



Distributed Computing Infrastructures for Astroparticle Earth and Environmental Sciences

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- ▶ e-Infrastructures
- ▶ Europe
- ▶ Mediterranean
- ▶ India
- ▶ China
- ▶ Latin America
- ▶ Science Gateway and Interoperability
- ▶ CHAIN-REDS
- ▶ Conclusions



The many faces of eInfrastructures

- The High Speed Communication Network
- The High Performance Computing for highly parallel applications
- The Grid for High Throughput Computing and resource sharing
- The Clouds for elastic resource provisioning
- Data Infrastructures with several issues such as: Large data volumes, Curation, Access, High Availability, etc.
- The Human Network: researchers working together sharing motivations, objectives, tools and resources



e-Infrastructures support wide geographically distributed communities

enhance international collaboration of scientists

promote collaboration in other fields.



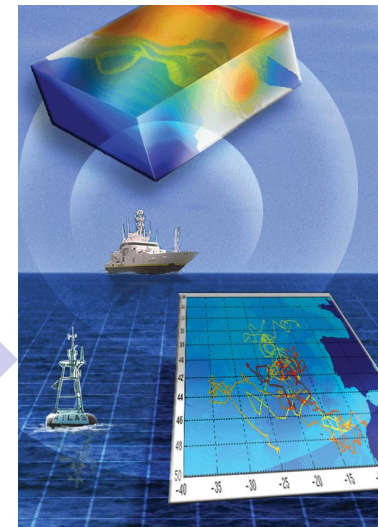
Grids and networks allow the access of many researchers to scientific resources (laboratories and data)

Disparity can be reduced and larger participation and contributions to high quality research.

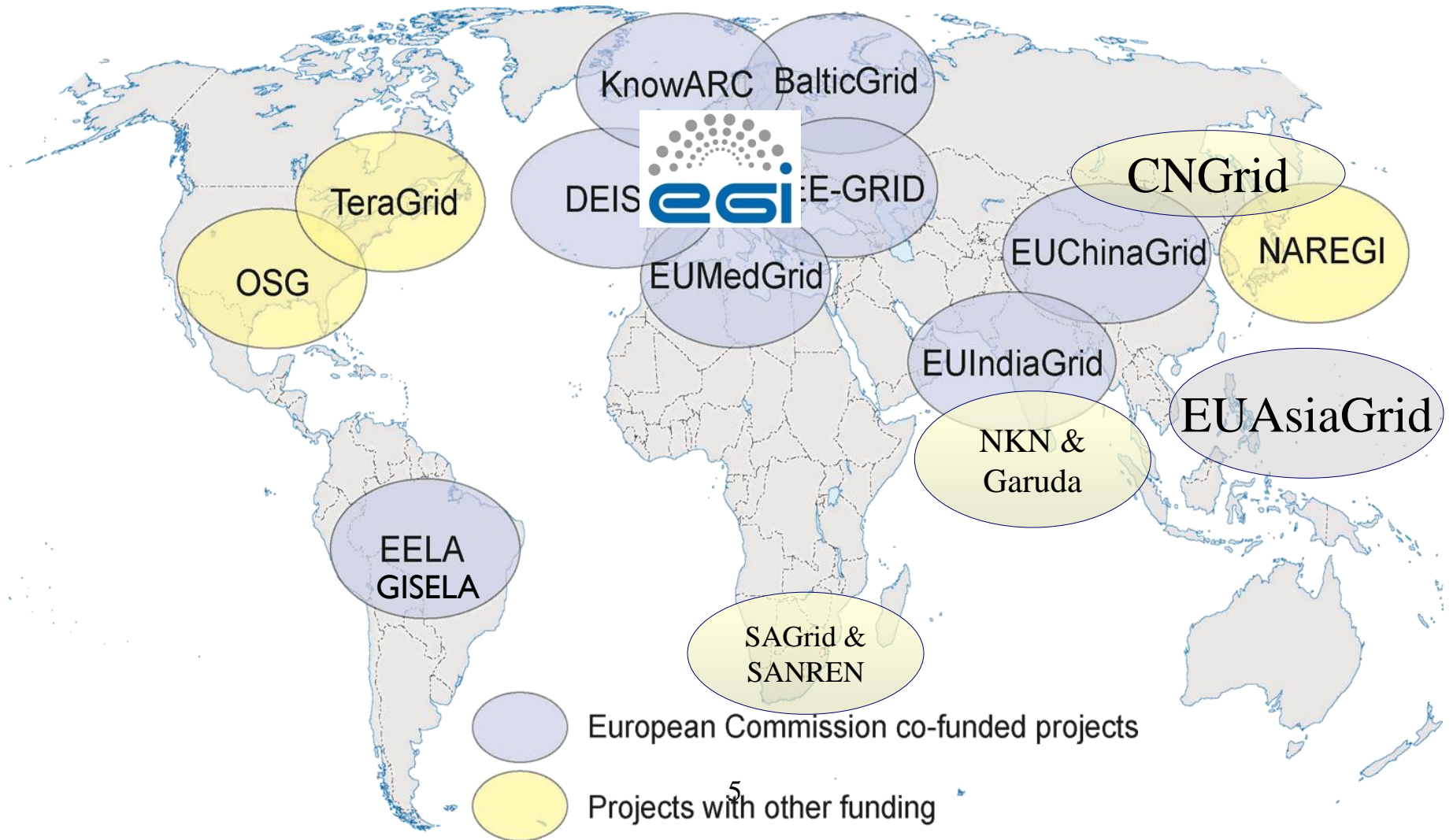


The e-Infrastructures promote the usage of network connectivity and stimulate scientific and technical development of countries

contribute to fight the digital divide and brain drain.



