ALICE GRID

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Outline

- Components of the ALICE GRID
- AliEn: ALICE Environment on the GRID
  - File Catalogue
  - Transfer Model
  - TaskQueue
- Other communities
- Conclusions

Recipe for a GRID

1. Find a community
2. Find resources
3. Exchange data
4. Connect centres and distribute work/files
5. Monitor
6. Expand and evolve…

Just choose the right ingredients!!

ALICE ingredients

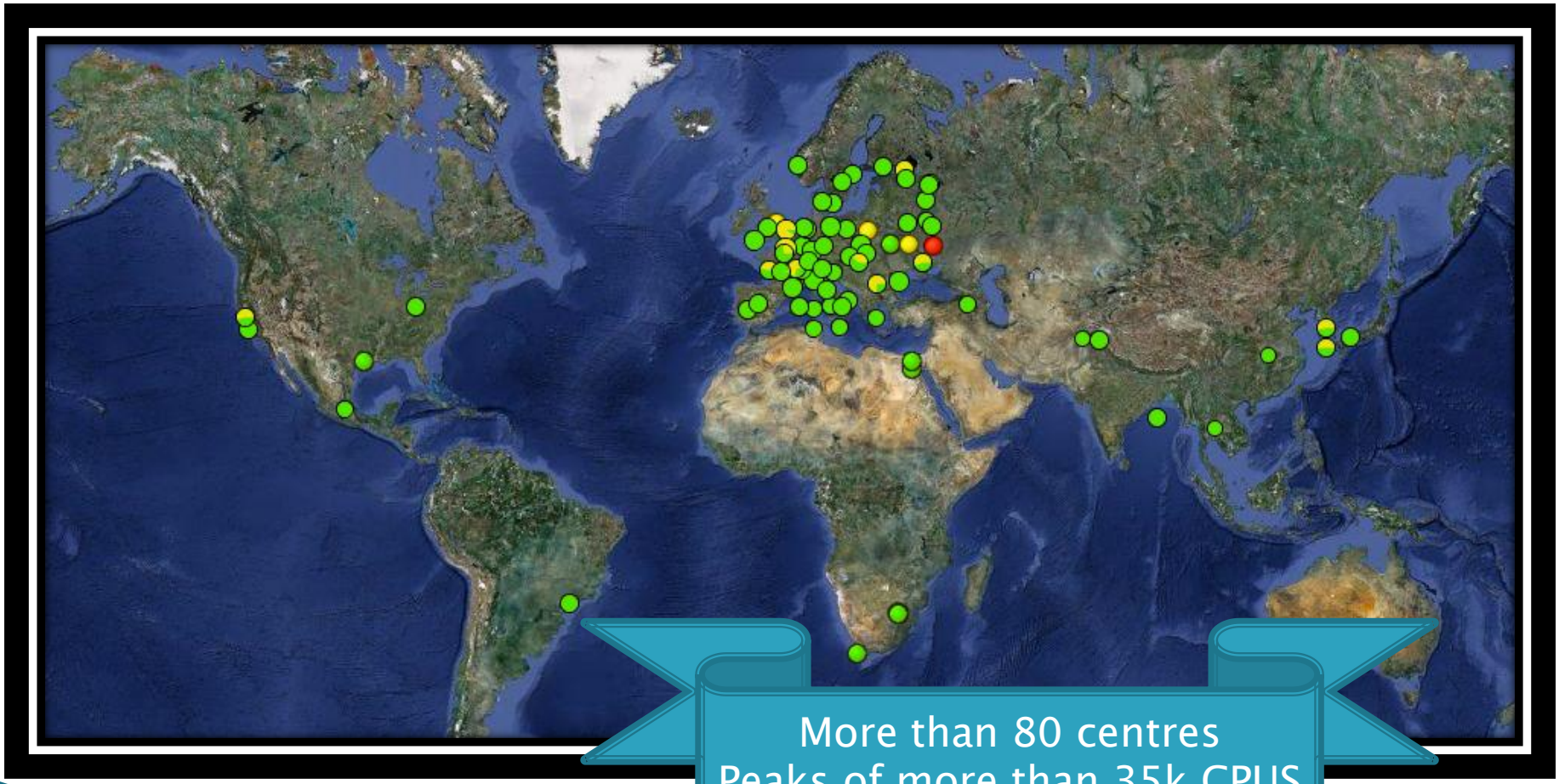
1. Find a community →1000 physicists
2. Find resources → +80 sites
3. Exchange data → xrootd
4. Connect centres and distribute work/files
   →AliEn
5. Monitor →MonALISA
6. Expand and evolve…→+10 years experience

