


# The ALICE Offline Framework

F.Carminati, L.Betev, R.Brun, P.Hristov,
A.Morsch, F.Rademakers, K.Safarik

On behalf of the ALICE Computing Project

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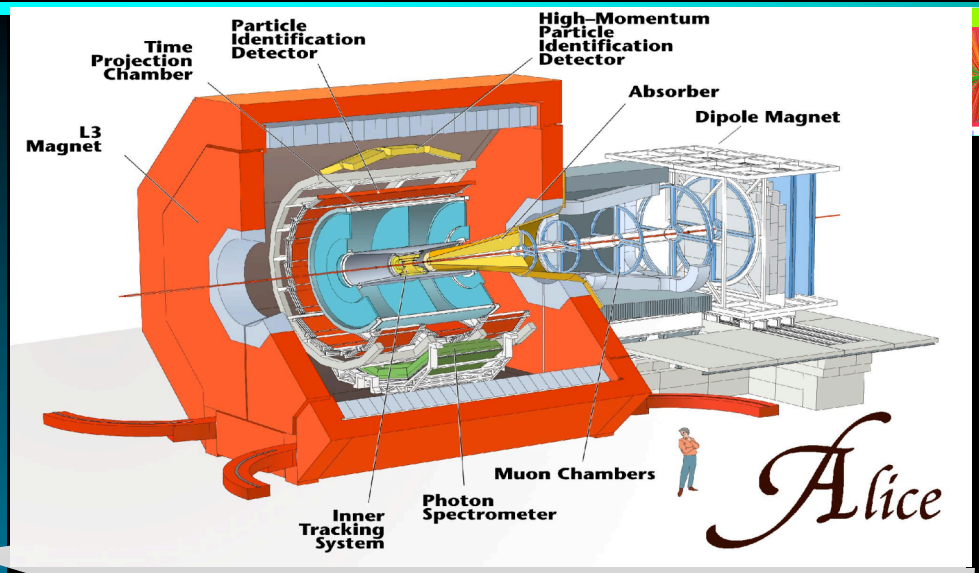



## ALICE Collaboration

- ~ 1/2 ATLAS, CMS, ~ 2x LHCb
- ~1000 people, 30 countries, ~ 80 Institutes

| | |
|---|---|
| **Total weight** | **10,000t** |
| **Overall diameter** | **16.00m** |
| **Overall length** | **25m** |
| **Magnetic Field** | **0.4Tesla** |

8 kHz (160 GB/sec)

level 0 - special hardware

200 Hz (4 GB/sec)

level 1 - embedded processors

30 Hz (2.5 GB/sec)

level 2 - PCs

30 Hz

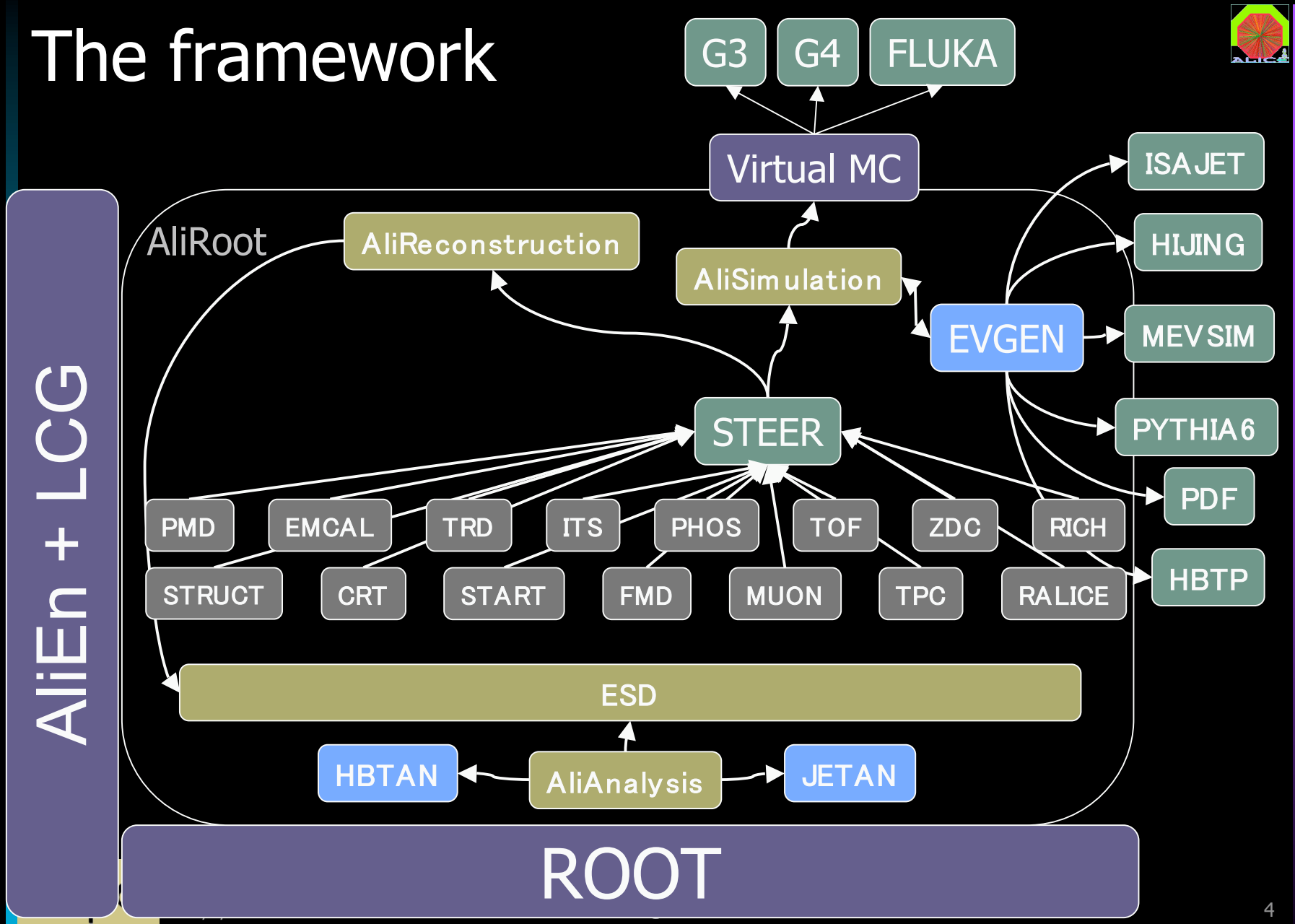
(1.25 GB/sec)

data recording & offline analysis

# The history

- Developed since 1998 along a coherent line
- Developed in close collaboration with the ROOT team
- No separate physics and computing team
  - Minimise communication problems
  - May lead to "double counting" of people
- Used for the TDR's of all detectors and Computing TDR simulations and reconstructions