Regional Grid infrastructures





Logical CPUs (cores)

- 271,000 EGI (+13%)
- 400,000 All

122 PB disk and 128 PB tape

Resource Centres

- 323 EGI-InSPIRE & EGI
- 352 All
- 108 supporting MPI (+12.5%)

Countries

- 42 EGI-InSPIRE & EGI
- 56 All

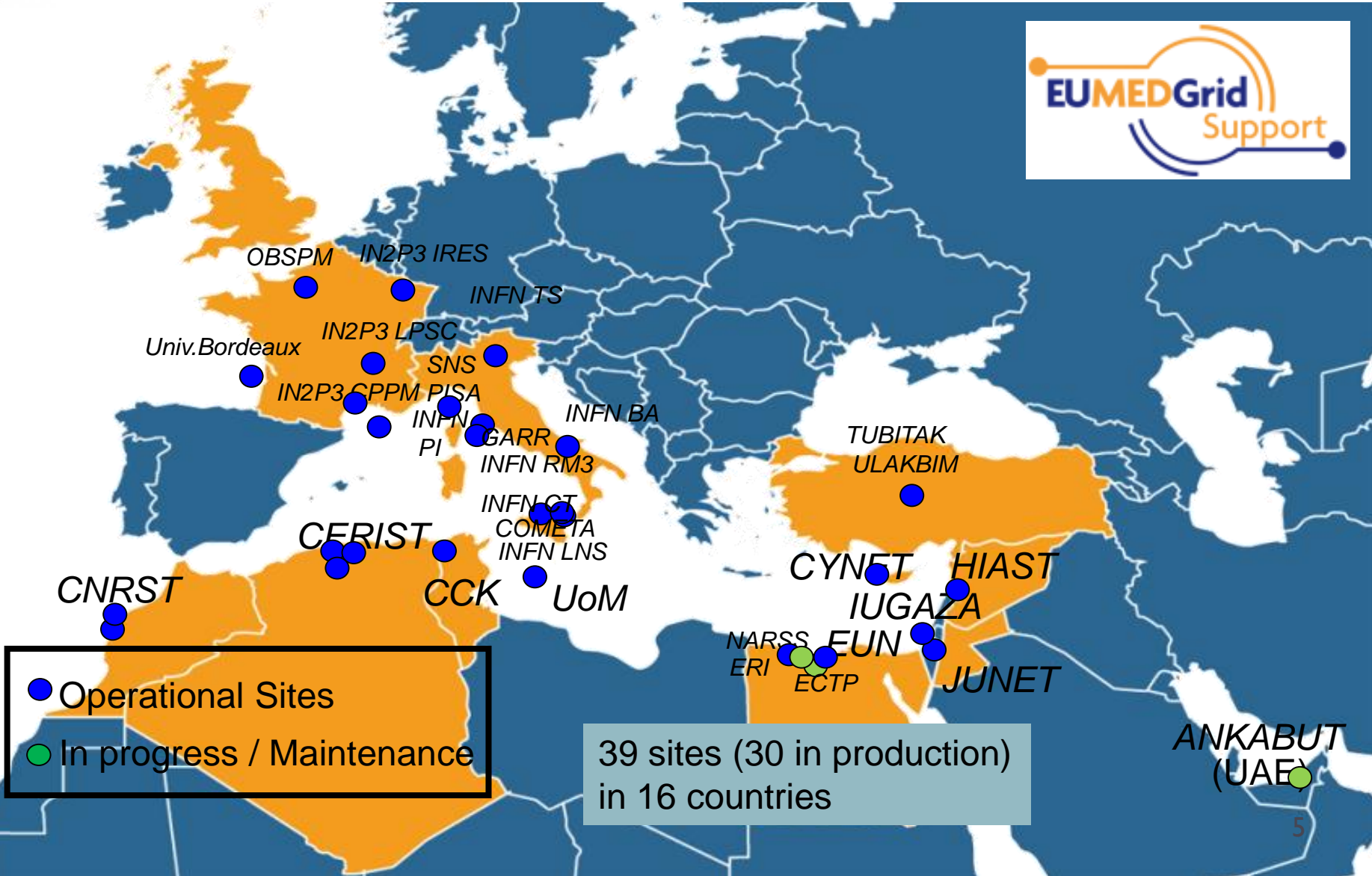
Operations Centres

- 27 National Operations Centres
- 9 Federations
- 1 EIRO (CERN)

Availability/Reliability (PQ7): 94.8%/95.6%



Mediterranean Grid (EUMEDGRID)





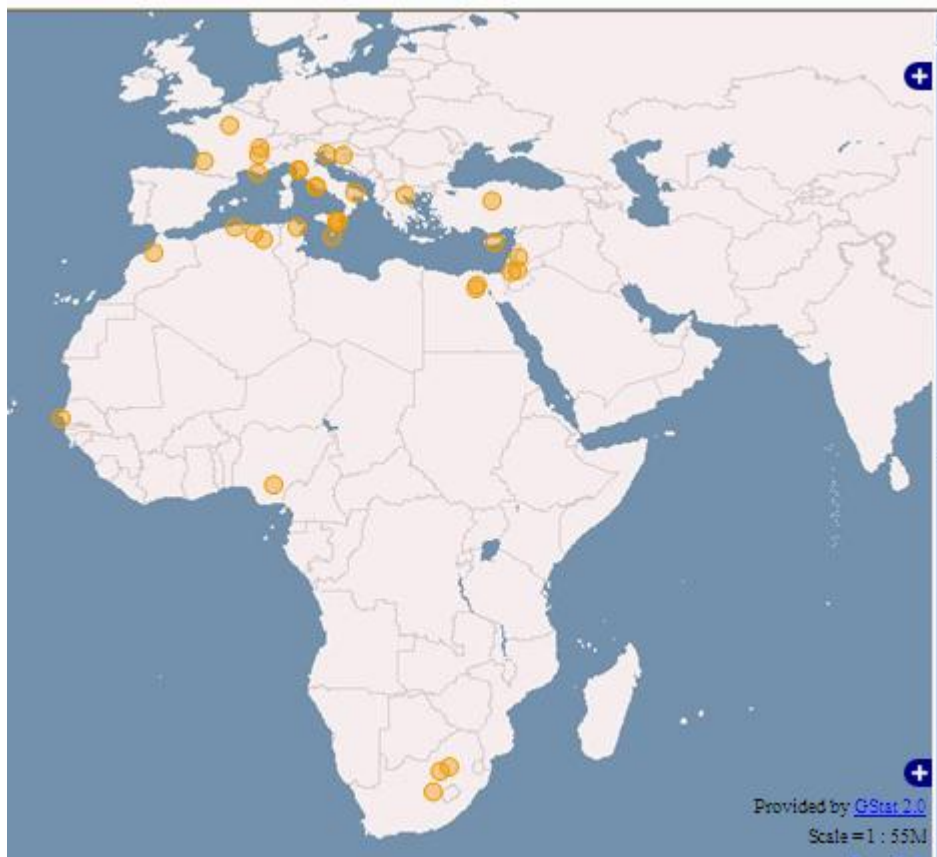
Africa & Arabia Regional Operation Centre

<http://roc.africa-grid.org>



Africa & Arabia ROC
Regional Operation Center

Home User Pages Site Manager Pages Virtual Organisations Grid Services Monitors User Support



...n by Roberto Barbera

C for short) has been created as a coordination and support point for all relating and challenging endeavour of creating a common Grid infrastructure

... They are listed on the right frame of this page.

