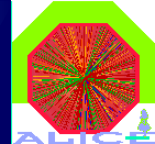


A 3D cutaway rendering of a complex particle detector component, likely a calorimeter or tracking chamber. The structure is cylindrical and composed of various layers and components. A prominent feature is a large, curved, light blue pipe or duct that runs along the top inner surface. Below this, there are several yellow structural elements, possibly support beams or part of the detector's frame. The central region contains a series of red and blue components, which could be sensors or readout electronics. The entire assembly is mounted on a dark grey base. The background is a solid blue color.

Recent grid activities at INFN Catania<sup>(\*)</sup>

Roberto Barbera

<sup>(\*)</sup>work in collaboration with NICE srl

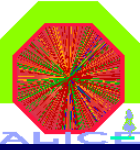


# Outline

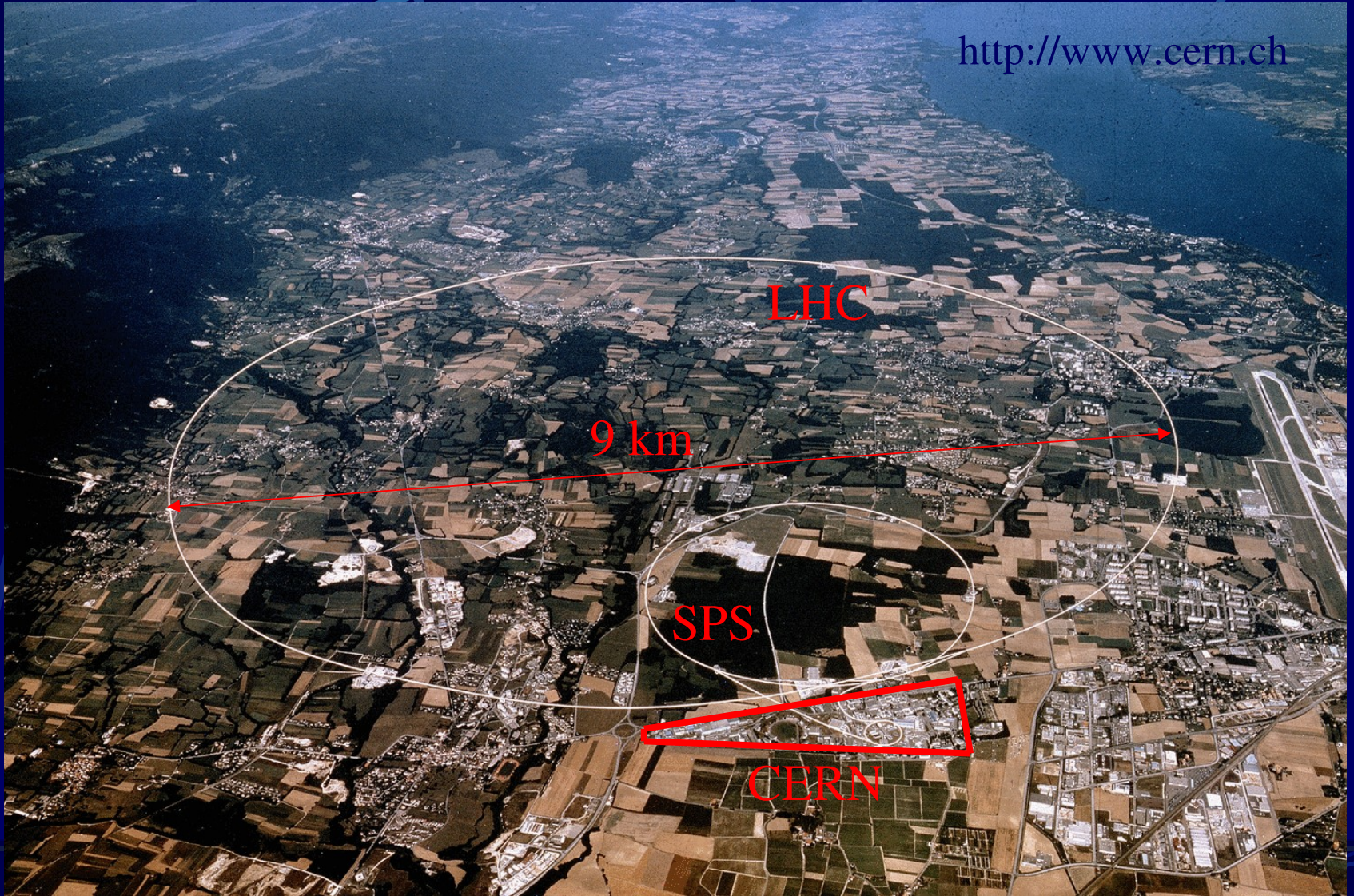
- Grid Computing:
  - why ?
  - how ?
  - who ?
  - where ?
- GENIUS: a web portal for the grid
  - live demo !
- Conclusions and outlook.