# The framework



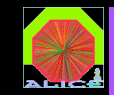
# The code

- 0.5MLOC C++
- 0.5MLOC "vintage" FORTRAN code
- Nightly builds
- Strict coding conventions
- Subset of C++ (no templates, STL or exceptions!)
  - "Simple" C++, fast compilation and link (see R.Brun's talk)
  - No configuration management tools (only cvs)
  - aliroot is a single package to install
- Maintained on several systems
  - DEC-Tru64, Mac OSX, Linux RH/SLC/Fedora (i32:i64:AMD), Sun Solaris
- 30% developed at CERN and 70% outside

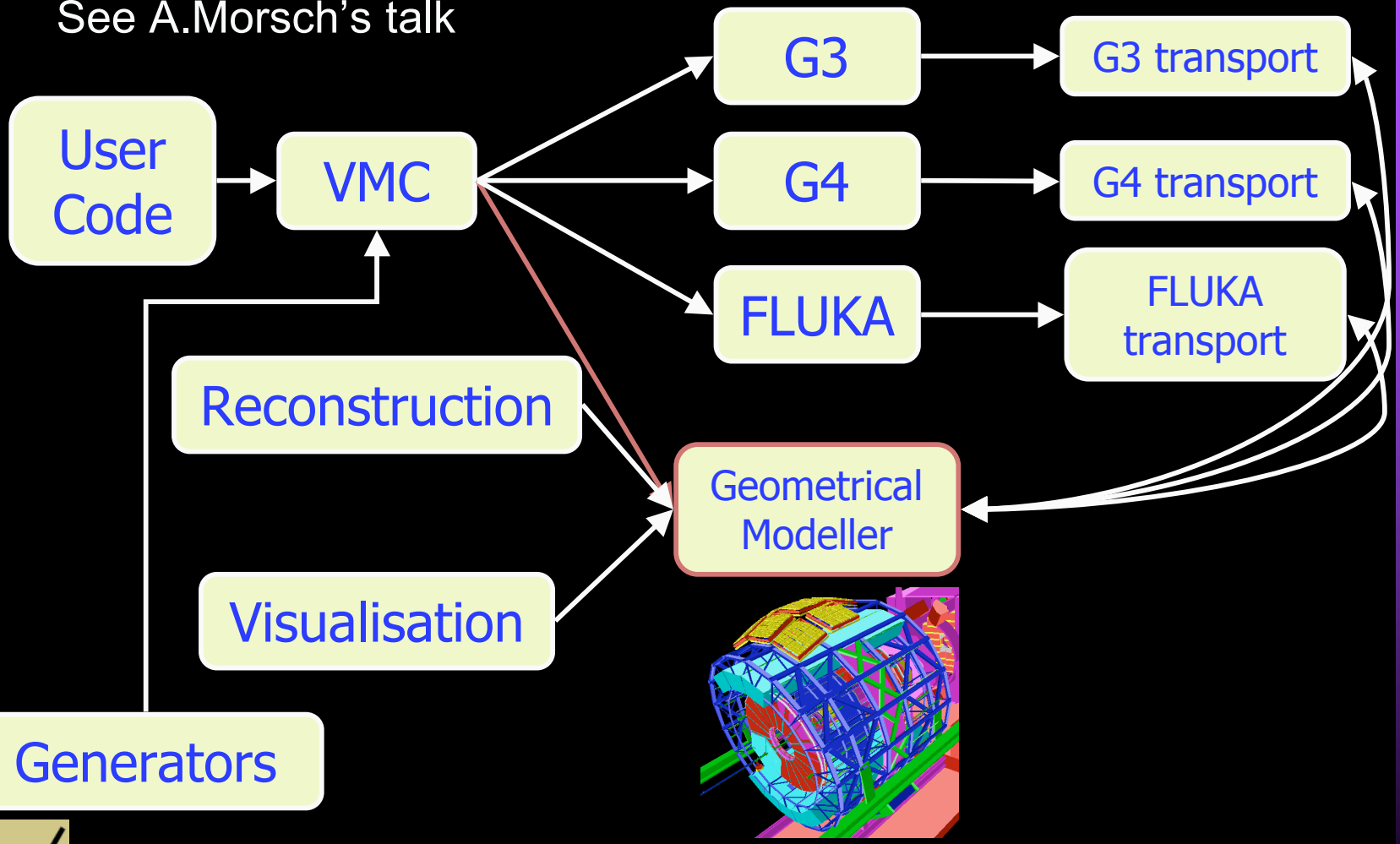
# The tools

- Coding convention checker
- Reverse engineering
- Smell detection
- Branch instrumentation
- Genetic testing (in preparation)
- Aspect Oriented Programming (in preparation)