See Fed's talk

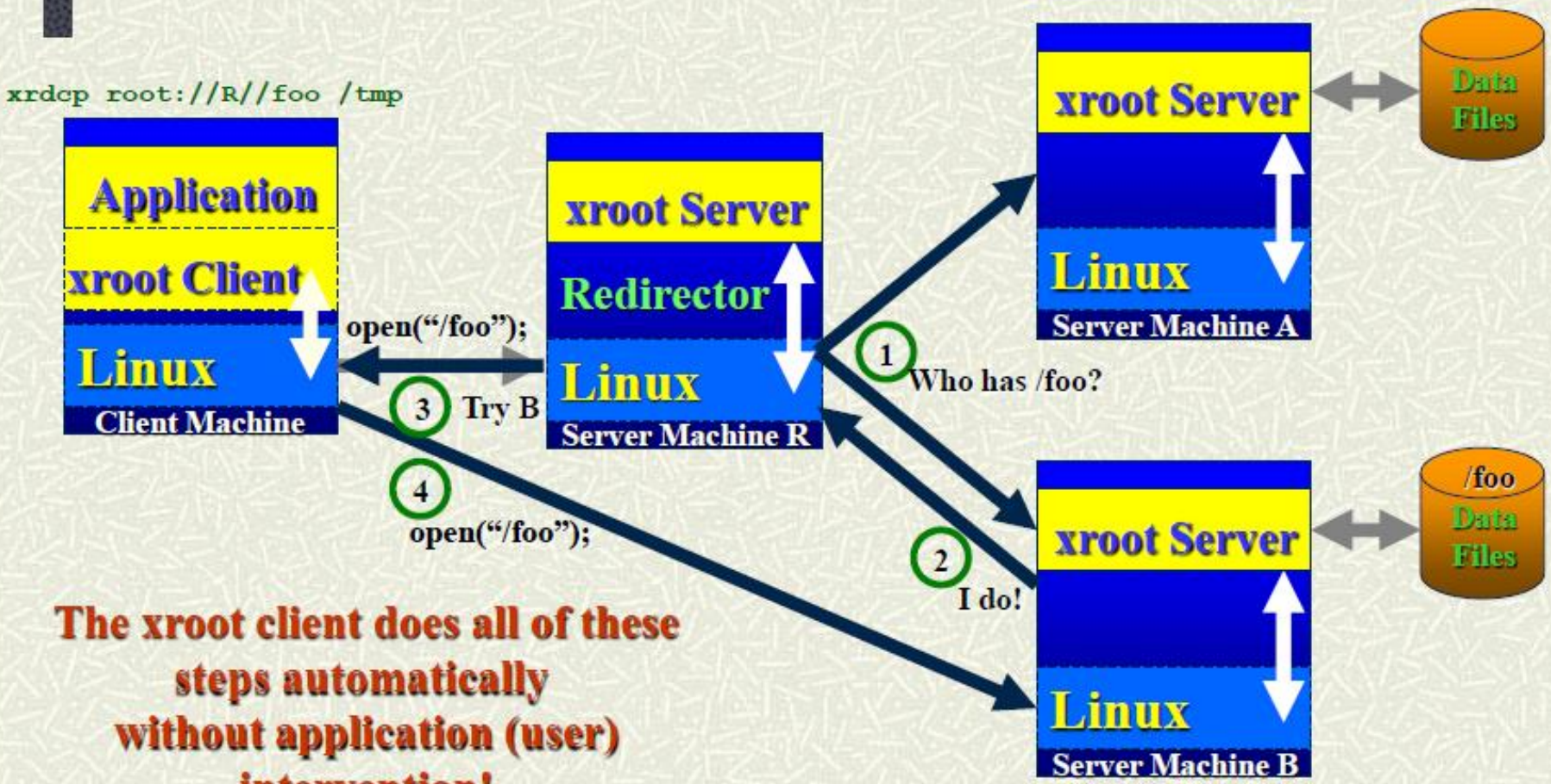
Stay tuned!

See Costin's talk

ALICE sites



The Scalla Approach



The xroot client does all of these steps automatically without application (user) intervention!

AliEn

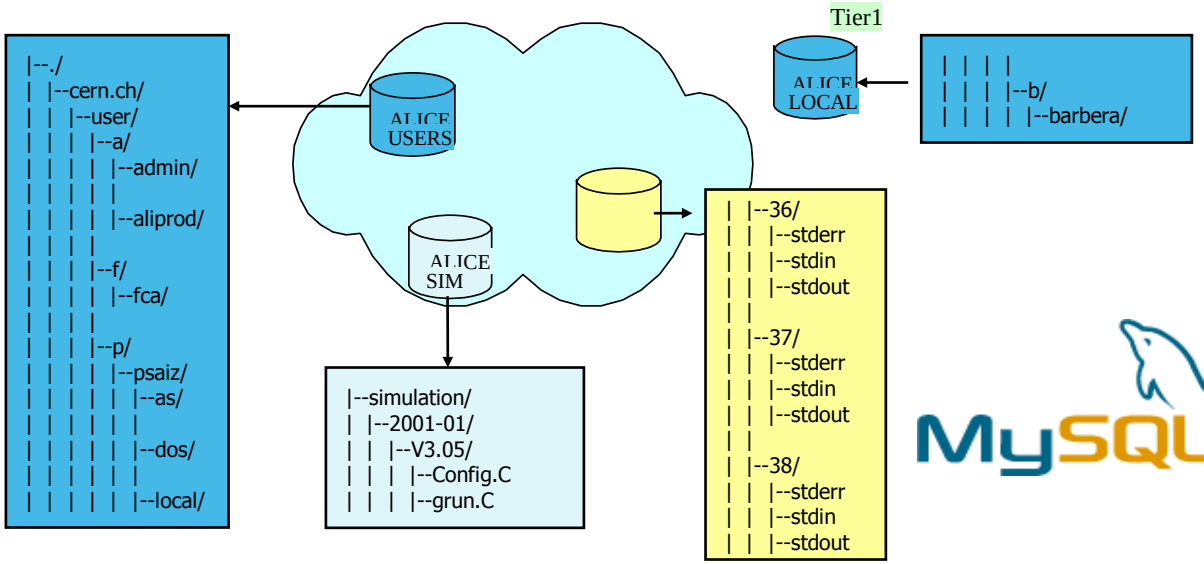
- All components to create a GRID
- File Catalogue
  - UNIX-like file system
  - Mapping to physical files
  - Metadata information
  - SE discovery
- Transfer Model
  - With different plugins
- TaskQueue
  - Job Agent & pull model
  - Automatic installation of software packages
  - Simulation, reconstruction, analysis…
- Developed by ALICE
  - Can be used by other communities

AliEn components

- Central services
  - Deployed once per experiment
  - File Catalogue, Task Queue, Transfer Queue, Authentication, Logging, Job Broker, API Services
- Site services
  - Deployed on the site (vobox)
  - CE, ClusterMonitor, PackMan
- Worker node
  - Job Agent. Executes the payload of the users

