mexico City

Merida





I'm the PPR production manager



Catania

Globus



Linux farm +  
MRTG monitor

Disk Pool

# Production test lay-out for phase I

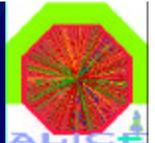
Batch surveyor

I'm the local surveyor



PPR site

**1 week run**  
**~ 200 events**  
**300+ GB**



# Utilities

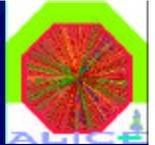
The screenshot shows an LDAP Browser/Editor window with the following structure:

- Tree view:
  - dc=infn,dc=it,o=Grid
    - dc=mi
    - dc=pd
    - dc=bo
    - dc=ba
    - dc=ct
    - dc=cnaf
    - dc=le
    - dc=lnl
    - dc=pr
    - dc=pi
    - dc=romal
    - dc=to
    - ou=Atlas
    - ou=CMS
    - ou=Alice
      - cn=gen
      - cn=test
      - cn=test1
      - cn=test2
      - cn=test3
    - dc=ca
    - dc=fe

- Attributes table:
 

Attribute	Value
owner	mail=Carlo.Rocca@ct.infn.it,ou=people,dc=c
ou	Alice
businessCategory	HEP Experiment
objectClass	groupOfNames
objectClass	top
o	Grid
member	mail=Carlo.Rocca@ct.infn.it,ou=people,dc=c
member	mail=Roberto.Barbera@ct.infn.it,ou=people,d
member	mail=Ernesto.Cangiano@ct.infn.it,ou=people
member	mail=Antonio.Forte@to.infn.it,ou=people,dc=
member	mail=Franco.Semeria@bo.infn.it,ou=people,d
member	mail=Giuseppe.LoBiondo@mi.infn.it,ou=peop
cn	gen

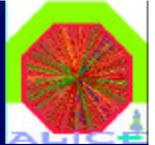
**LDAP server for ALICE  
(only in Italy)**



# What did we learn ? (1)

## ● Pros:

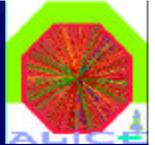
- We are able to successfully manage certificates from different CA's (INFN, CNRS, Globus).
- The Root/AliRoot installation toolkit (Torino) works nicely at all sites (ALICE's and WP6's).
- The web interface EnginFrame is interfaced not only with the Globus GRAM and GSI but also with the local monitoring systems and with the presently available information service.
- A geographically distributed AliRoot production can be centrally managed.



# What did we learn ? (2)

## ● Cons:

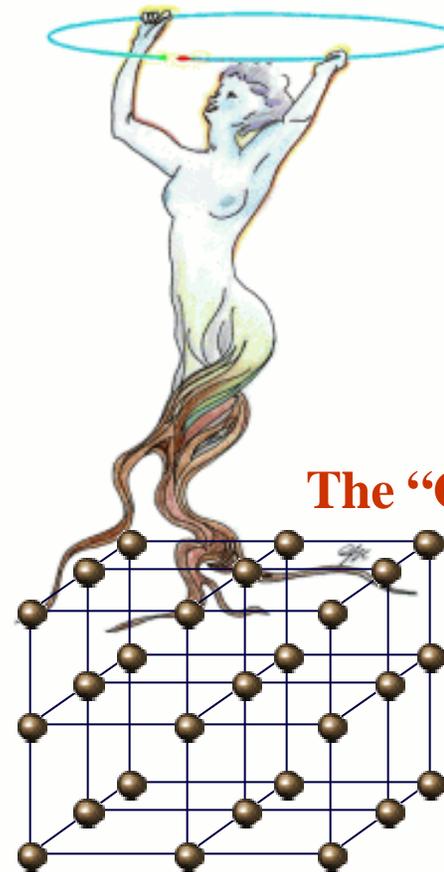
- The output and error files **do not** fly back to the submitting machine if a job manager different from fork is used by the Globus commands.
- The absence of a centralized bookkeeping system which could also acts as job monitor was the most critical issue.
- There was no **direct** interaction between Root and the GRID services.