# The Simulation

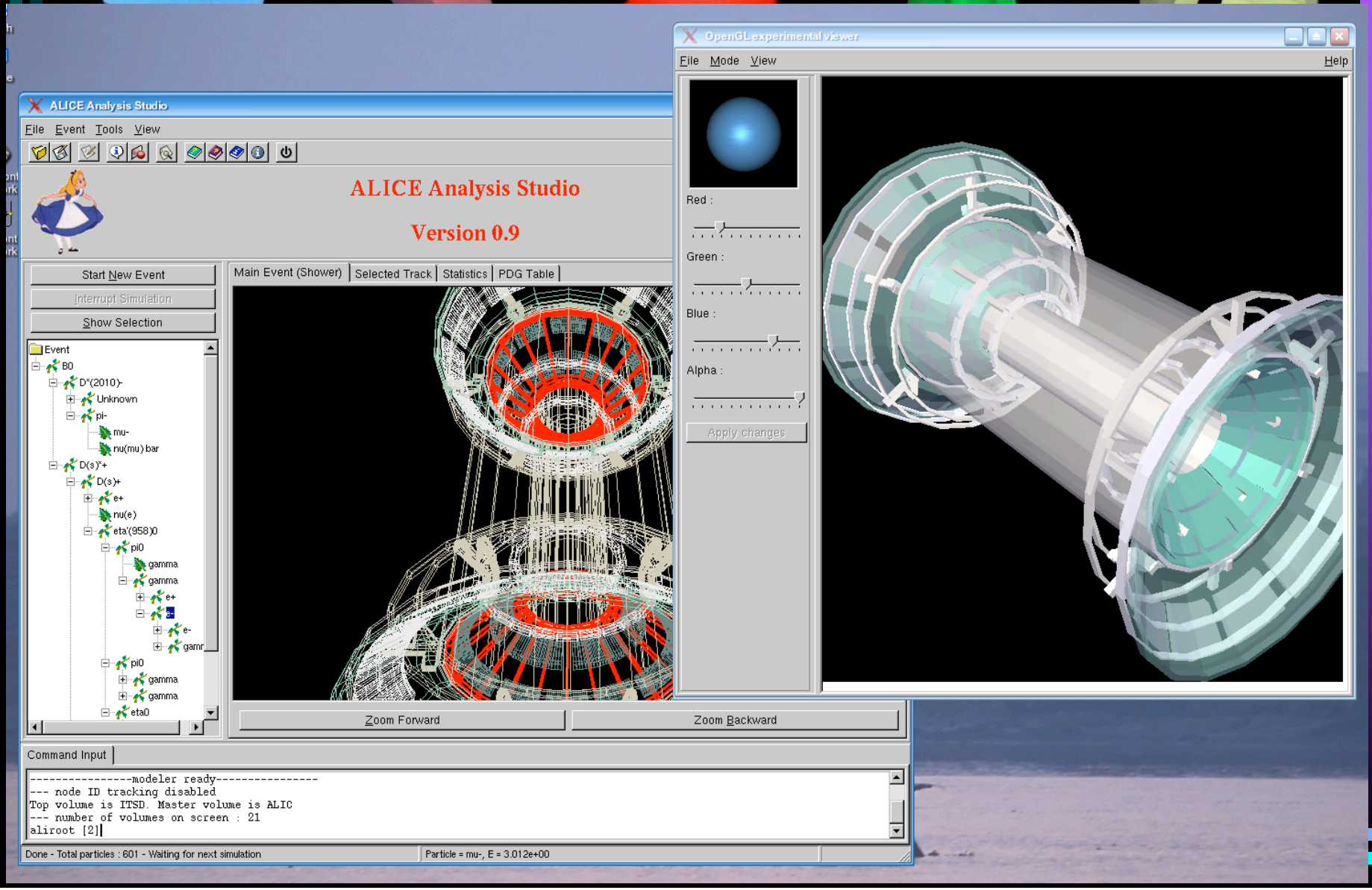


See A.Morsch's talk



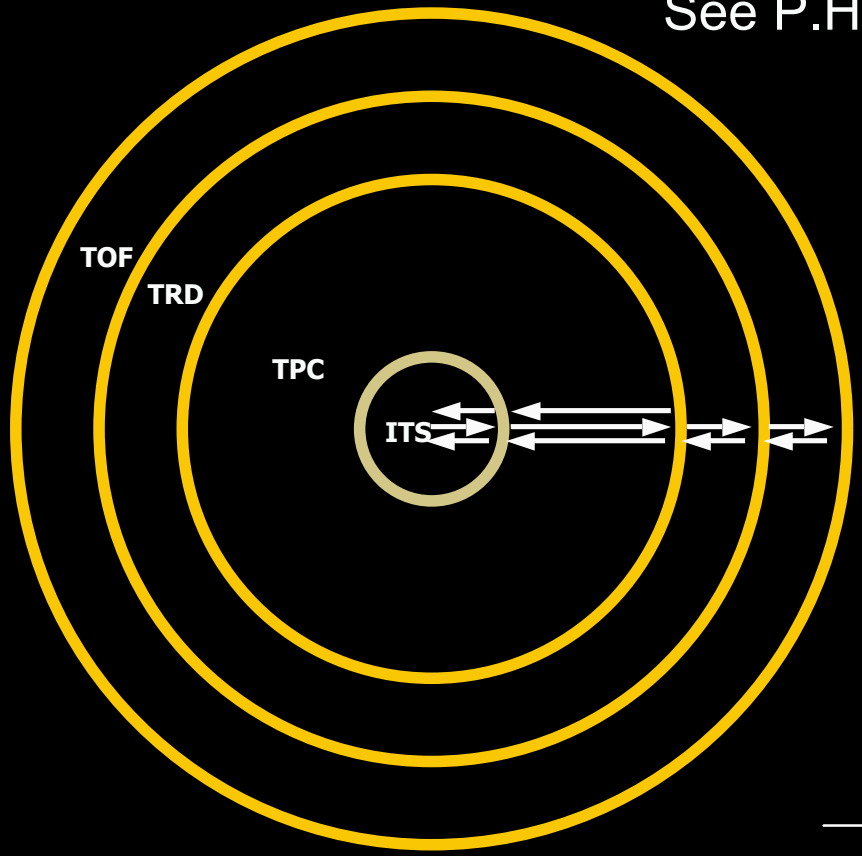

Ground Building

# TGeo modeller



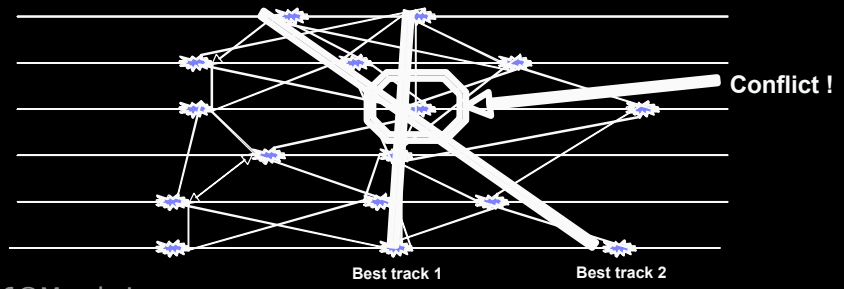
# The reconstruction

See P.Hristov's talk

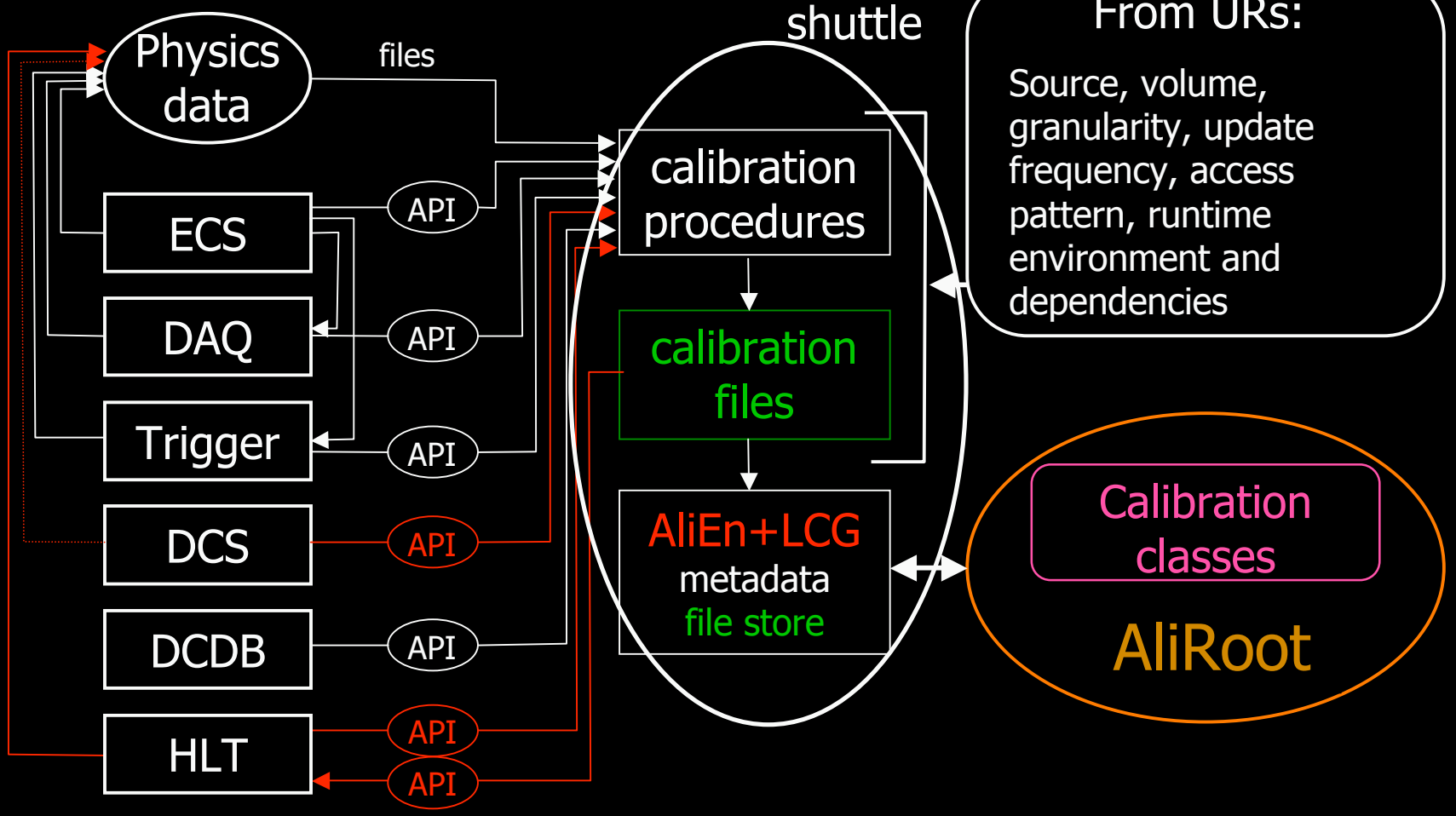



- Incremental process
  - Forward propagation towards to the vertex TPC⇒ITS
  - Back propagation ITS⇒ TPC⇒TRD⇒TOF
  - Refit inward TOF⇒TRD ⇒TPC⇒ITS
- Continuous seeding
  - Track segment finding in all detectors

- Combinatorial tracking in ITS
  - Weighted two-tracks $\chi^2$ calculated
  - Effective probability of cluster sharing
  - Probability not to cross given layer for secondary particles