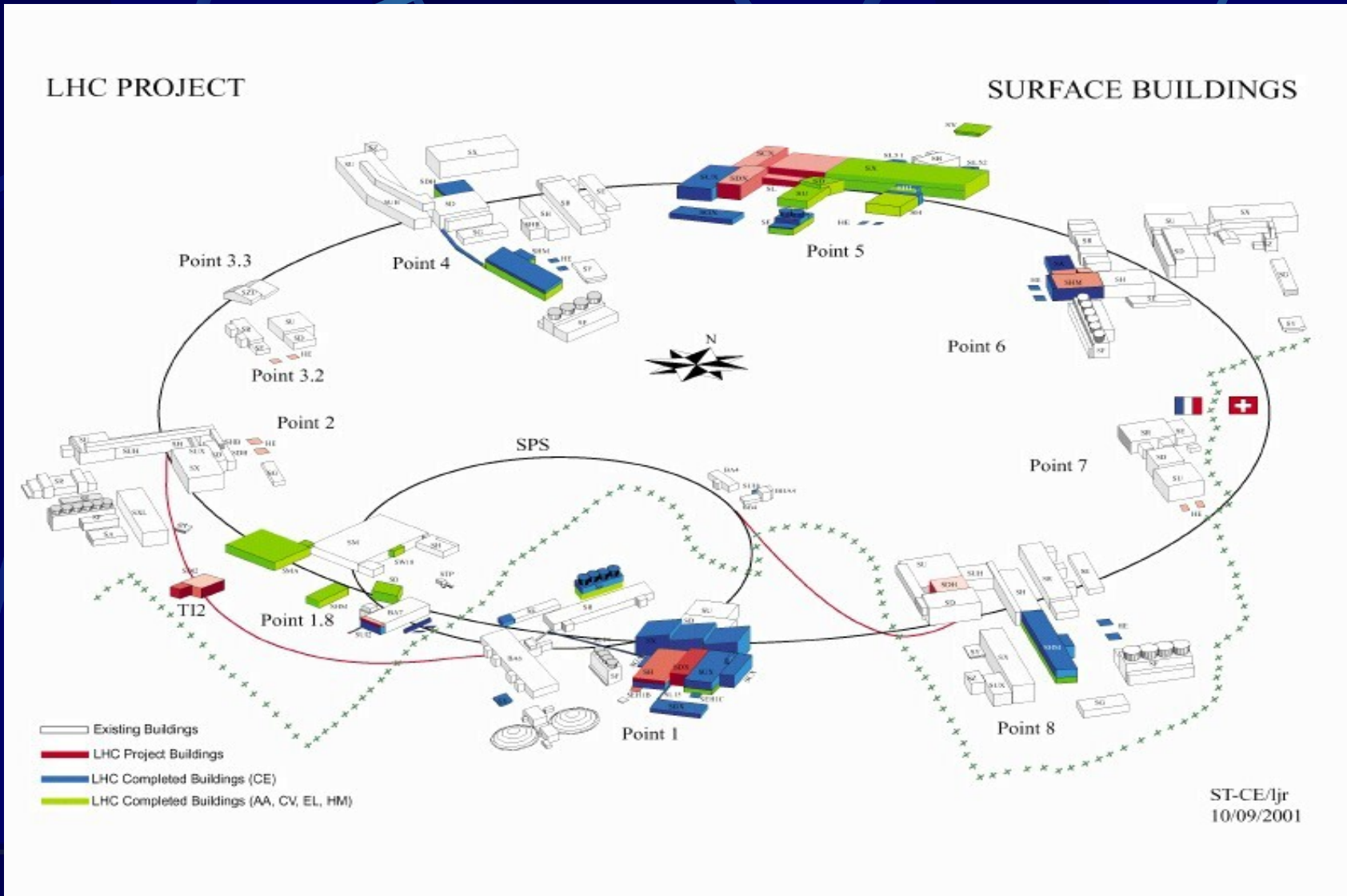
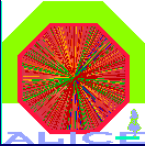
# High Energy Physics