... the Africa ROC and those sites belonging to other ROCs but participating roles, referring to sites, to get more information on their status.

... please visit the pages of this site and/or feel free to contact us.

- Supporting Projects/Initiatives**
- ASREN +
 - CHAIN +
 - EPIKH +
 - EUMEDGRID-SUPPORT +
 - SAGRID +



INFN Simulations on the RM3 Grid lab

- Atmospheric Transport Modeling Based Estimation of Radioactive Release from the Fukushima Dai-ichi Nuclear Power Plant Accident
- Use of Flexpart simulation application run in parallel on several nodes

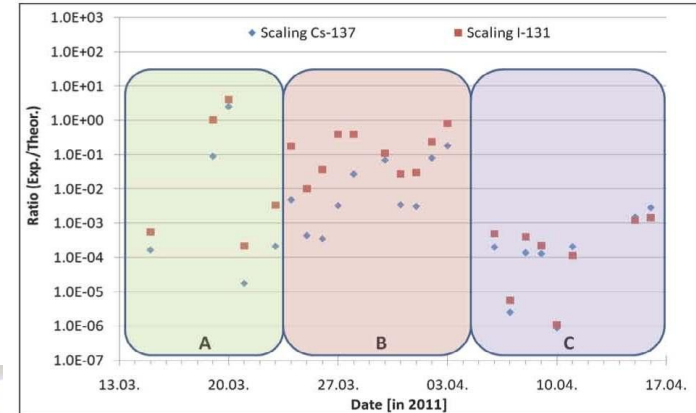


Figure 5: Scaling factors at JPP38 for caesium-137 and iodine-131, i.e. the ratios of experimental measurement and Flexpart simulation.

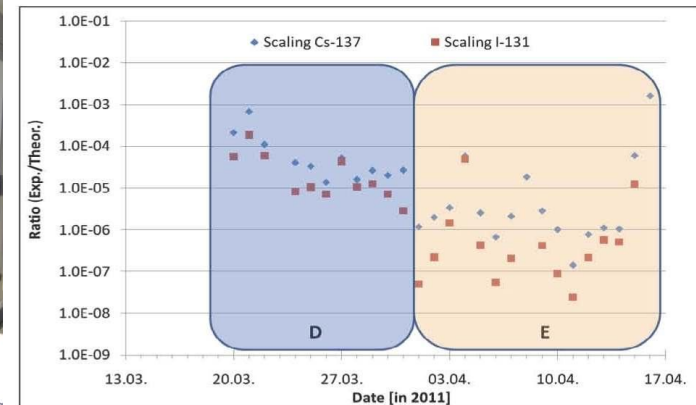
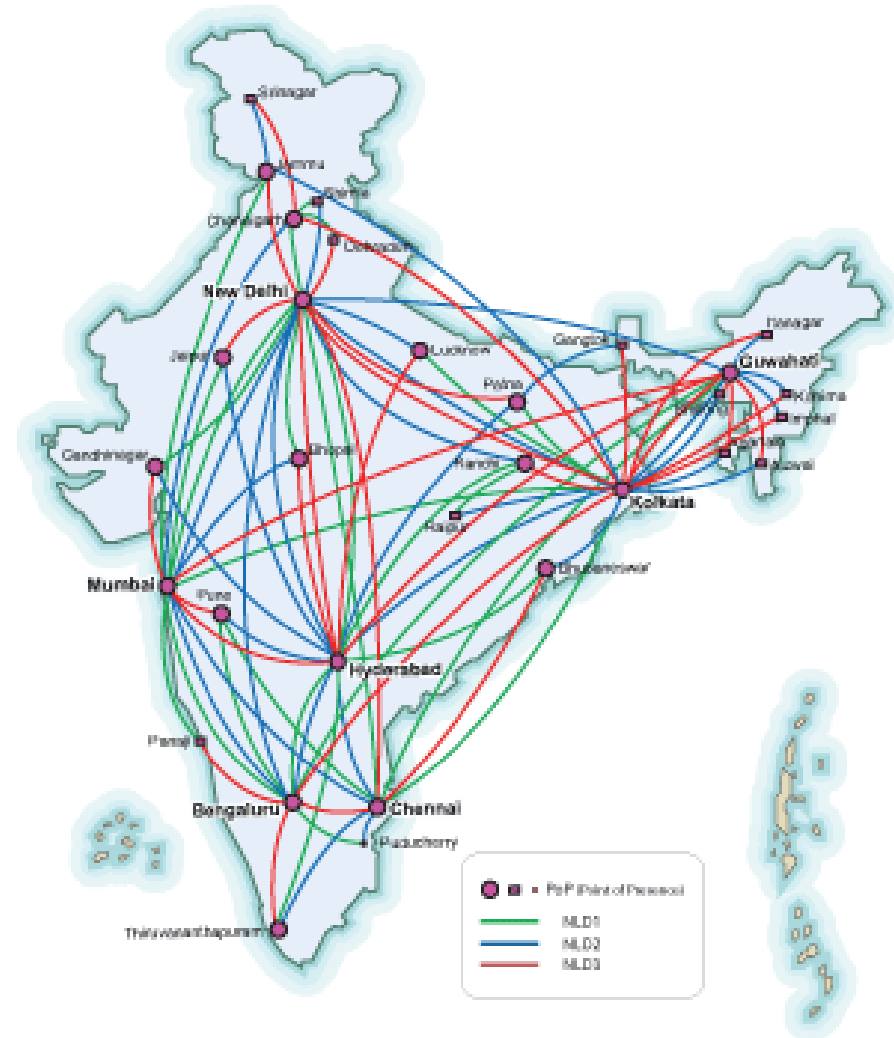


Figure 6: Scaling factors at USP79 for caesium-137 and iodine-131, i.e. the ratios of experimental measurement and Flexpart simulation.