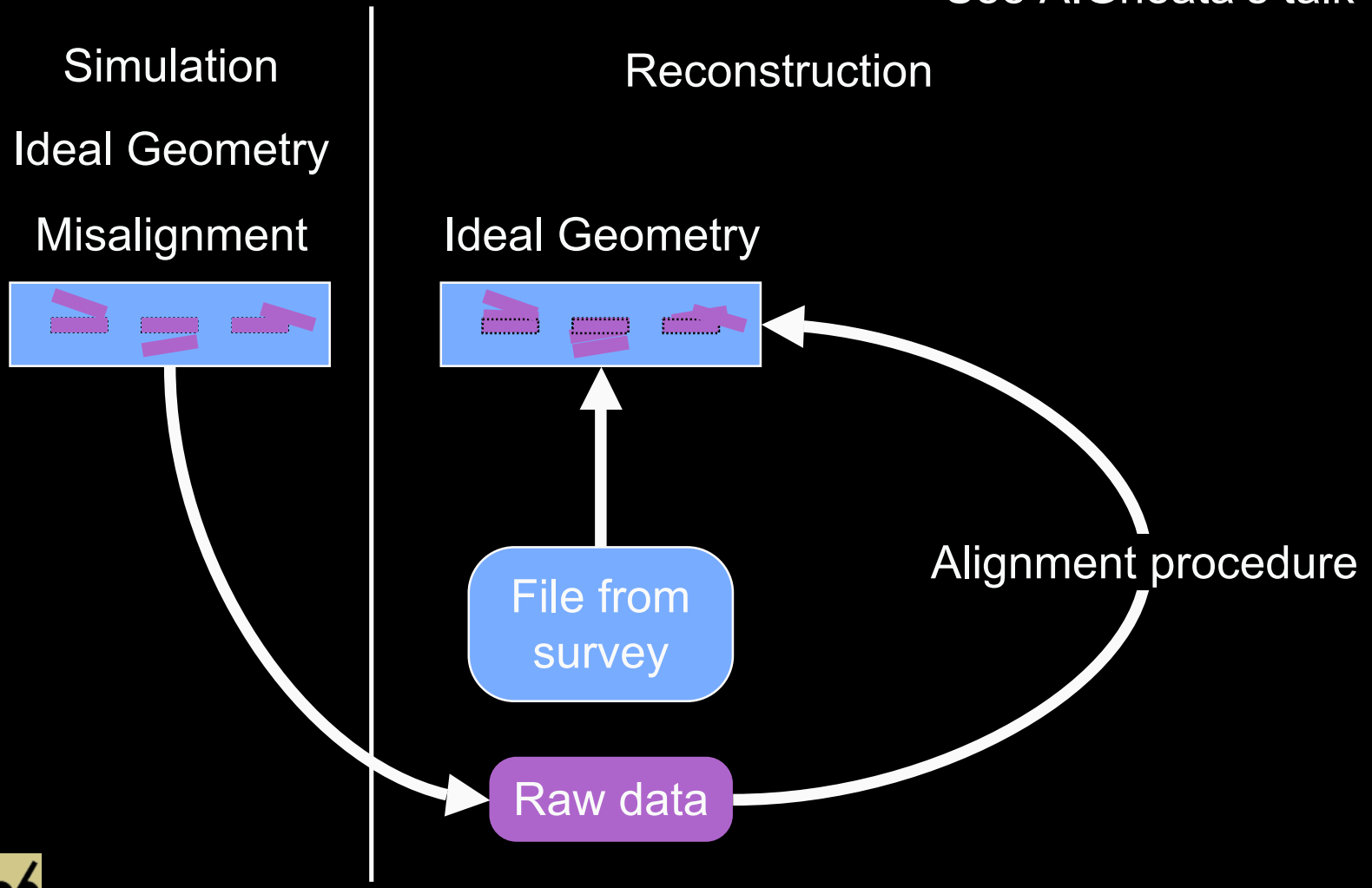
# Calibration



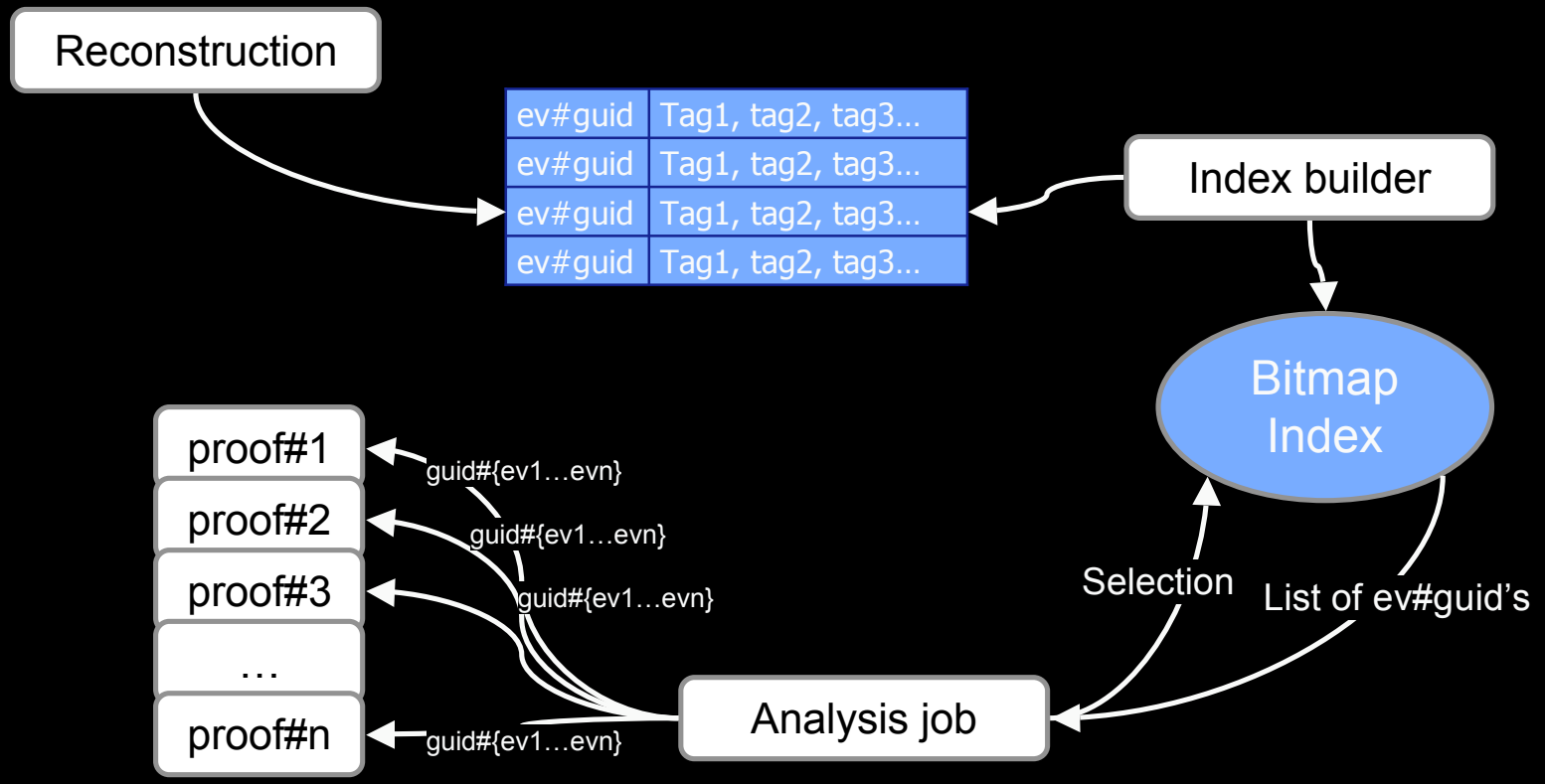

API – Application Program Interface

# Alignment

See A.Gheata's talk

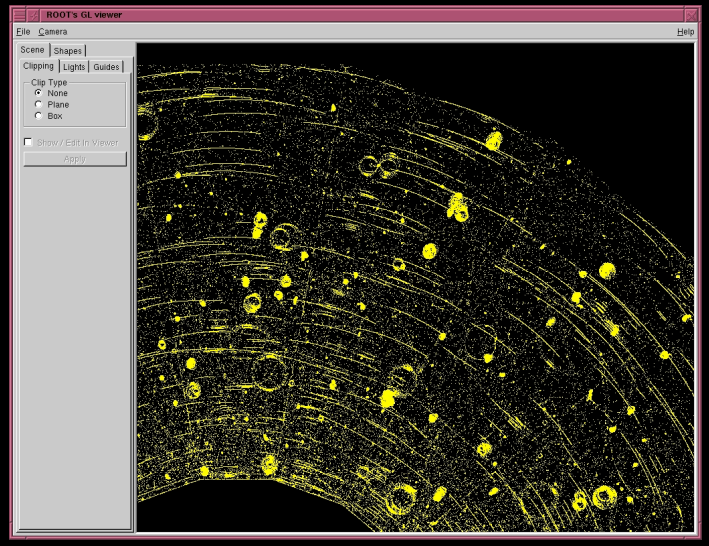


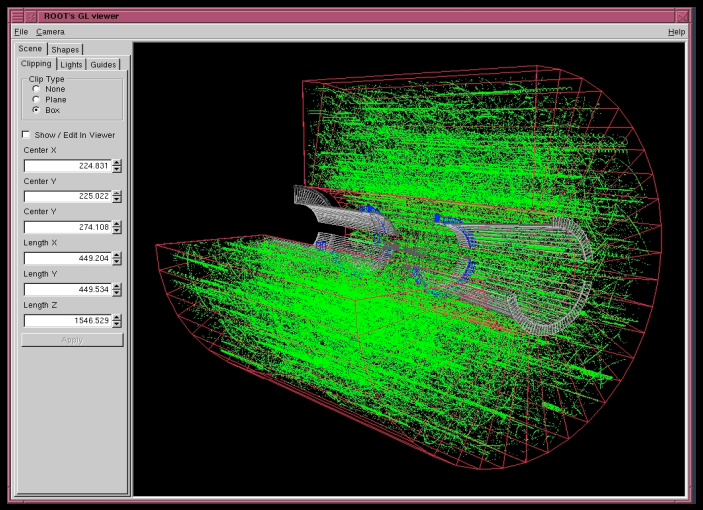
# Tag architecture

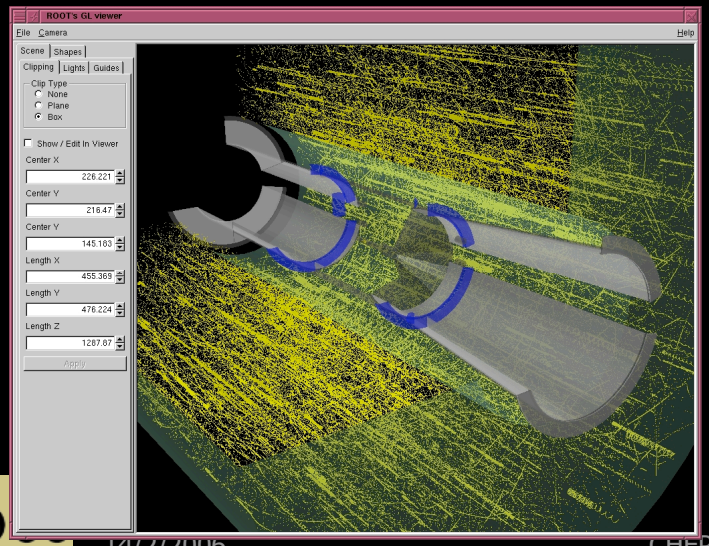


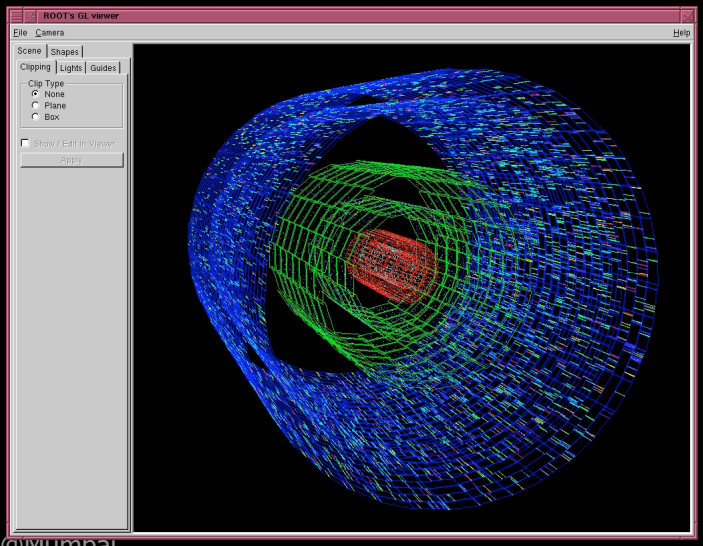
# Visualisation

See M.Tadel's talk