<http://www.cern.ch>

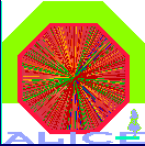


# High Energy Physics



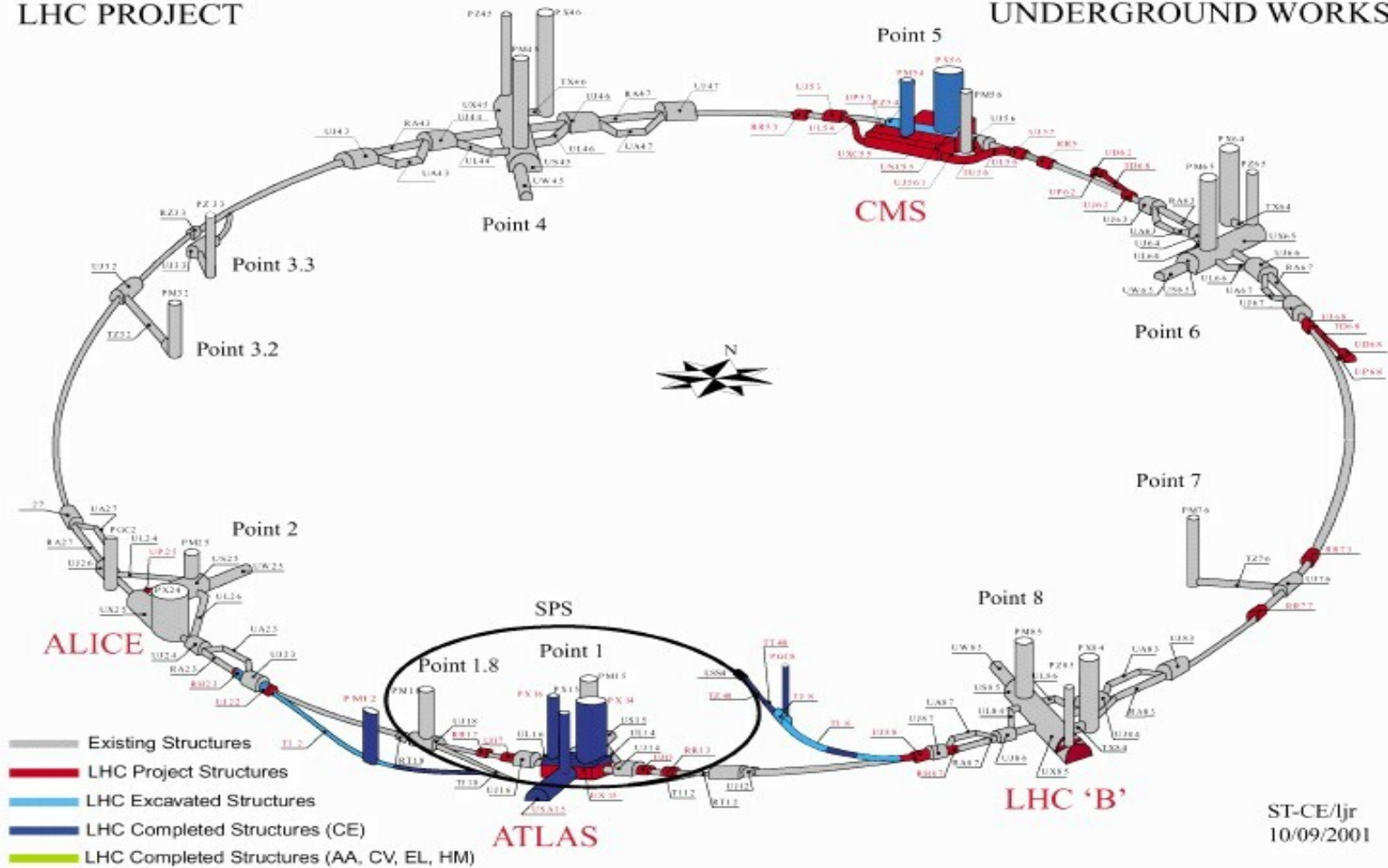


# High Energy Physics



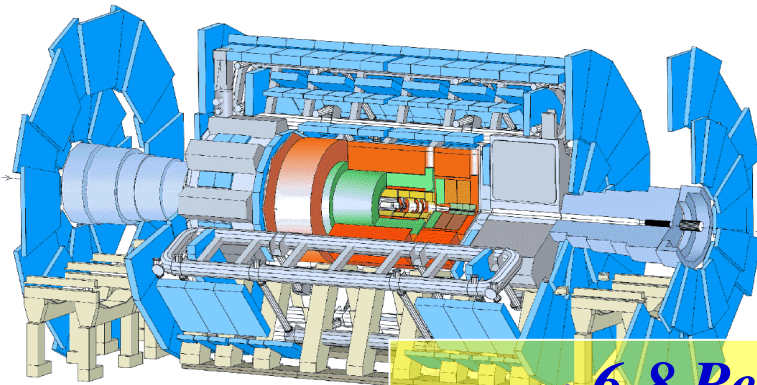
LHC PROJECT

UNDERGROUND WORKS



# High Energy Physics

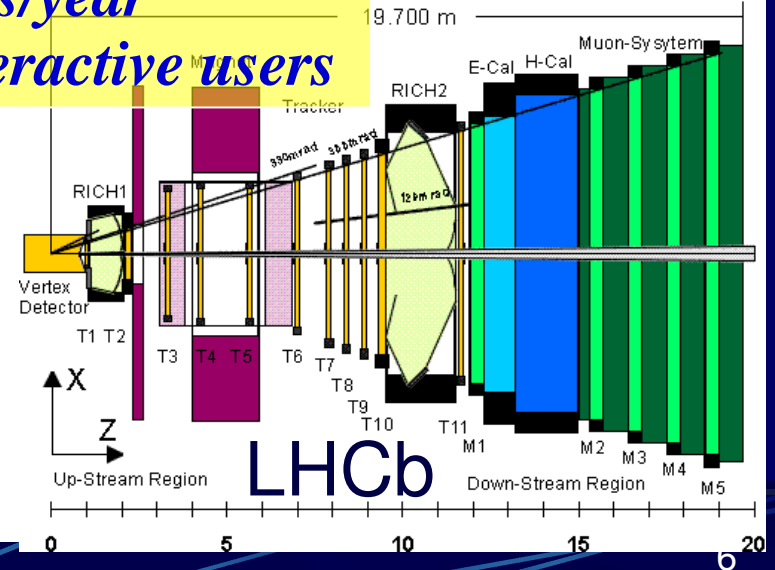
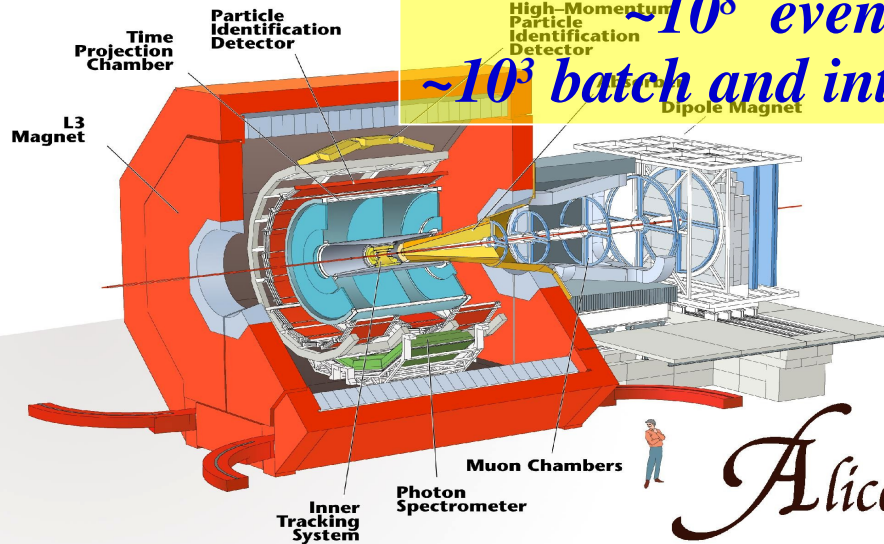
ATLAS



CMS



*~6-8 PetaBytes / year*  
*~10<sup>8</sup> events/year*  
*~10<sup>3</sup> batch and interactive users*



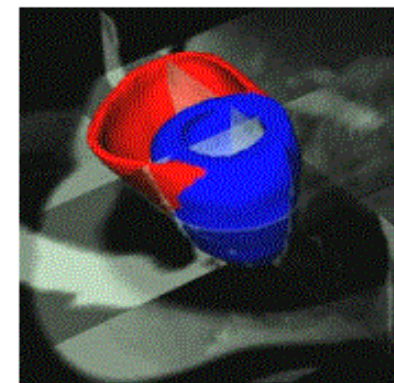
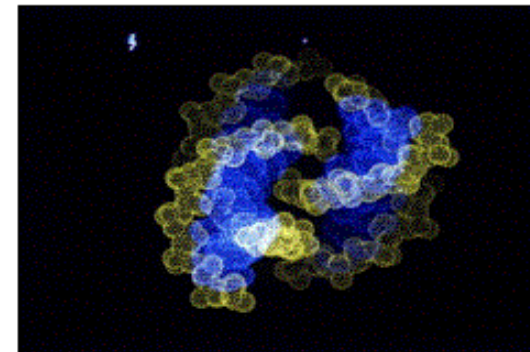
*Alice*