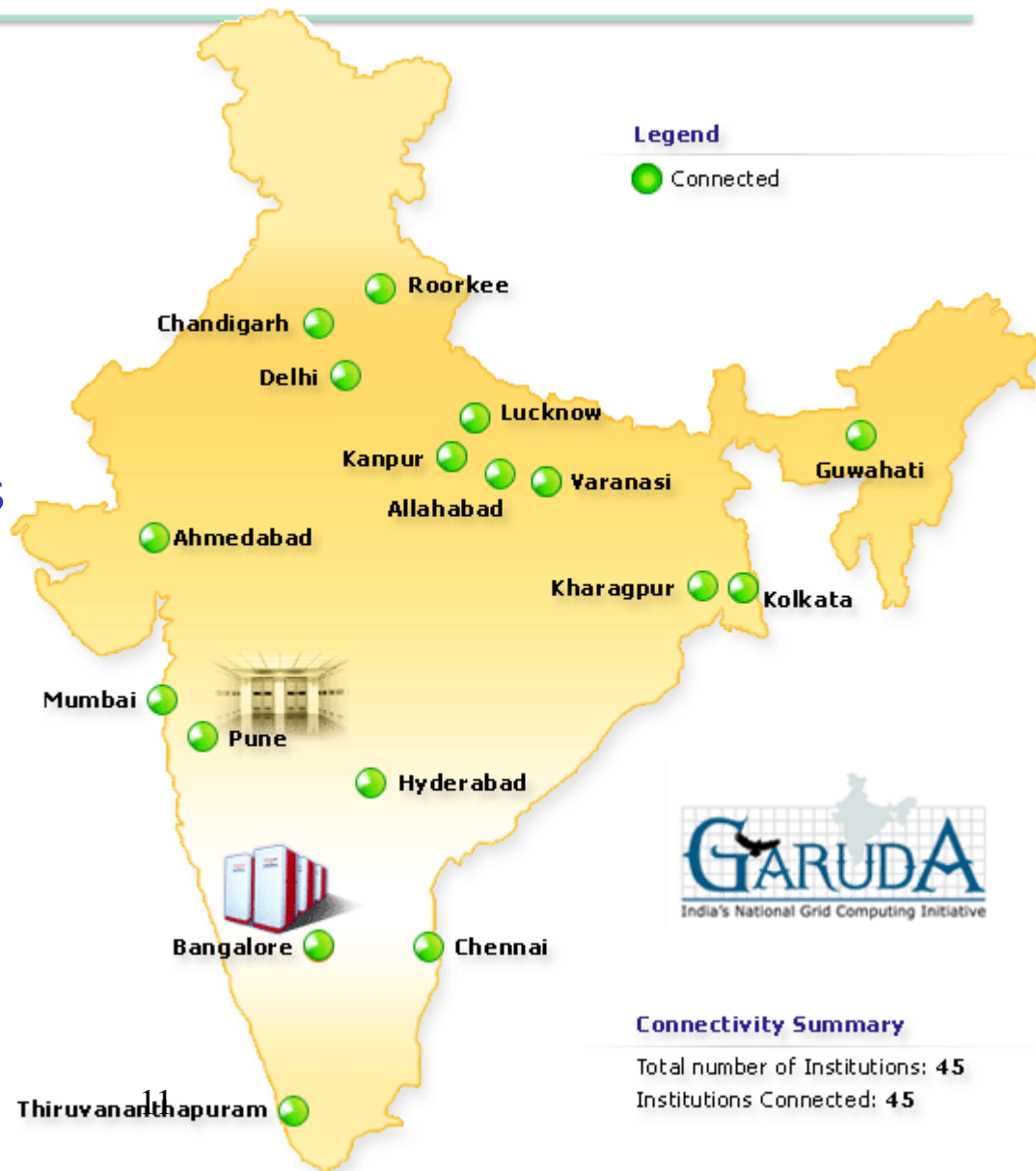
India National Knowledge Network

- A state-of-the-art multi-gigabit pan-India network for providing a unified high speed network backbone for all knowledge related institutions in the country
- An ultra-high speed CORE (multiples of 10 Gbps), with a distribution layer at speeds of 1 Gbps or higher
- Will connect 1500 institutes by March 2013 (831 in November 2012)
- Large governmental investment



Multiple 10G Connecting all the State Capitals
Gigabit Connectivity to all the 640 Districts

- GARUDA is the Grid Computing initiative of the C-DAC to allow access for scientific and academic institutions to the aggregation of High Performance Computing (HPC) clusters from various C-DAC centres and partners, comprising now over 6000 CPUs (~ 70 teraflops) and terabytes of mass storage to provide distributed data.
- The GARUDA Grid is now powered by the NKN - a highly reliable and secure national backbone.



INFN Remote access from India to FIP

FIP Experimental Set-up (*French beamline for Investigation of Proteins*) IBS/CEA, Grenoble, France

It is specially dedicated to crystallography of biological macromolecules.

This beam-line will be used either for normal diffraction or for multi-wavelength diffraction, using anomalous dispersion.