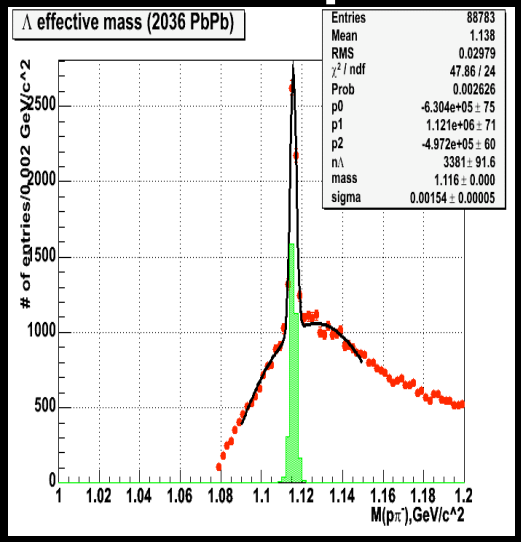



# ALICE Analysis Basic Concepts

- Analysis Models
  - Prompt reco/analysis at T0 using PROOF infrastructure
  - Batch Analysis using GRID infrastructure
  - Interactive Analysis using PROOF(+GRID) infrastructure
- User Interface
  - ALICE User access any GRID Infrastructure via AliEn or ROOT/PROOF UIs
- AliEn