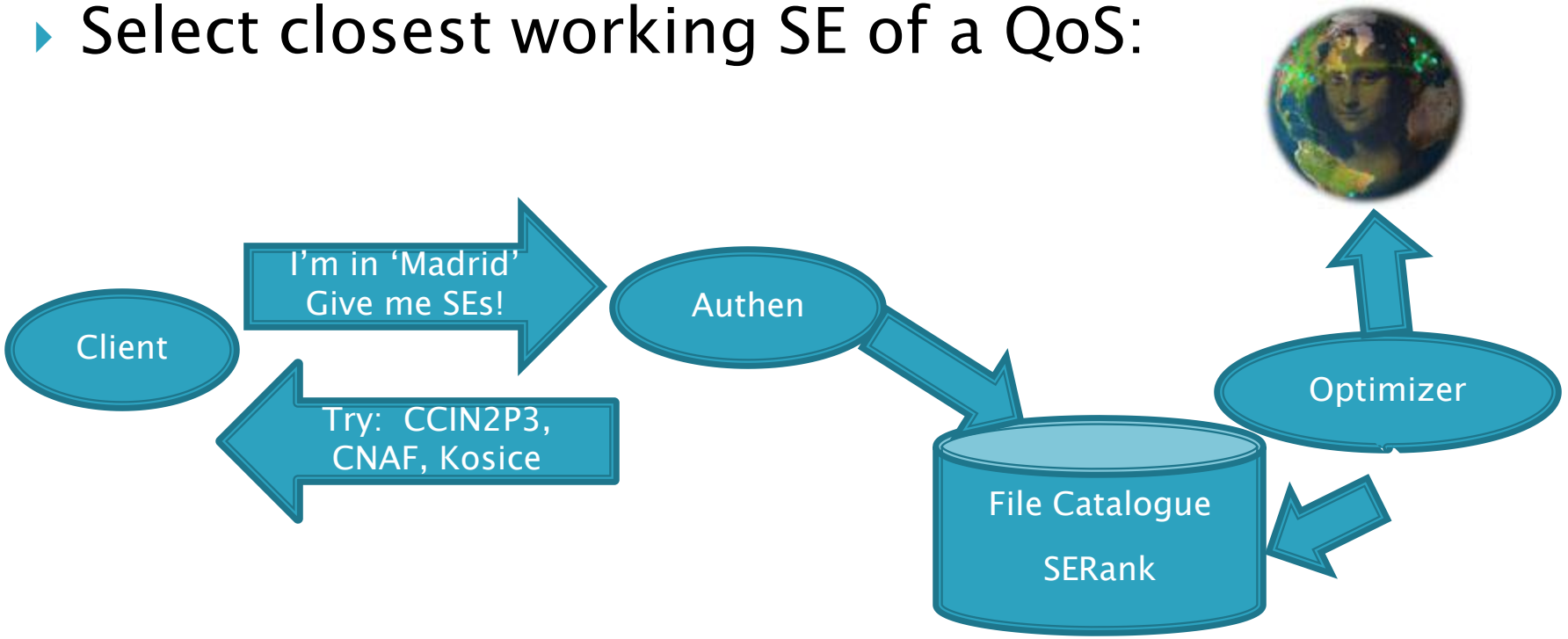
File catalogue

- UNIX-like file system
- Mapping from LFN to SE and PFN
- Built on top of distributed databases
- File collections
- Metadata
- GUID
- Quotas
- Used by all other Services



How SE discovery works

- Select closest working SE of a QoS:



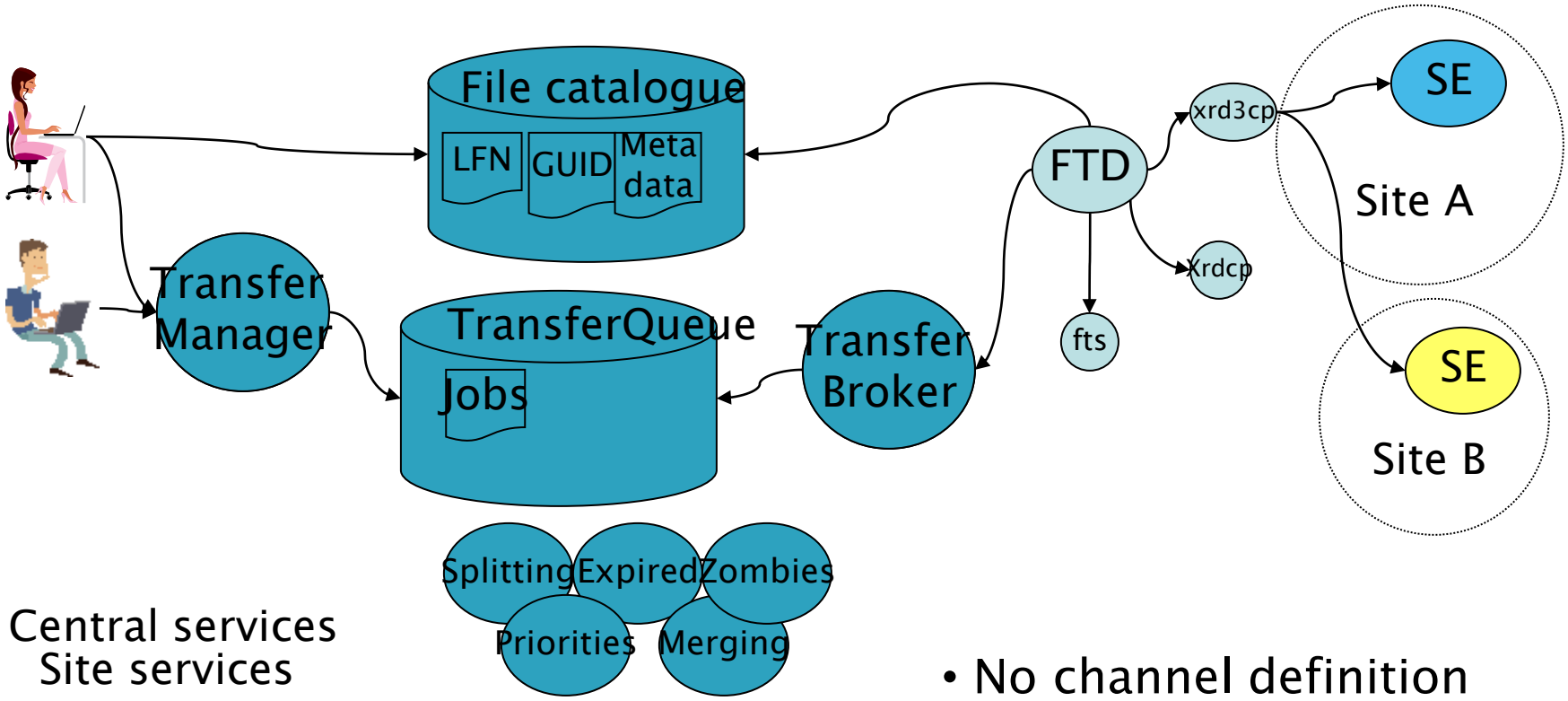
Similar process for read (limited to SE having the file)
Can select number of SE, QoS, particular user, avoid SE...