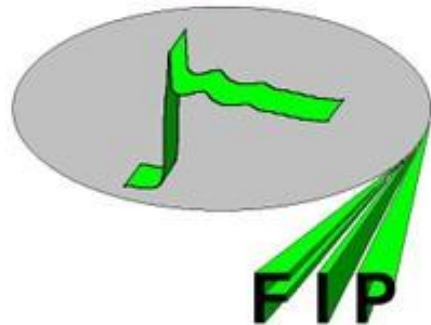
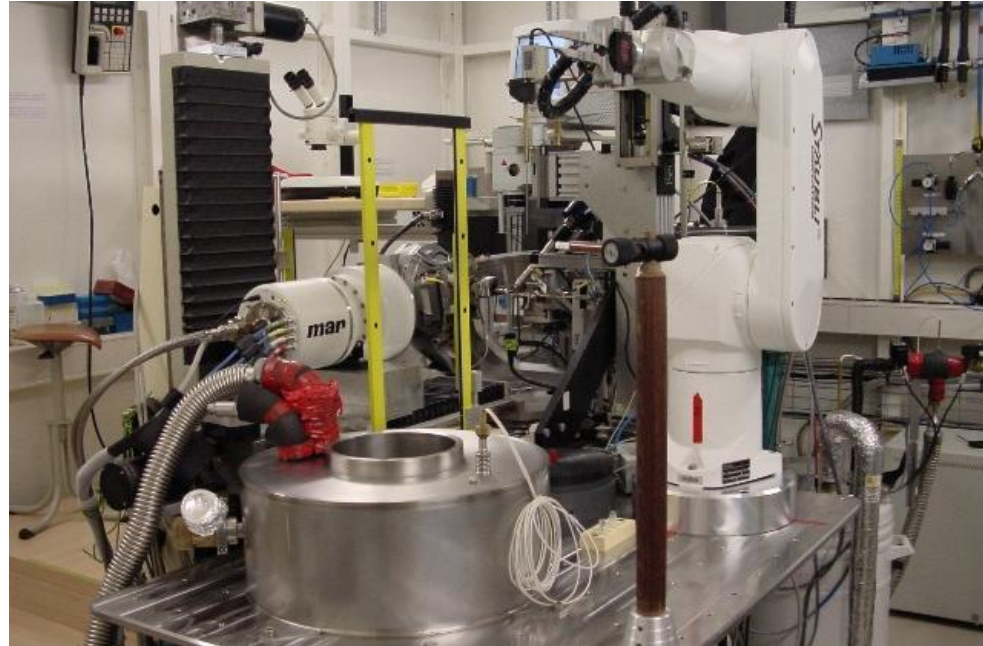


Plate size 225mm * 225mm

Pixel size 75 – 150 microns

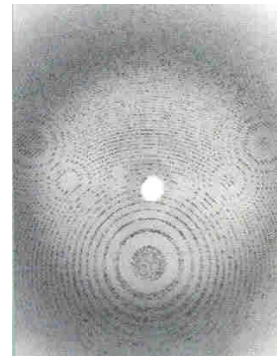
Many such frames constitute one data set for a crystal.

Typically 360 frames.

Size of one frame file = 18MB

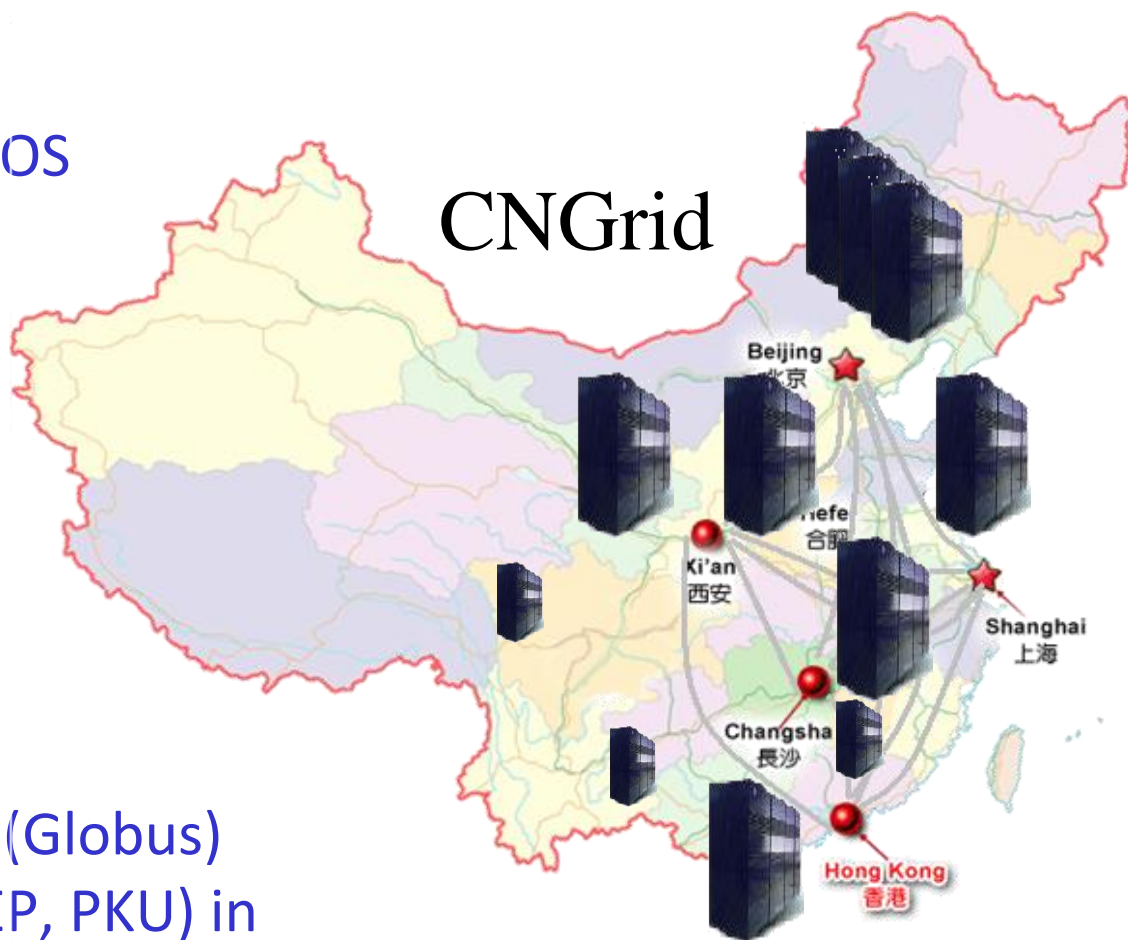
Four wave length data sets.