# Computational bio-medicine



## Grid added value for biomedical applications

- ◆ Data mining on genomics databases (exponential growth).
- ◆ Indexing of medical databases (Tb/hospital/year).
- ◆ Collaborative framework for large scale experiments (e.g. epidemiological studies).
- ◆ Parallel processing for
  - Databases analysis
  - Complex 3D modelling



# Computational bio-medicine

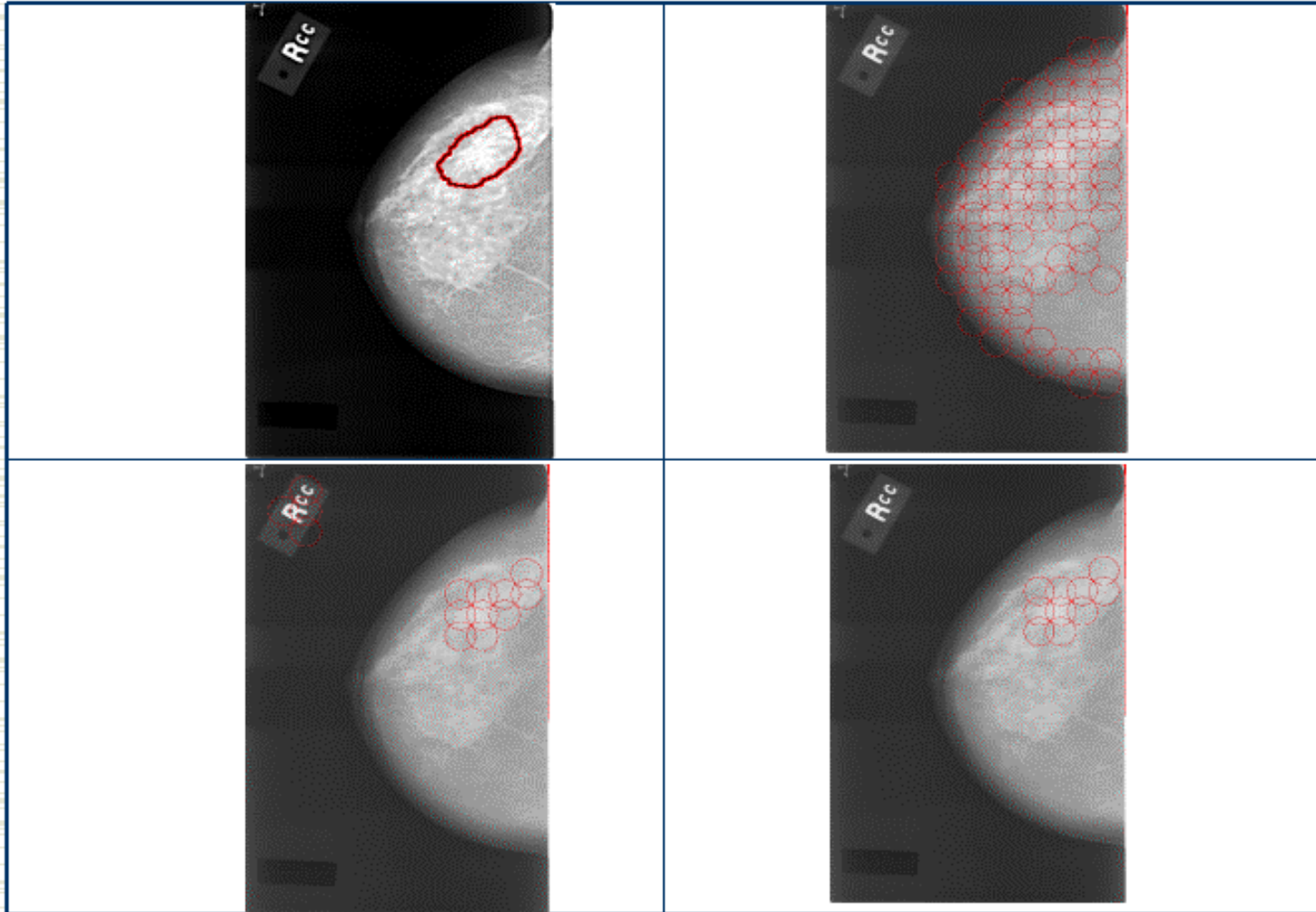
The screenshot displays the Visual DataGrid BLAST application. The main window shows a sequence alignment for 'NR\_SC:SW-PABP\_YEAST' with 32 homologies found and a maximum score of 2778. A bar chart visualizes the alignment scores. An overlaid 'Visual DataGrid BLAST' dialog box contains the following fields:

- Sequence file:  Browse...
- Output file:  Browse...
- Logical filename:
- Database: YEAST Algorithm: BlastP+MSPcrunch
- Number of job(s): 5 Default number
- Buttons: Start, Cancel, Clear all

The search results list on the right includes entries such as NR\_SC:GP-CAA60917\_1, NR\_SC:PIR-B23496, NR\_SC:GP-CAA92351\_1, NR\_SC:GP-CAA81266\_1, NR\_SC:GP-CAA93202\_1, NR\_SC:GP-AAA79056\_1, NR\_SC:GP-CAA86921\_1, NR\_SC:GP-CAA80386\_1, NR\_SC:GP-CAA89648\_1, NR\_SC:GP-CAA89258\_1, NR\_SC:GP-CAA24060\_1, NR\_SC:GP-CAA58985\_1, NR\_SC:GP-CAA86497\_1, NR\_SC:SW-GFA1\_YEAST, NR\_SC:SW-UG61\_YEAST, P-AAB67523\_1, P-CAA97711\_1, W-ASN1\_YEAST, W-HS83\_YEAST, W-ASN2\_YEAST, P-CAA60726\_1, W-PABP\_YEAST, P-CAA84004\_1, W-GUAA\_YEAST, W-HS75\_YEAST, W-HS76\_YEAST, P-AAB23074\_1, P-CAA73947\_1, P-CAA67472\_1, P-AAA99665\_1, P-CAA86120\_1, P-CAA82046\_1, P-AAB60298\_1, P-CAA8762\_1, NR\_SC:GP-CAA89019\_1, NR\_SC:SW-END1\_YEAST, NR\_SC:GP-CAA97041\_1, NR\_SC:SW-END2\_YEAST, NR\_SC:GP-AAA34930\_1, NR\_SC:GP-CAA97655\_1.