## AliRoot and the GRID – Phase II: Reconstruction and analysis

# ROOT

An Object-Oriented  
Data Analysis Framework

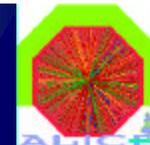


The "GRID"

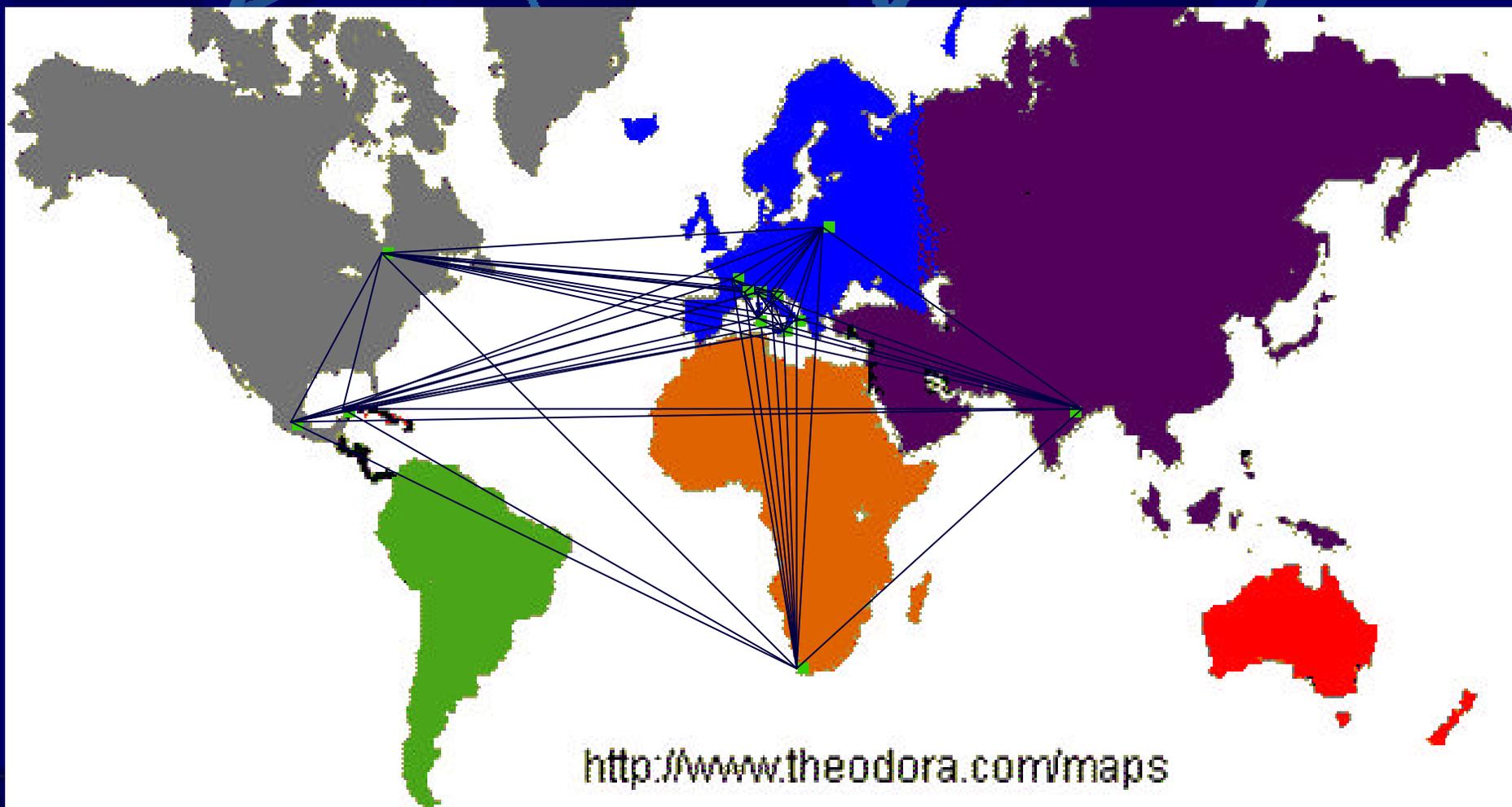


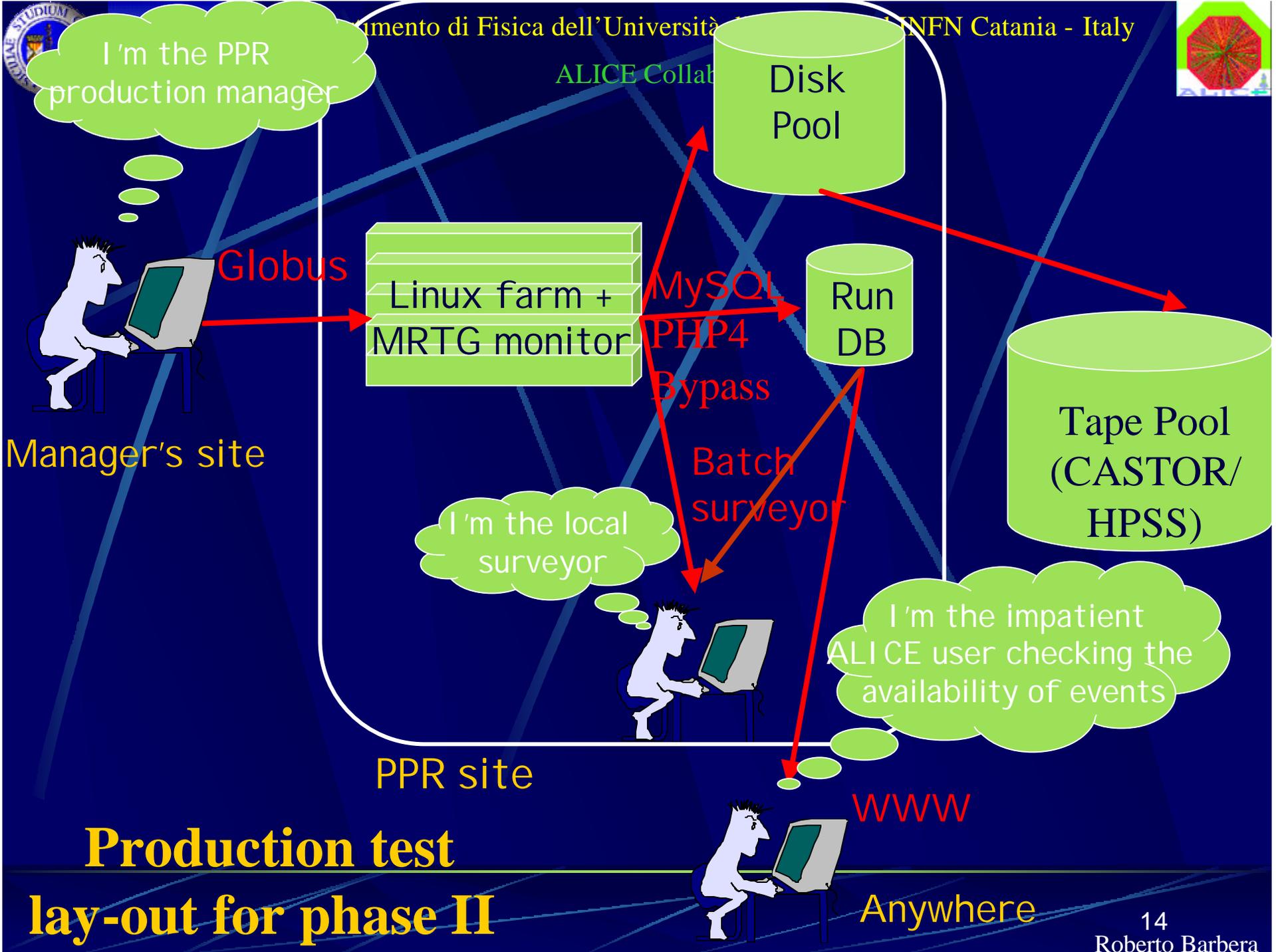
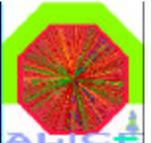
Dipartimento di Fisica dell'Università di Catania and INFN Catania - Italy

ALICE Collaboration



# The ALICE testbed for Phase II



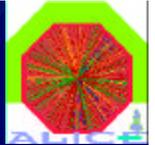


Manager's site

PPR site

Anywhere

# Production test lay-out for phase II



# More integration: Grid services addressed from Root (analysis)

- **TAuthorization (P. Malzacher)**
  - Interface between Root and the Globus GSI service.
- **TLDAP (P. Malzacher)**
  - Interface between Root and the Globus GIS service based on LDAP directories.
- **TPServer, TPServerSocket, TFTP (Fons)**
  - Parallel socket transfer over TCP/IP.
- **RootFTP (Fons)**
  - File transfer utility which uses parallel sockets.