DEFAULT ARGUMENTS SHOULD BE USED WHENEVER POSSIBLE

File access in AliEn

- If the file already retrieved, use the cache
- Get closest copy defined in the catalogue
  - If that fail, attempt next one, and so on
- Md5sum and file size check
- Scheduled transfers:
  - Tell the system to replicate a file
  - After completion, update the catalogue
  - Used for the ALICE raw data distribution

Scheduled transfers

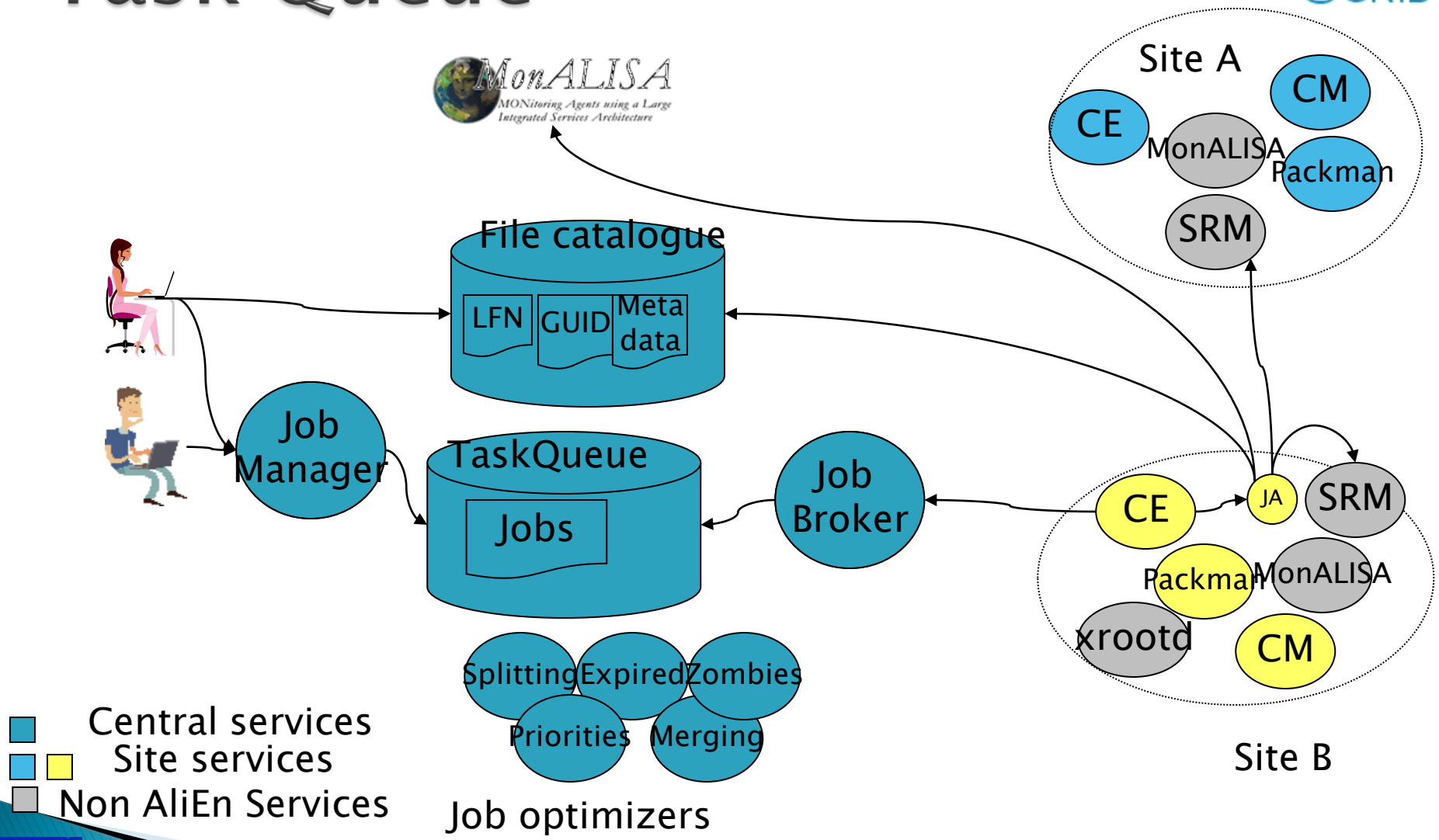


- No channel definition
- Limit on transfers per SE
- Multiple protocols

Workload management

- Single TaskQueue
- Quotas & priorities
- Pull model from the sites
- Job splitting and merging
- Automatic software package installation
- JDL matching
  - Requirements: TTL, memory, disk, site, CE, partition

Task Queue


MonALISA
MONitoring Agents using a Large Integrated Services Architecture
Site A
CM
CE
MonALISA
Packman
SRM
File catalogue
LFN
GUID
Meta data
Job Manager
TaskQueue
Jobs
Job Broker
CE
JA
SRM
Packman
MonALISA
xrootd
CM
Site B
Splitting
Expired
Zombies
Priorities
Merging
Job optimizers
Central services
Site services
Non AliEn Services