# Computational bio-medicine



September 21st, 2001

*Datagrid Meeting, Lyon*

15

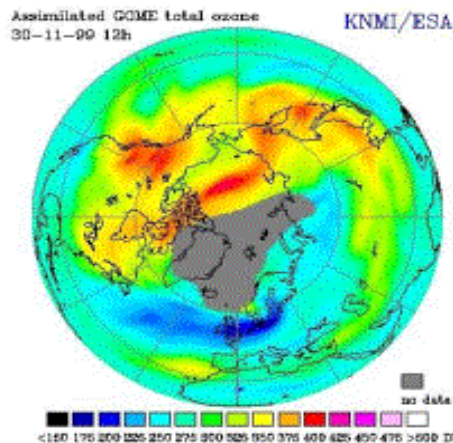
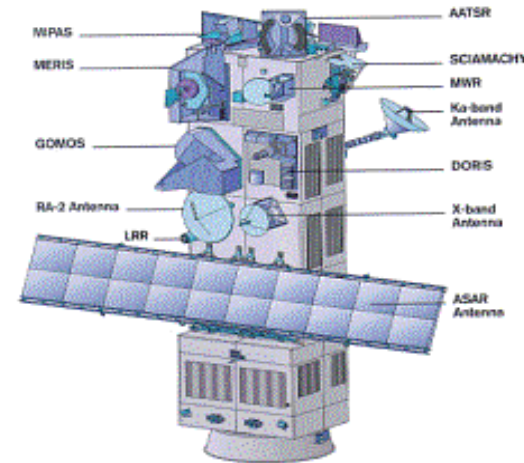
9

# Earth Observations

## Data GRID Earth Observations

### ESA missions:

- about 100 Gbytes of data per day (ERS 1/2)
- 500 Gbytes, for the next ENVISAT mission (2002).



### DataGrid contribute to EO:

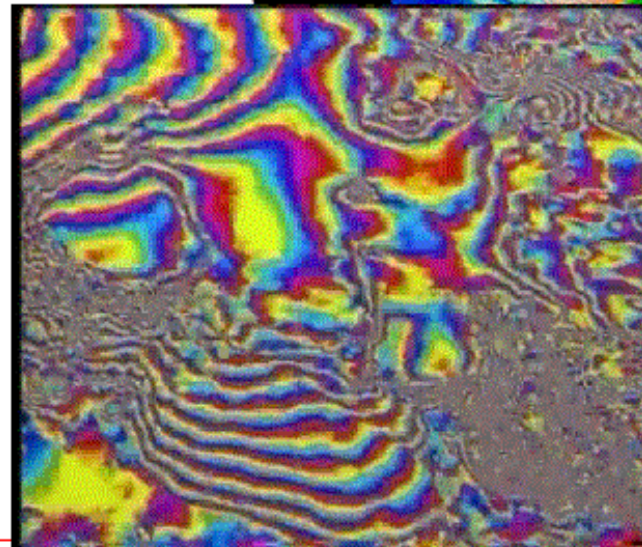
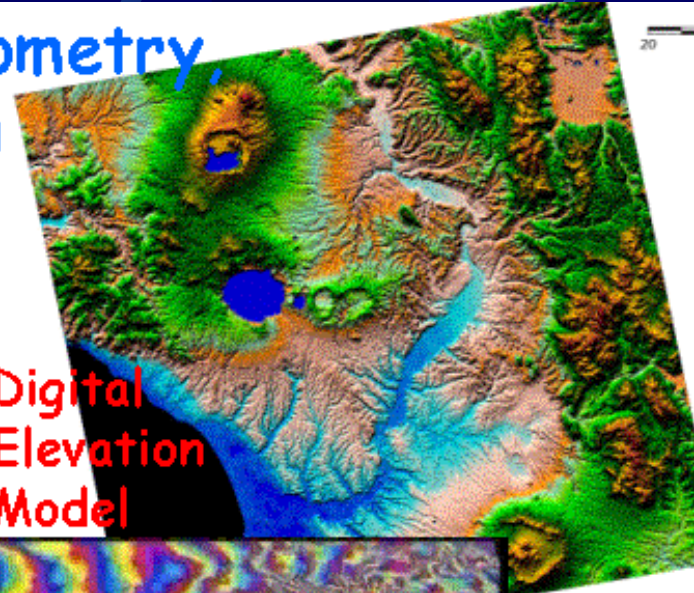
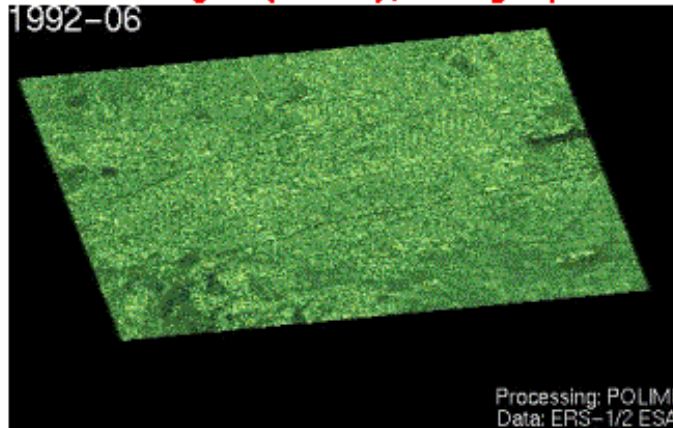
- enhance the ability to access high level products
- allow reprocessing of large historical archives
- improve Earth science complex applications (data fusion, data mining, modelling ...)