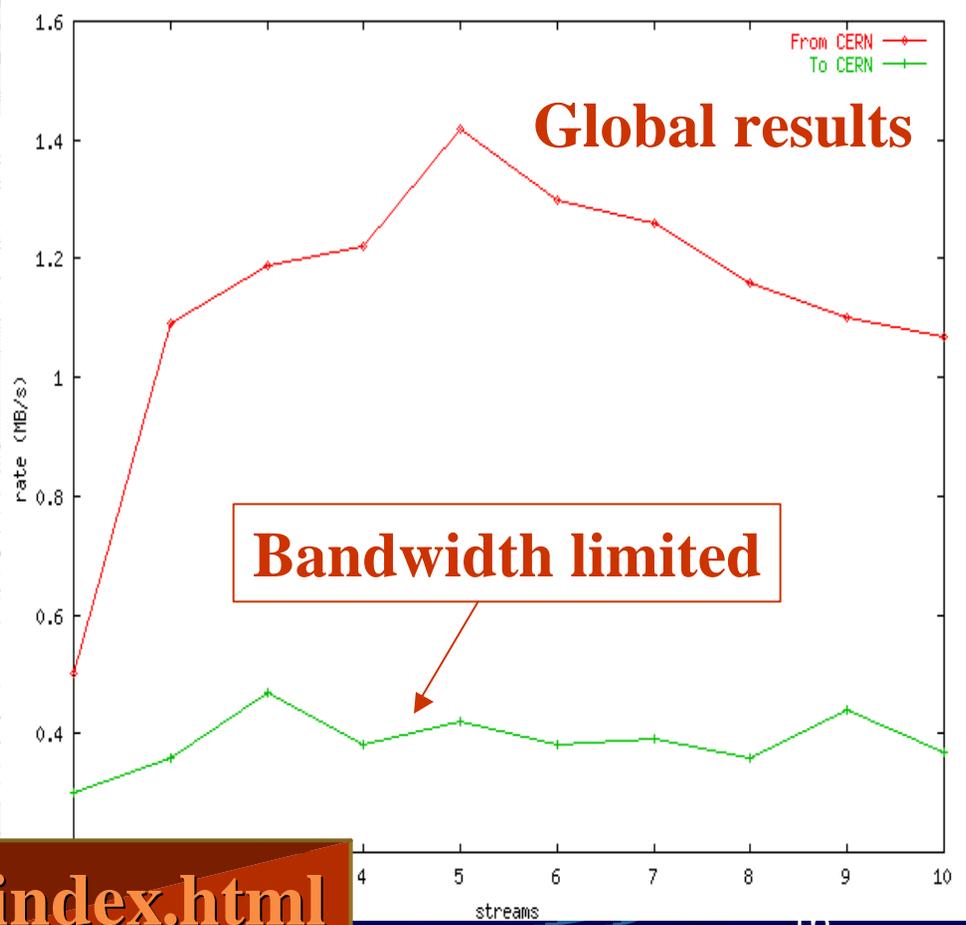