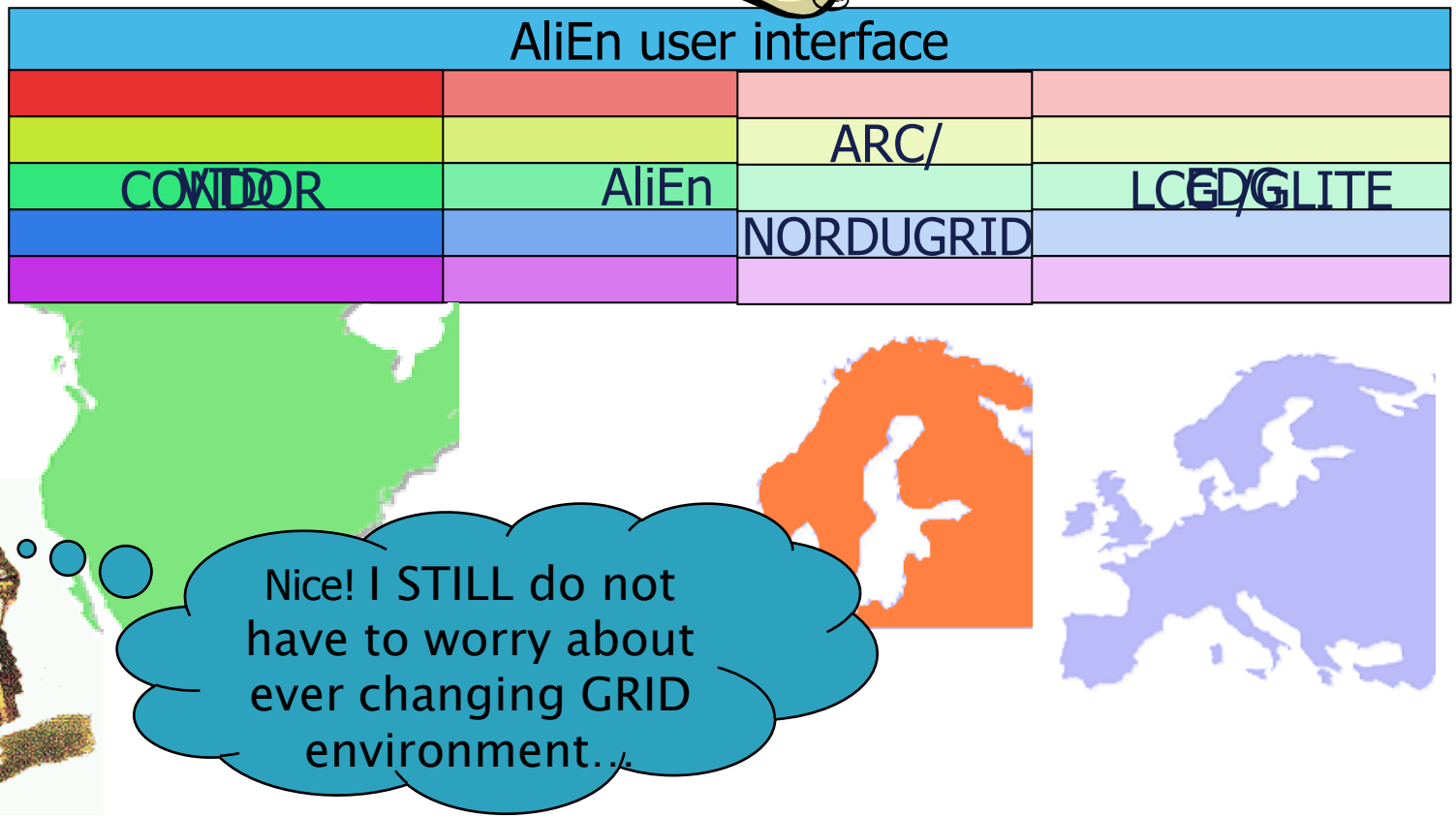
Site services

- CE
  - Checks available slots on the site, and submits jobagents to the batch system
  - Plugins to FORK, LSF, PBS, CONDOR, CREAMCE...
- ClusterMonitor
  - Collects site messages, and send them back to the central services
  - Used to contact the JA from outside the site
- PackMan
  - Installs and configures software packages
  - On share area or local area on the worker node
  - Done before the job assignment