Source: L. Fusco, June 2001

# Earth Observations

Number crunching: interferometry, subsidence, DEM generation

Pomona (Cal): subsidence velocity fields  
40 ERS1/2 images (92-99), Ambiguity: 28 mm



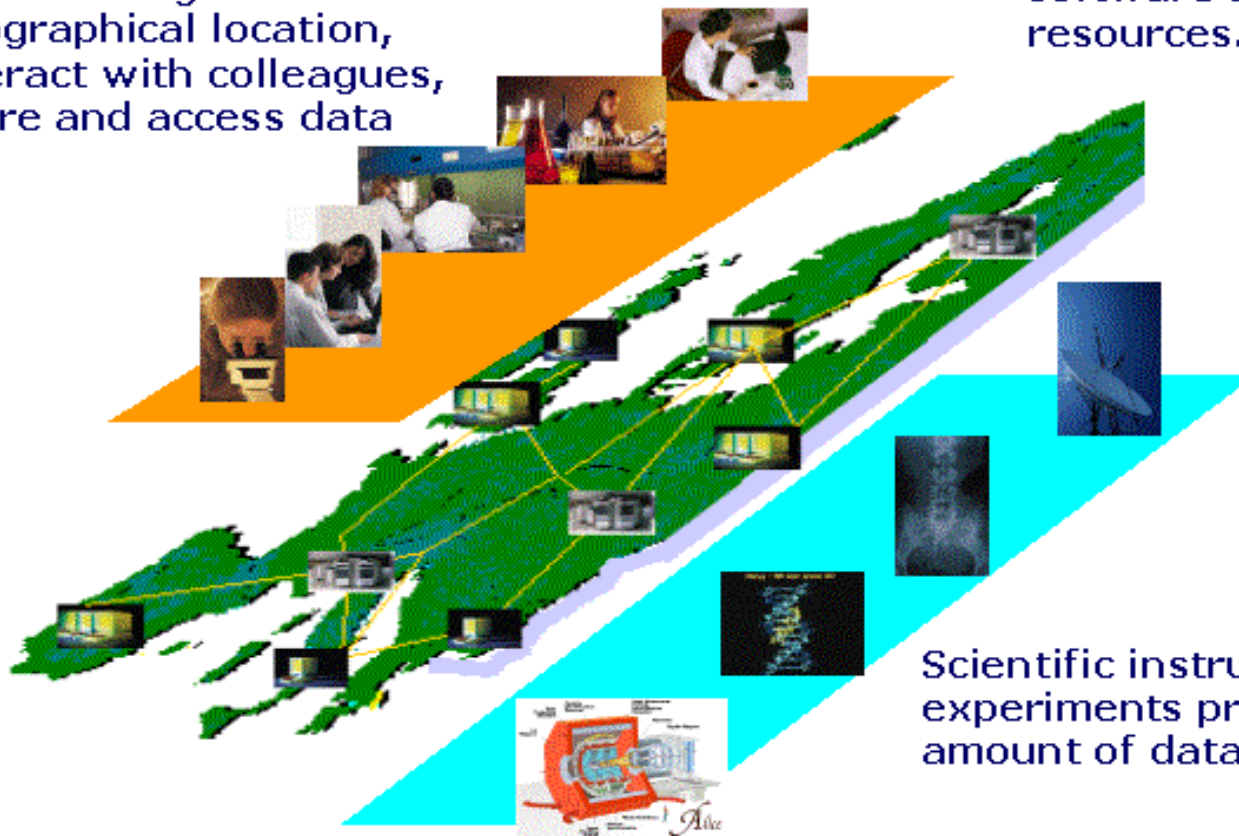
GRID requirements:

- large data files (10+ GB)
- stages with intensive processing
- science driven value adding