  - Native and "GRID on a GRID" (LCG/EGEE, ARC, OSG)
  - integrate as much as possible common components
    - LFC, FTS, WMS, MonALISA ...
- PROOF/ROOT
  - single + multitier static and dynamic PROOF cluster
  - GRID API class TGrid(virtual)⇒ TAliEn(real)

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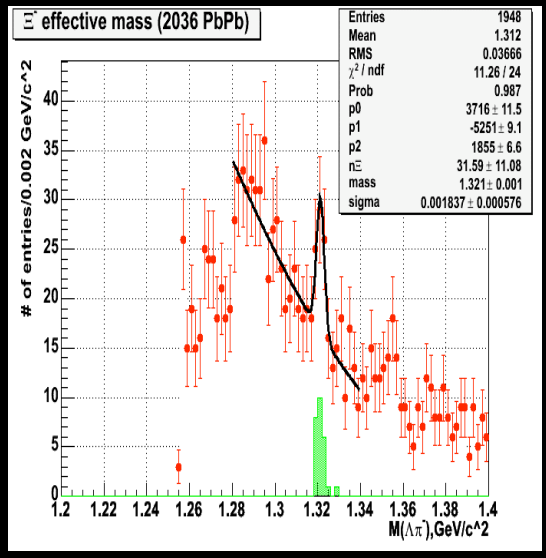
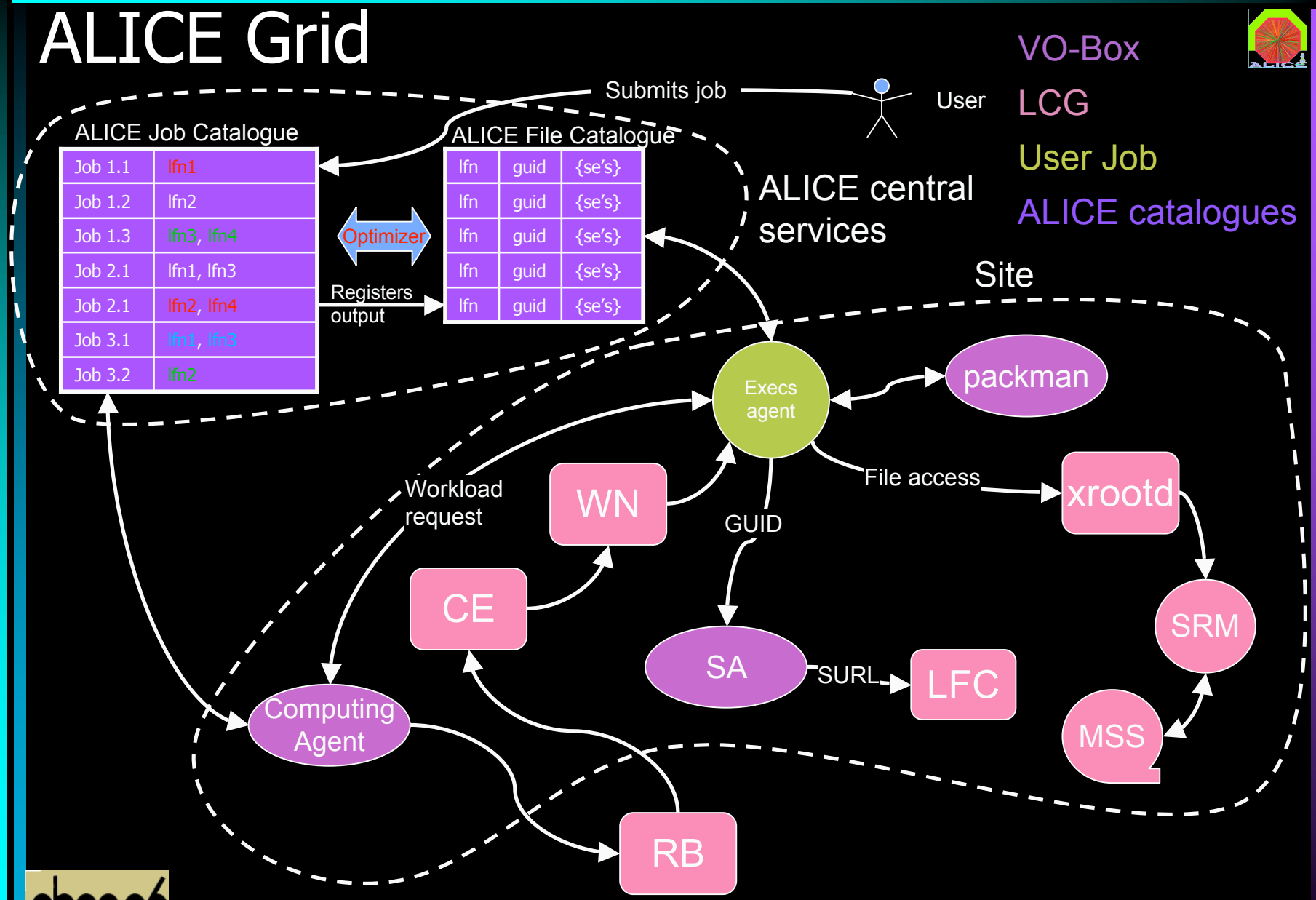