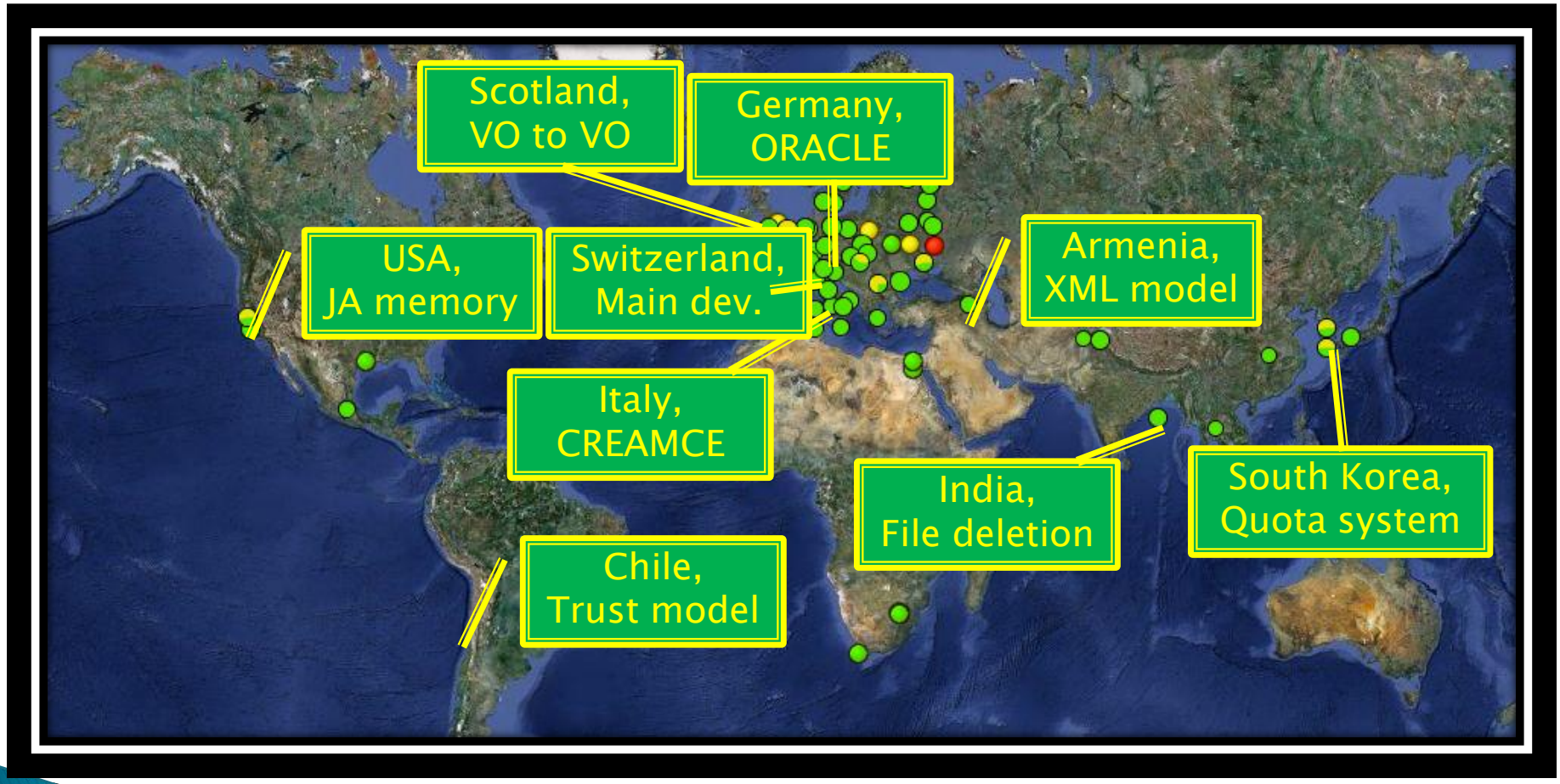
Security

- Envelopes for file registration
  - Envelope created by Authen before talking to SE
  - Validated by the SE
  - Authen registers entries in the catalogue
- Services over https, using X509 proxy certificates
- Prototype with glexec

Middleware interfaces

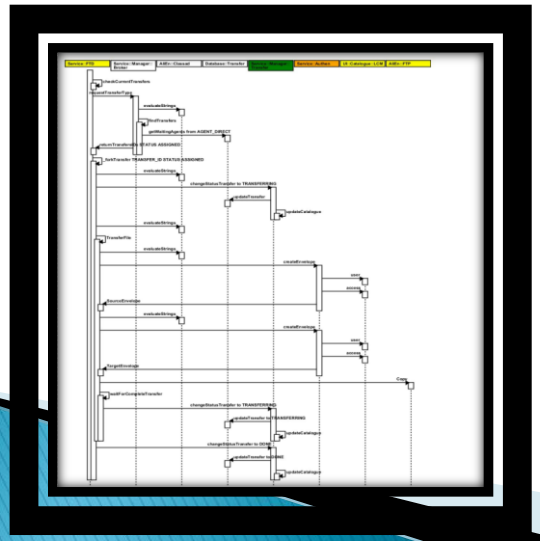


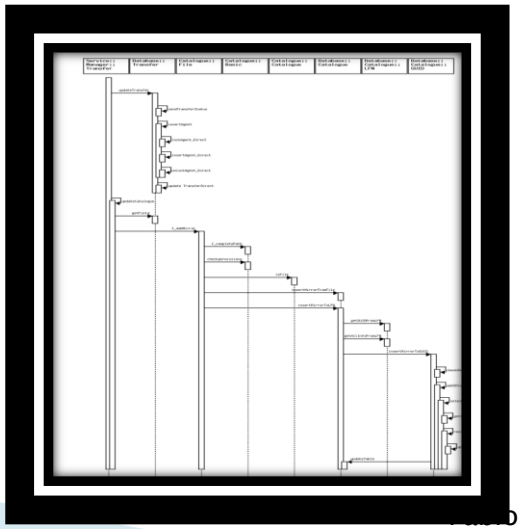
Human grid


Scotland,
VO to VO
Germany,
ORACLE
USA,
JA memory
Switzerland,
Main dev.
Armenia,
XML model
Italy,
CREAMCE
India,
File deletion
South Korea,
Quota system
Chile,
Trust model

AliEn development

- Developer guidelines:
  - http://alien2.cern.ch/index.php?option=com_content&view=article&id=84:developer-main&catid=7&Itemid=64
- Can setup the whole system on one machine
  - Done also on the build servers
- UML diagrams:
  - Description of all the interactions





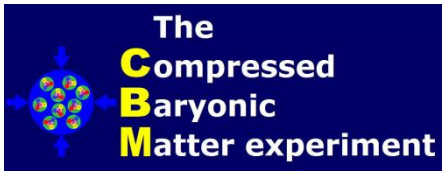
Other communities

1. Find a community → PUT YOUR COMMUNITY AND RESOURCES HERE
2. Find resources →
3. Exchange data → xrootd
4. Connect centres and distribute work/files →AliEn
5. Monitor →MonALISA
6. Expand and evolve…→+10 years experience