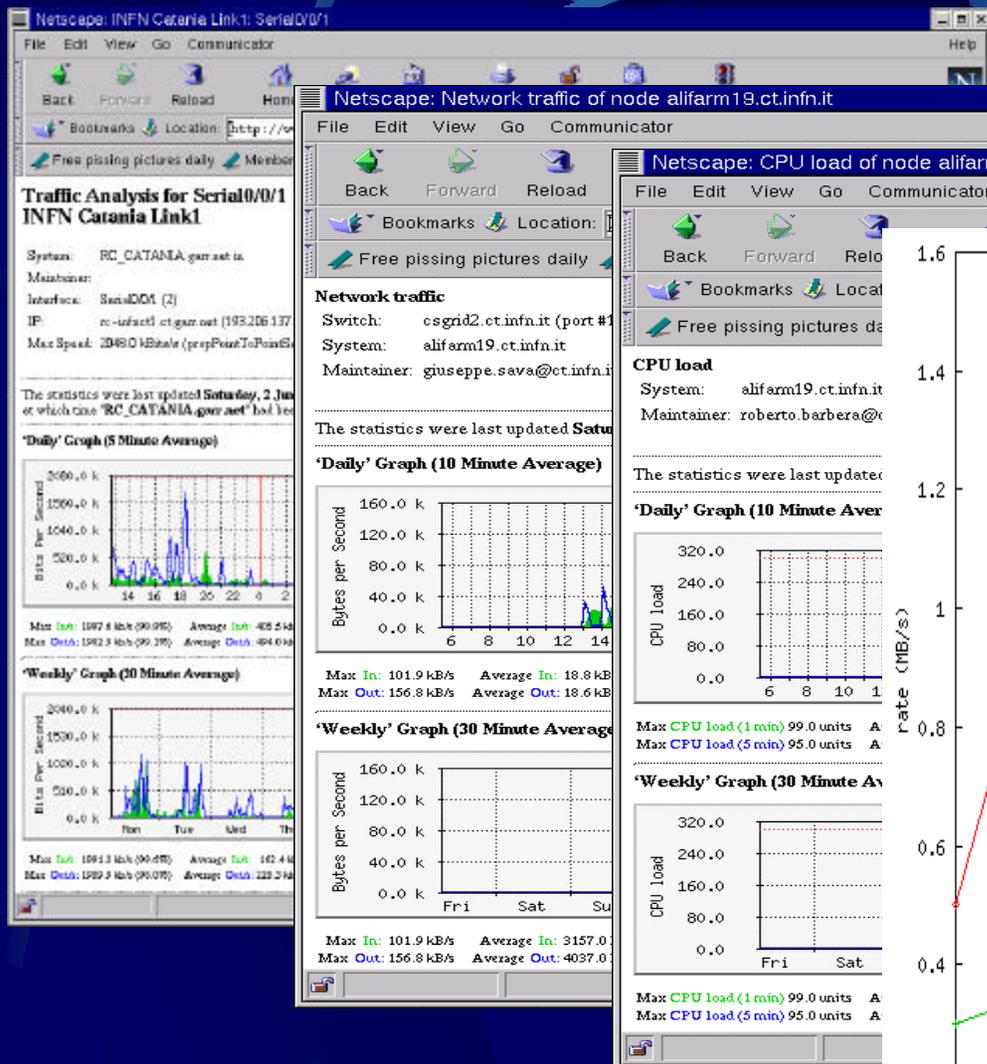