Total size 1440 * 18 MB per protein crystal



Robot for automatic sample change under cryo-conditions

- HPC Systems
 - Two 100 Tflops
 - 3 PFlops
- Grid Software: CNGrid GOS
- CNGrid Environment
 - 14 sites
 - One OP Centers
 - Some domain app. Grids
- Applications
 - Research
 - Resource & Environment
 - Manufacturing
 - Services
- ChinaGrid for Education (Globus)
- Sites with gLite/EMI (IHEP, PKU) in WLCG

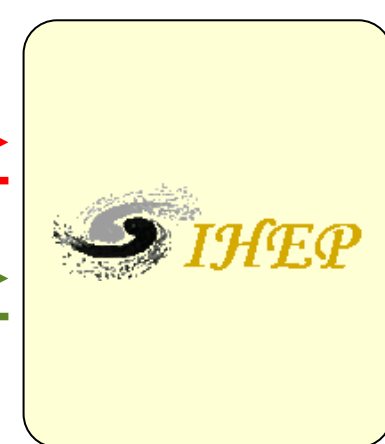
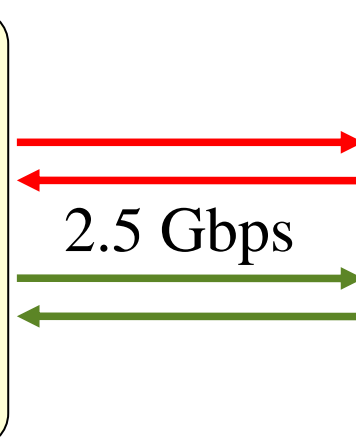
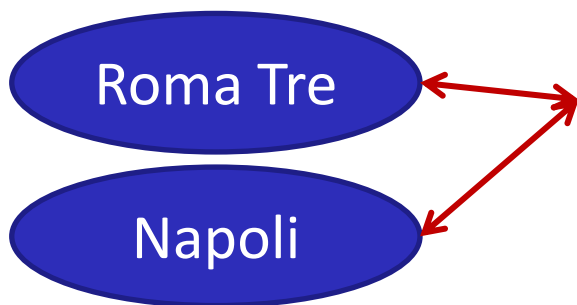


INFN ARGO-YBJ DAQ and Data Transfer

- Reliable Data Transfer from Yangbajing
- 2 Data Repositories (CNAF & IHEP)
- All the data transferred via network both to IHEP and INFN-CNAF via:
 - YBJ-IHEP 155 Mbps and
 - ORIENT Link 2.5 Gbps
 - 100 TB/year Data