Contribute with your experience

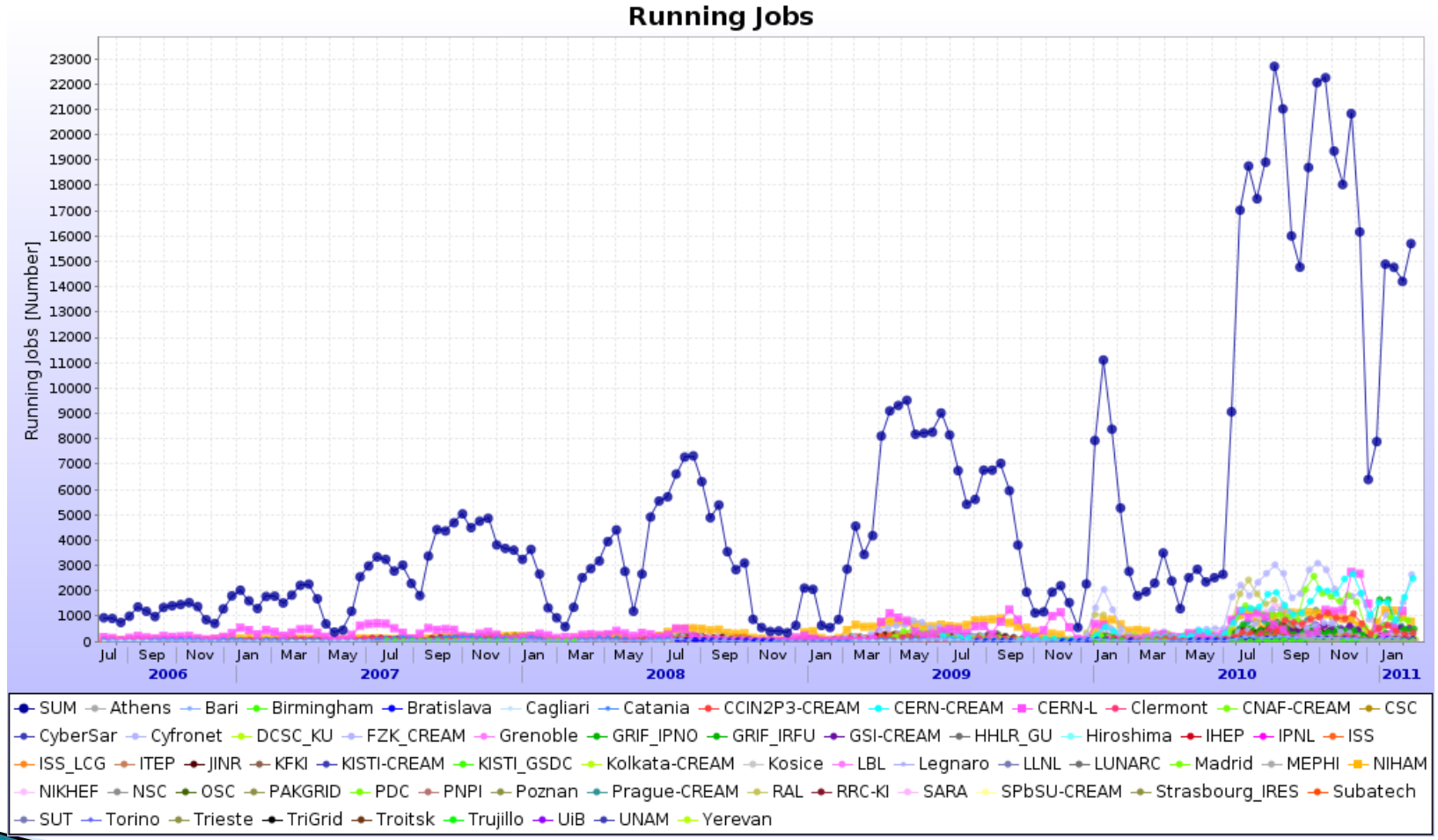
Other communities

- 

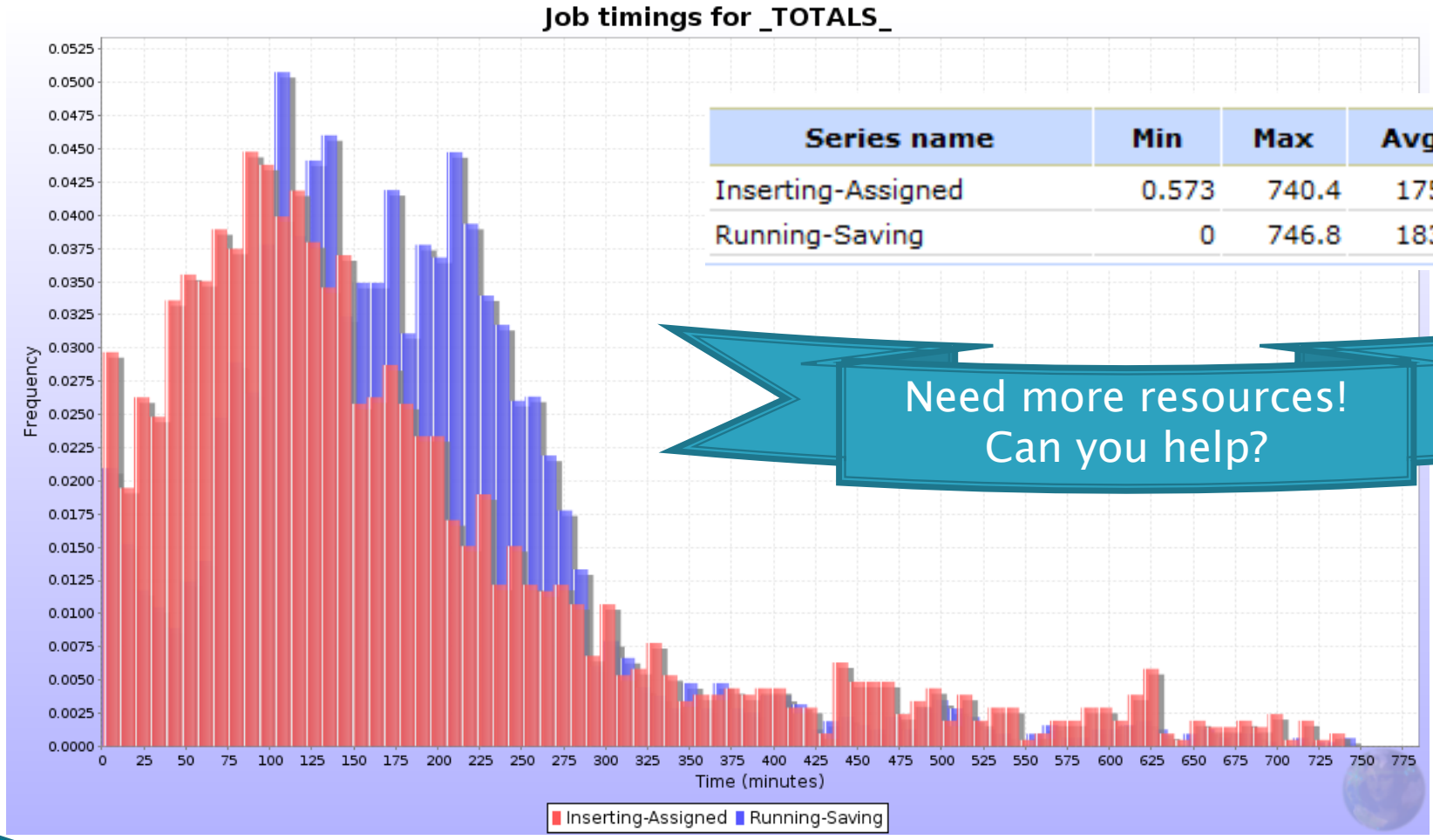
  - HEP experiment at GSI (Germany)
  - Using AliEn since 2005
  - 15 sites
- 

  - HEP experiment at GSI (Germany)
  - Using AliEn since 2008
  - 5 sites
- Mammogrid
  - 3 year project to share mammography between hospitals