# Data GRID The Grid Vision

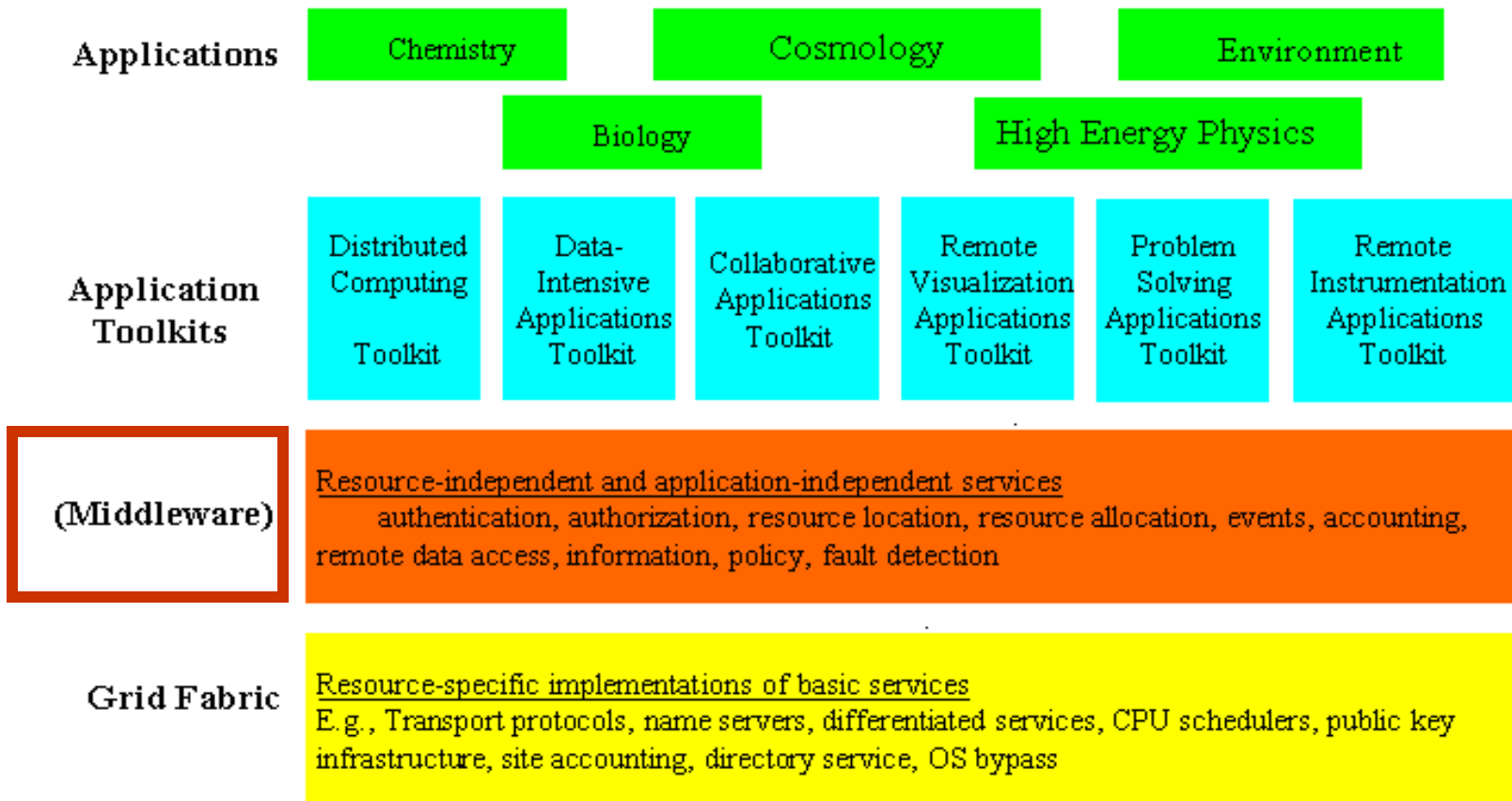
Researchers perform their activities regardless geographical location, interact with colleagues, share and access data

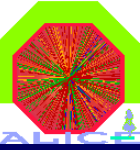
The GRID: networked data processing centres and "middleware" software as the "glue" of resources.



Scientific instruments and experiments provide huge amount of data

# The Grid from a Services View

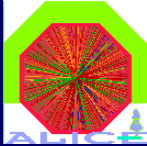






# Middleware has been released but...

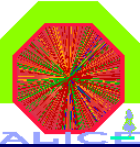
- EDG software (Globus, UI, JDL, WP2, WP3, etc.) contains tens of commands/switches which also have their own logical sequences (“B” after “A”, “C” before “D” and so on).
- Browsing Grid VO “directories” (users, RC’s, DB’s, etc.) requires LDAP “speaking” and tomorrow could require SQL “speaking”.
- “User gridification” is a tough task for a “rookie”  $\Rightarrow$  how does this fit with the claim that we are “doing grids” for everybody and that grid computing will be as easy as surfing the Internet ?
- Furthermore, all this holds for DataGrid. What will happen when other grids’ software (especially UI’s) will come up (PPDG, iVDGL, etc.) ? Will users have to learn tens of “grid dialects” ?
- Today “grid computing” is a rather struggling experience which you can do only at selected machines (UI’s)  $\Rightarrow$  how does this fit with the claim that one could do “grid computing” even from a PDA ?
- **Is there any way to set-up a “user-friendly” grid ?**



# A web portal: why and how ?

- It can be accessed from everywhere and by “everything” (desktop, laptop, PDA, WAP phone).
- It can keep the same user interface to several back-ends (grid “dialects”  $\Leftrightarrow$  command-line UI’s).
- It must be redundantly “secure” at all levels: **1)** secure for web transactions, **2)** secure for user credentials, **3)** secure for user authentication, **4)** secure at VO level.
- All available grid services must be incorporated in a logic way, just “one mouse click away”.
- Its layout must be easily understandable and user friendly.





# GENIUS®

(Grid Enabled web eNvironment for

site Independent User job Submission)