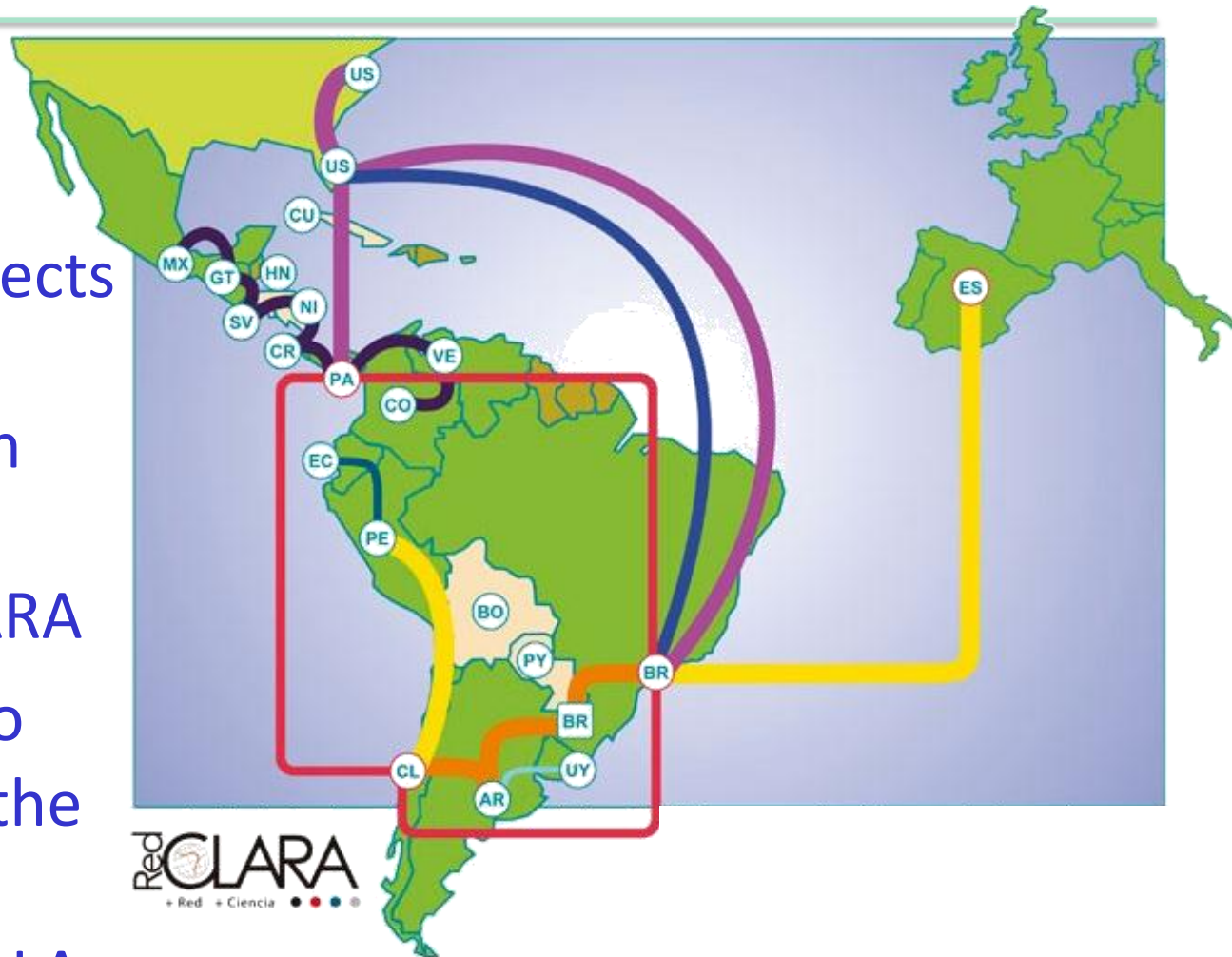


ARGO-YBJ
ON-LINE
System



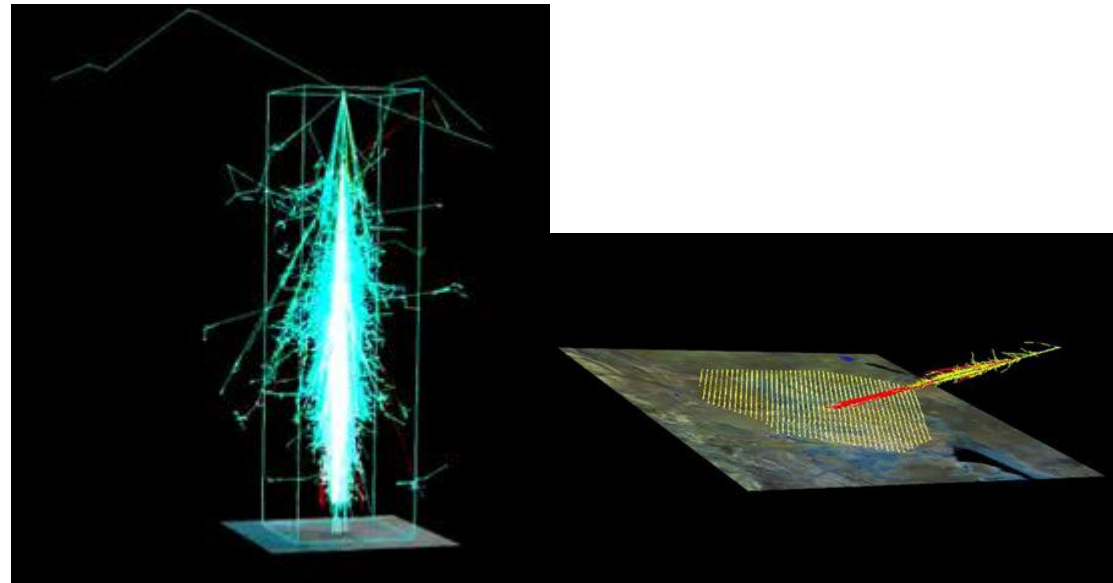
Latin America

- Red CLARA connects almost all the countries in Latin America and is managed by CLARA
- CLARA is going to coordinate also the Regional Grid Infrastructure in LA



Examples of Latin America sites & labs

- LAGO (Large Aperture Gamma Ray Burst Observatory)
- Auger: a network of 1600 detectors integrated with a set of high sensitivity telescopes



CHAIN: global coverage

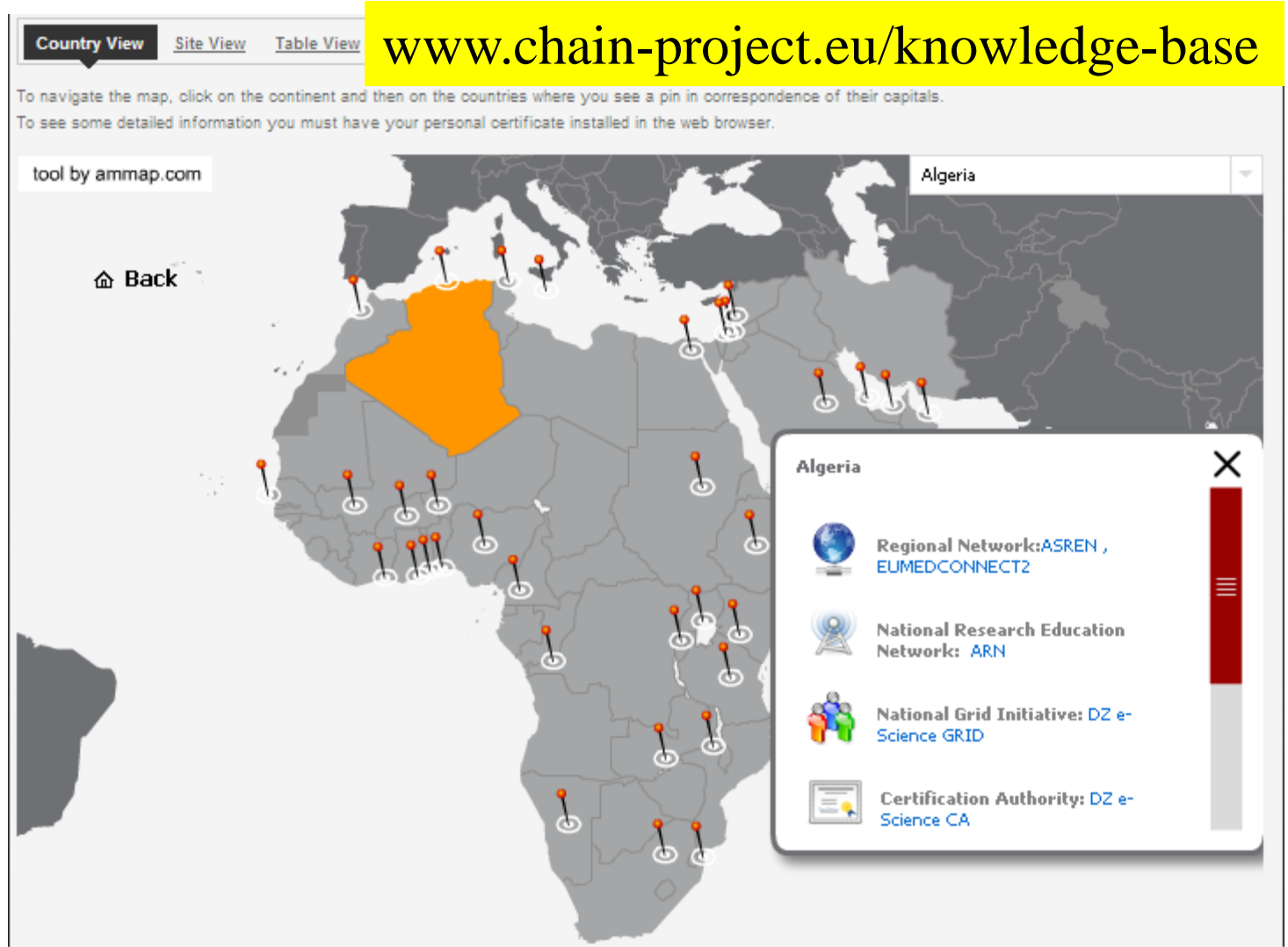


[Country View](#) [Site View](#) [Table View](#) www.chain-project.eu/knowledge-base