# ALICE view on the current situation

**Exp specific services (AliEn' for ALICE)**

**EGEE, ARC, OSG…**

# ALICE Grid


VO-Box
LCG
User Job
ALICE catalogues
Submits job
User
ALICE Job Catalogue
ALICE File Catalogue
Job 1.1 lfn1
Job 1.2 lfn2
Job 1.3 lfn3, lfn4
Job 2.1 lfn1, lfn3
Job 2.1 lfn2, lfn4
Job 3.1 lfn1, lfn3
Job 3.2 lfn2
lfn guid {se's}
Optimizer
Registers output
ALICE central services
Site
Execs agent
packman
Workload request
WN
File access
xrootd
GUID
CE
SRM
SA
SURL
LFC
Computing Agent
MSS
RB

# Distributed analysis

File Catalogue query

User job (many events)

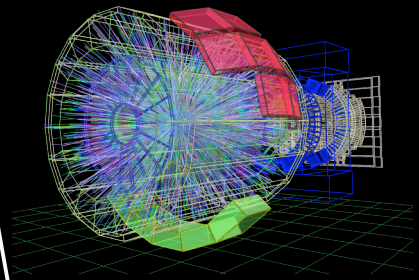
Data set (ESD's, AOD's)

Job output

Job Optimizer

Sub-job 1 | Sub-job 2 | Sub-job n

Grouped by SE files location



Job Broker

Submit to CE with closest SE

CE and SE processing Output file 1

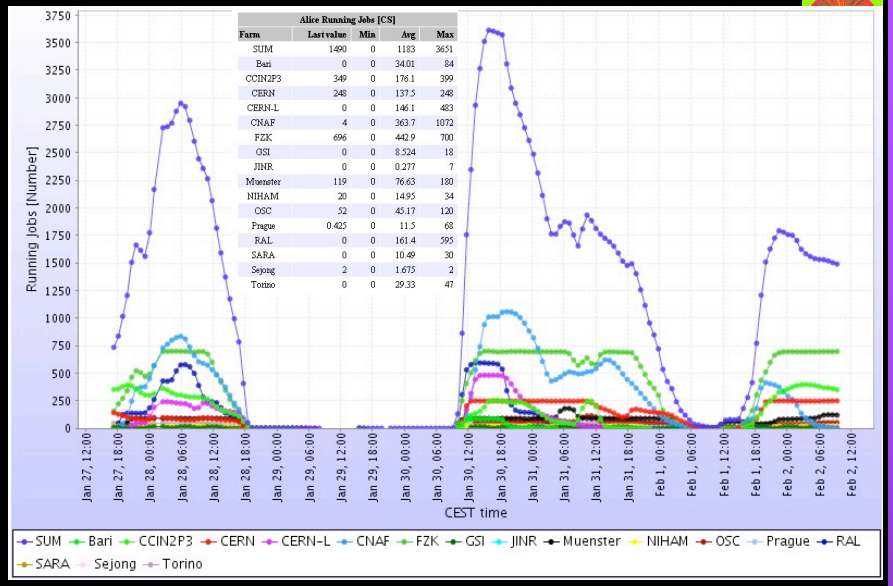
CE and SE processing Output file 2

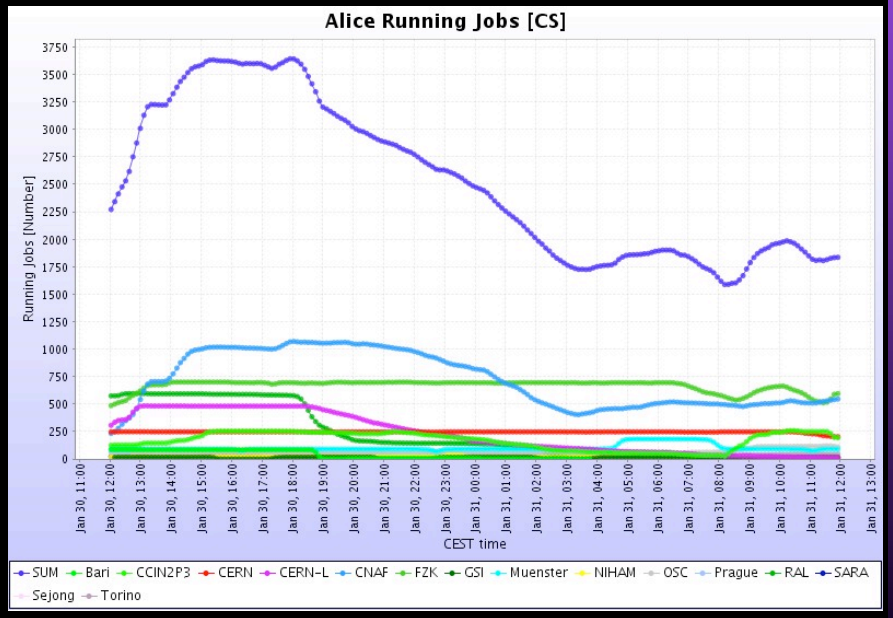
CE and SE processing Output file n

File merging job

# Data Challenge

- Last (!) exercise before data taking
- Test of the system started with simulation
- Up to 3600 jobs running in parallel
- Next will be reconstruction and analysis



# Mistakes we made

- Planning was very difficult with a *really* distributed community
  - We found very difficult to set milestones
- Communication stays a real problem in spite of frequent meetings
- We did not understand that some essential information was going to become available (too) late

# Conclusions

- ALICE has followed a single evolution line since eight years
- Most of the initial choices have been validated by our experience
- Some parts of the framework still have to be populated by the sub-detectors
- Wish us good luck!


"That's
all
folks!"