ALICE Results



More results

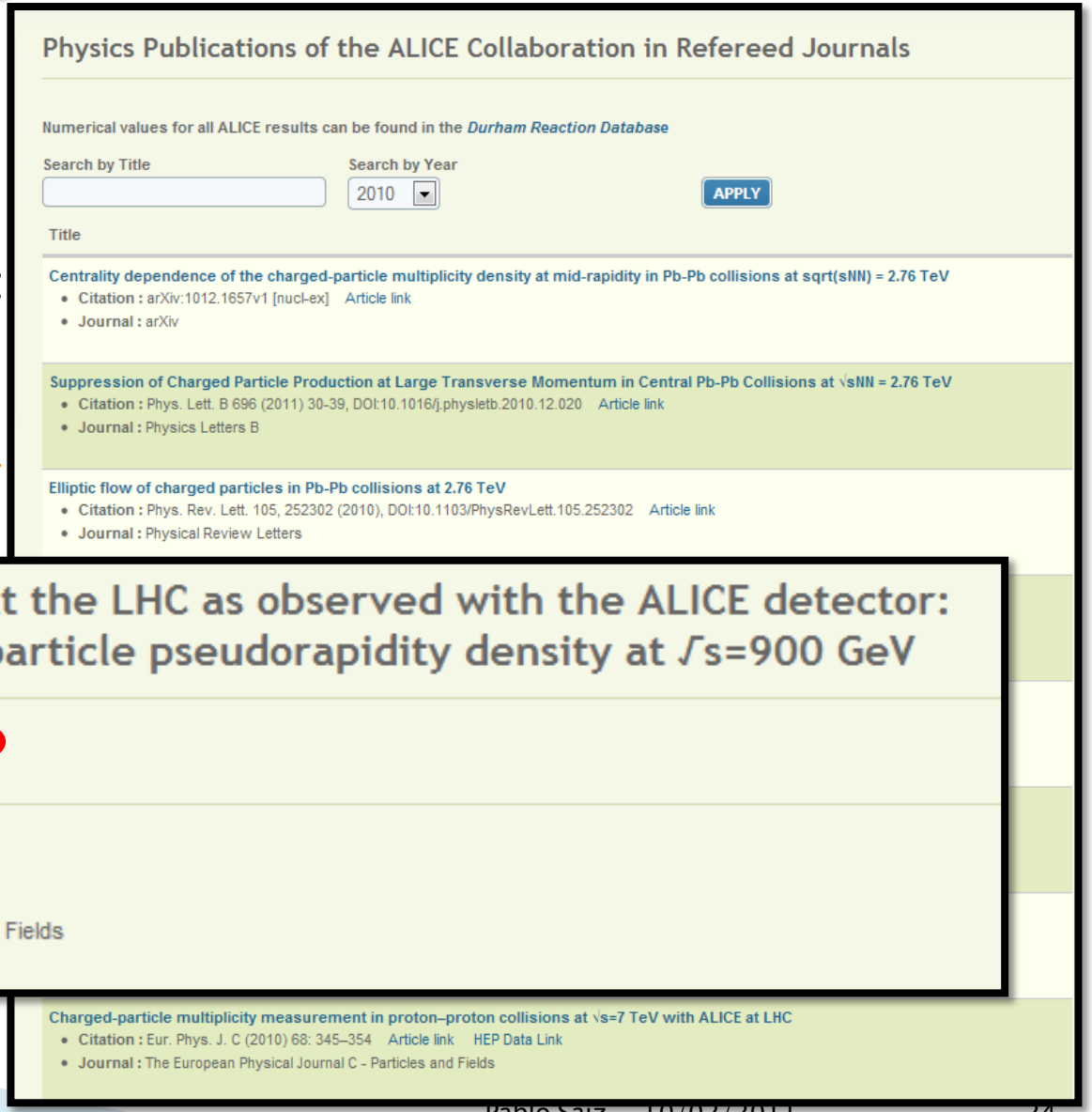


Series name	Min	Max	Avg
Inserting-Assigned	0.573	740.4	175.2
Running-Saving	0	746.8	183.4

Need more resources!
Can you help?

More results

- 12 publications with LHC data
- First one days after LHC start
- ALICE was the first experiment to publish
- http://aliweb.cern.ch/Documents/generalpublications



Physics Publications of the ALICE Collaboration in Refereed Journals

Numerical values for all ALICE results can be found in the *Durham Reaction Database*

Search by Title | Search by Year: 2010 | APPLY

Title

Centrality dependence of the charged-particle multiplicity density at mid-rapidity in Pb-Pb collisions at sqrt(sNN) = 2.76 TeV
- Citation : arXiv:1012.1657v1 [nucl-ex] Article link
- Journal : arXiv

Suppression of Charged Particle Production at Large Transverse Momentum in Central Pb-Pb Collisions at √sNN = 2.76 TeV
- Citation : Phys. Lett. B 696 (2011) 30-39, DOI:10.1016/j.physletb.2010.12.020 Article link
- Journal : Physics Letters B

Elliptic flow of charged particles in Pb-Pb collisions at 2.76 TeV
- Citation : Phys. Rev. Lett. 105, 252302 (2010), DOI:10.1103/PhysRevLett.105.252302 Article link
- Journal : Physical Review Letters

First proton-proton collisions at the LHC as observed with the ALICE detector: measurement of the charged-particle pseudorapidity density at √s=900 GeV

Submitted by Anonymou on Sun, 09/26/2010 - 03:54

Article Information

Published on: 12-11-2009
Citation: Eur. Phys. J. C (2010) 65: 111-125
Journal: The European Physical Journal C - Particles and Fields
Article link: Link to Springer

Charged-particle multiplicity measurement in proton–proton collisions at √s=7 TeV with ALICE at LHC
- Citation : Eur. Phys. J. C (2010) 68: 345–354 Article link HEP Data Link
- Journal : The European Physical Journal C - Particles and Fields

Challenges

- Amount of resources
- Interactive jobs
- Multi core
- Landing on vanilla worker nodes
- Database replicas (?)
- Users want more:
  - User submitted 20 jobs with 50k files each!
    - It worked. It took some time to process…

Summary

- ALICE has been using the GRID since 2001
- AliEn provides an interface to the GRID
  - Access to multiple resources
  - Transparent to the user
- AliEn Components
  - File & metadata catalogue
  - TaskQueue
  - Transfer model
- Can be used by other communities

http://alien.cern.ch