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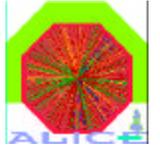
ALICE Collaboration

Preliminary RootFTP tests CERN → Catania (14 nodes, 28 CPUs)

**34 Mb/s soon !**



<http://alicedb.cern.ch/mrtg/index.html>

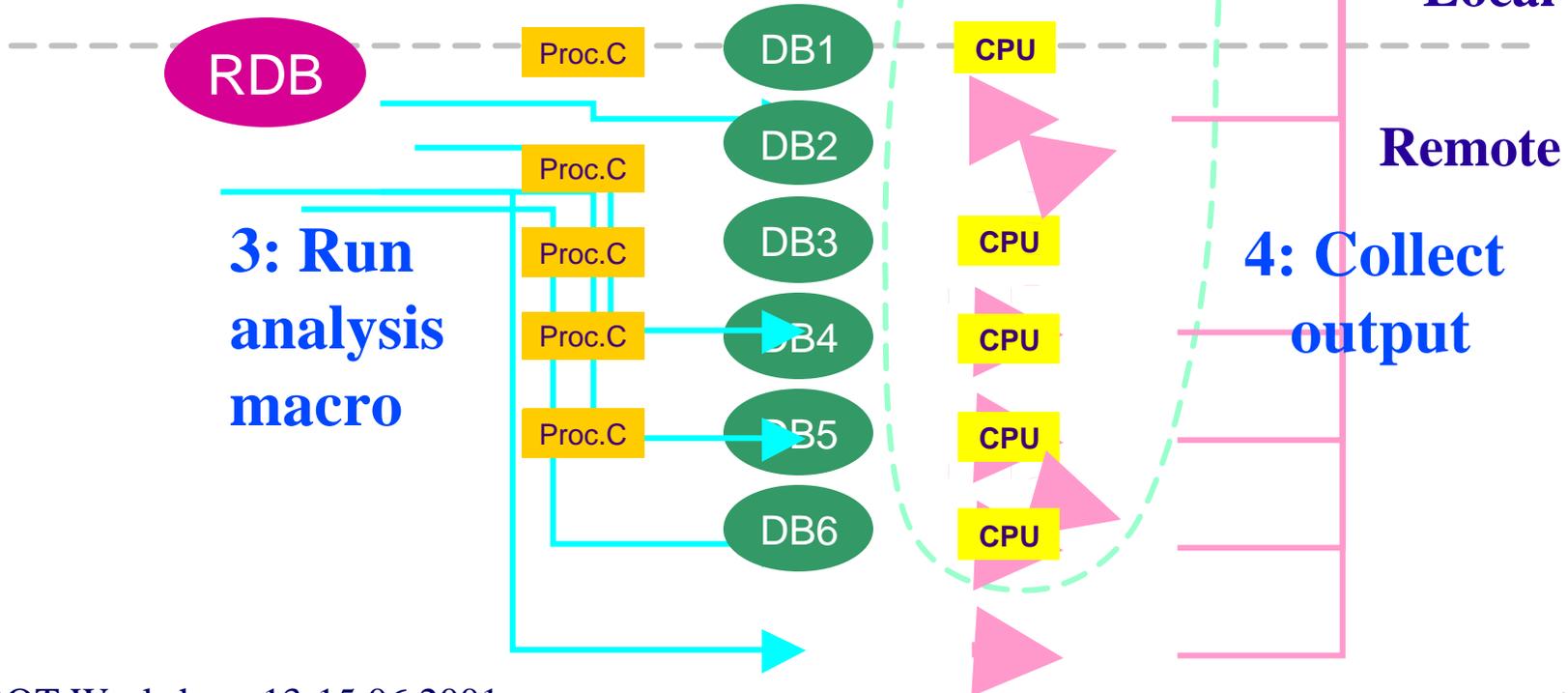


# AliRoot + PROOF

## 1: Select input data

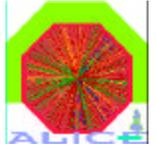


## 2: Configure PROOF



## 3: Run analysis macro

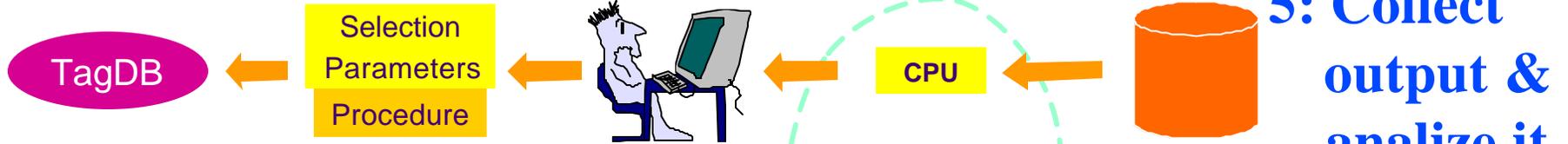
## 4: Collect output



# AliRoot + PROOF + DataGRID Services

## 1: Select input data (ALICE Data Catalogue)

### Retrieve LFNs



## 2: Contact GRID scheduler

### PROOF

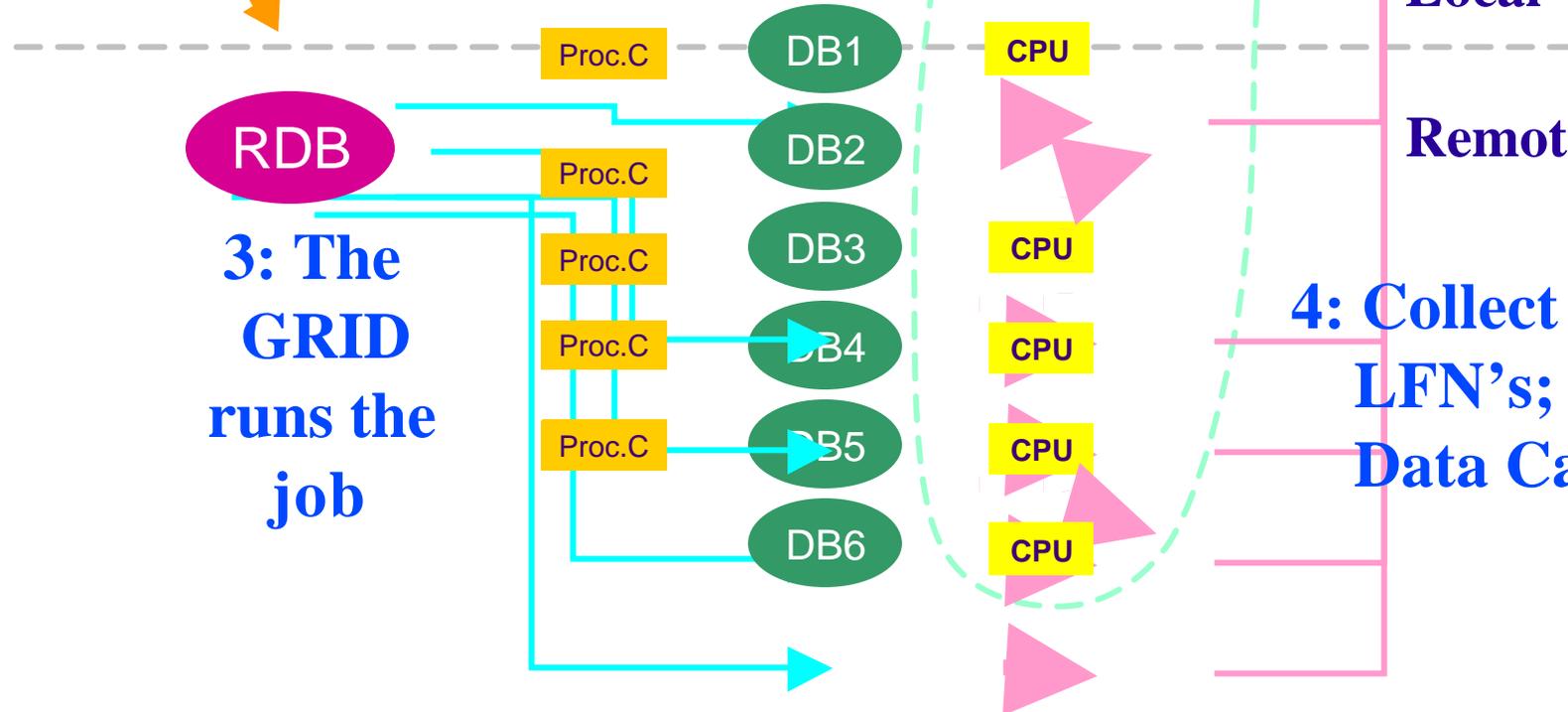
Local

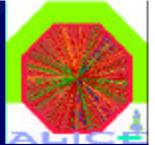
Remote

RDB

## 3: The GRID runs the job

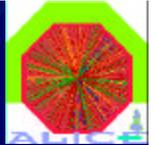
## 4: Collect output LFN's; update Data Catalogue





# Internal milestones for Phase II

- **6/2001**
  - List of ALICE users (& Certificates) distributed to the test sites and to DataGRID WP6.
- **7/2001**
  - Distributed production/reconstruction test with a centralized bookkeeping system and Bypass. As many sites involved as possible.
- **8/2001**
  - Distributed analysis test with PROOF .
- **9/2001**
  - Test with/on DataGRID WP6 resources.
- **12/2001**
  - First results of tests of DataGRID PM9 middleware release.



# Possible Root developments

- Interface between Root and the DataGRID WP2 middleware (GDMP API's).
- Interface between PROOF and the GRID scheduler (possible use of TLDAAP for resource discovery from the GRID information service(s)).
- Interface between TFTP and the Globus GSI services via TAuthorization. Comparison with GridFTP.