To navigate the map, click on the continent and then on the countries where you see a pin in correspondence of their capitals.
To see some detailed information you must have your personal certificate installed in the web browser.





tool by ammap.com

[Back](#)

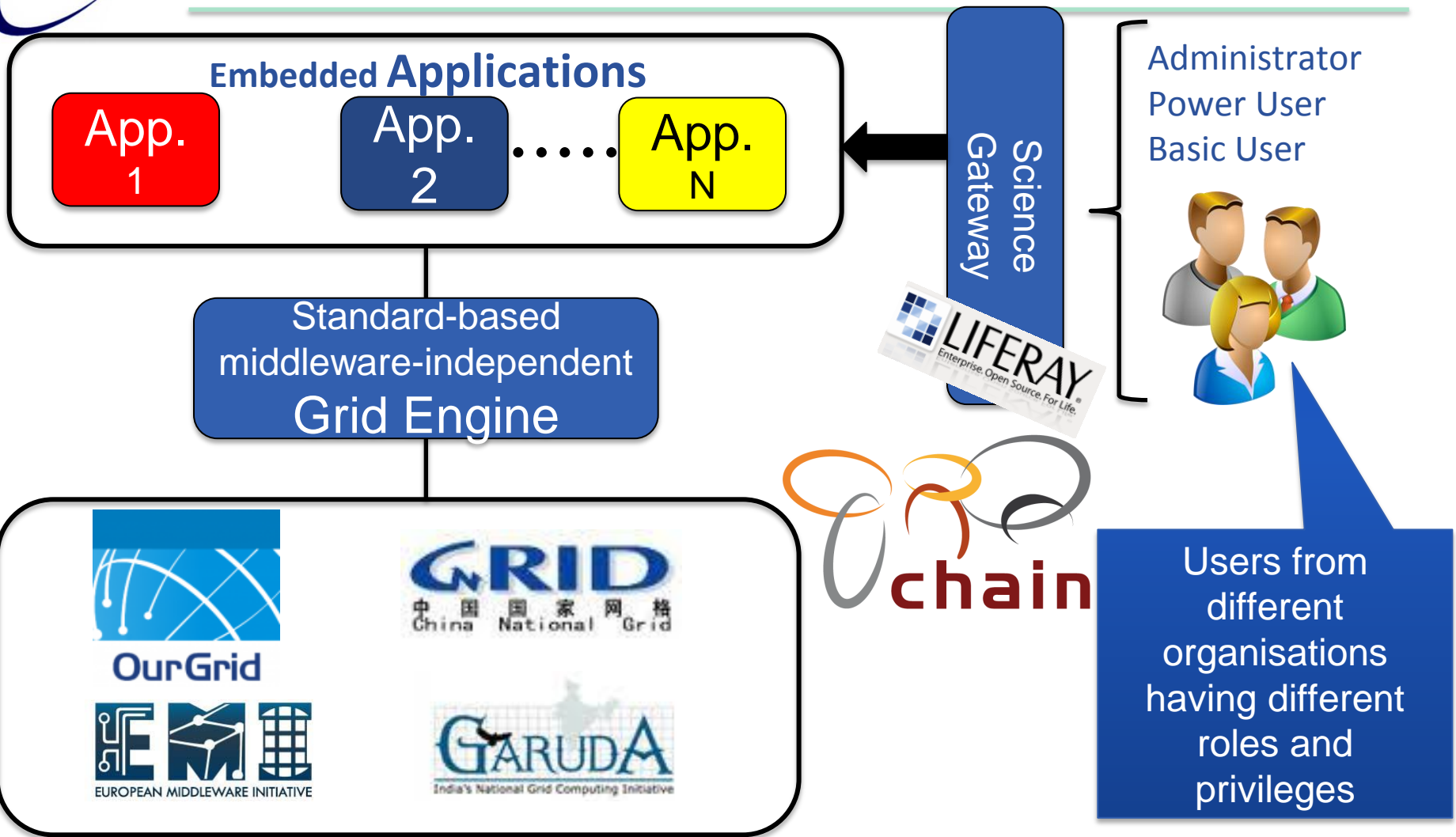


The image shows a web interface for a knowledge base. It features a map of Africa with numerous red pins indicating the locations of various research networks and initiatives. A popup window is open for Algeria, providing details about its regional, national, and certification entities. The popup includes a close button (X) and a vertical red bar on the right side.

Algeria

-  **Regional Network:** ASREN , EUMEDCONNECT2
-  **National Research Education Network:** ARN
-  **National Grid Initiative:** D2 e-Science GRID
-  **Certification Authority:** D2 e-Science CA

Access: the Science Gateway model





▶ Structural biology



▶ Meteorology and other Earth Science



▶ Evolutionary biology



▶ Digital cultural heritage



▶ Health



▶ Agriculture



CHAIN-REDS

- Co-ordination & Harmonisation of Advanced e-Infrastructures for Research and Education Data Sharing
- Research Infrastructures – Support Action
- Grant Agreement n. 306819
- Total Costs of € 2.3 M
- Max. EC contribution: € 1.52 M
- Start date: 1 December 2012
- Duration: 30 Months



Office of the Principal Scientific Adviser
to the Government of India



Conclusions

- E-Infrastructures are an important requirement for intercontinental research activities
- HEP/LHC has demonstrated that working efficiently with large widespread collaborations is possible and allows for great scientific results
- Globalisation of Science requires data and resource sharing to address the big scientific challenges (e.g. Climate Change, Genomics, Astroparticle, SKA, etc.)
- E-Infrastructures can mitigate disparities in the developing regions allowing every researcher to access data and analyse them
- Astroparticle physics, Earth and Environmental Sciences can exploit the available resources



Thank you !

www.chain-project.eu