## GENIUS web portal

- ALICE
- ATLAS
- CMS
- LHCb
- Other apps

Applications' specific layer

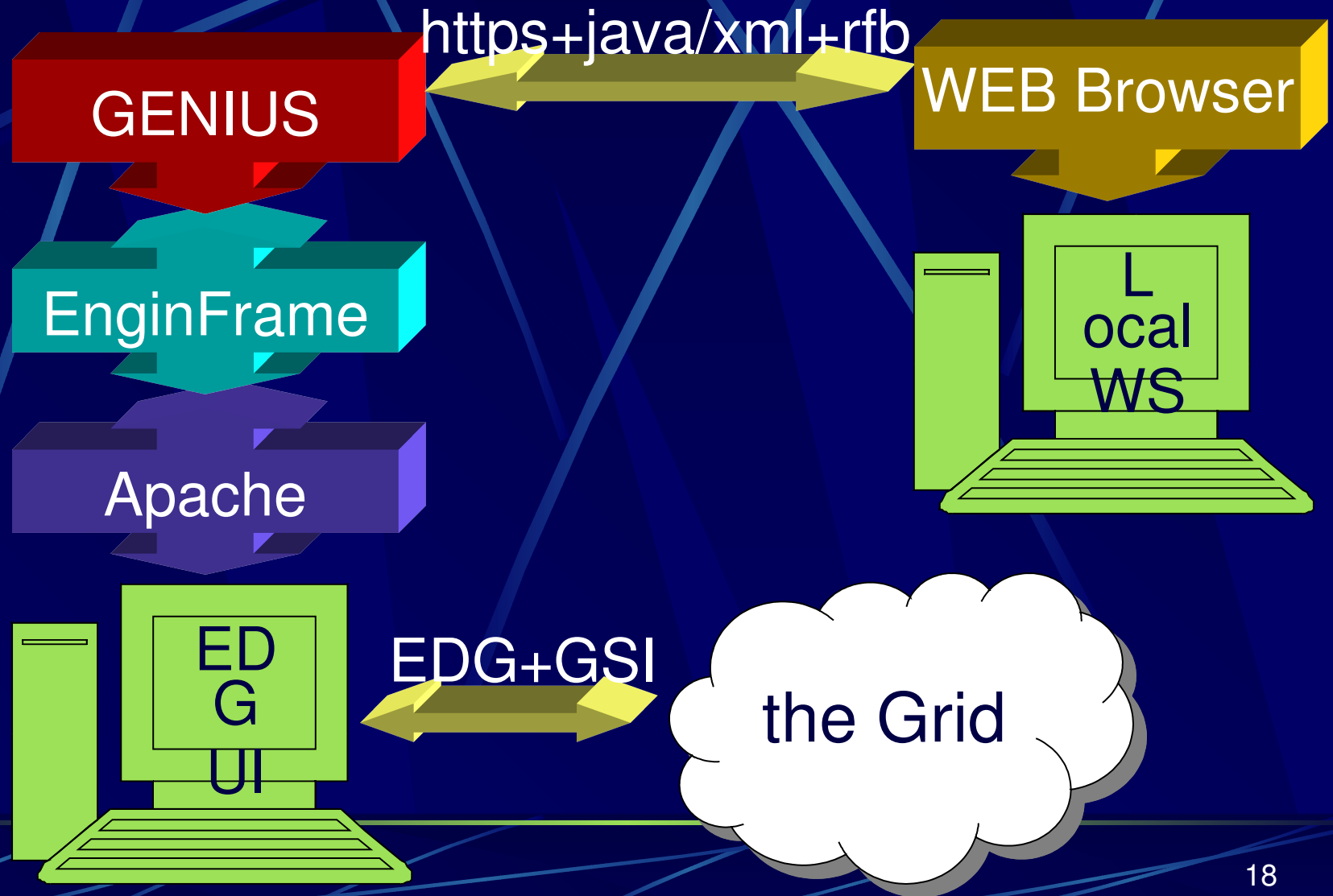
DataGRID architecture

GLOBUS toolkit

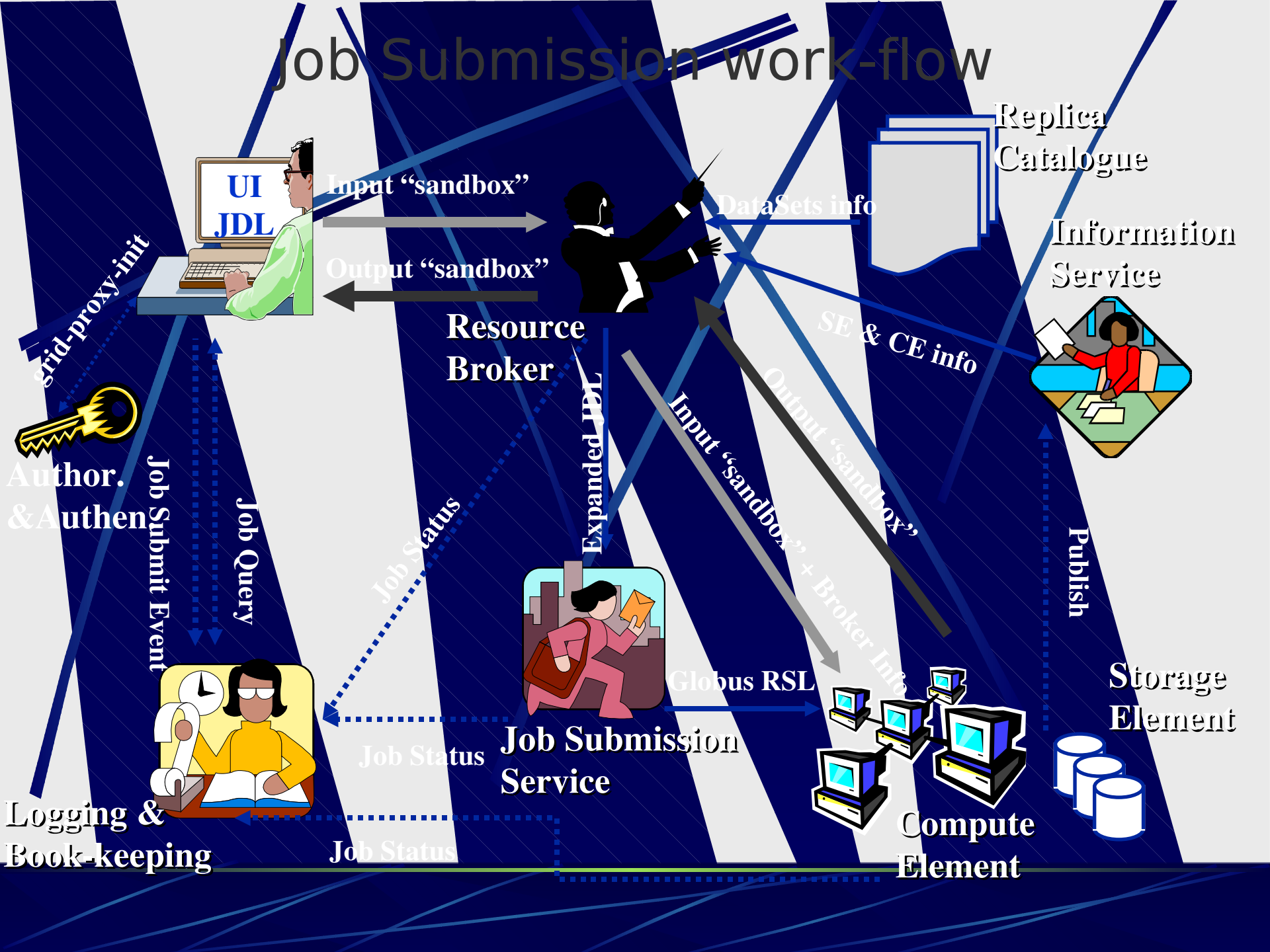
High level GRID middleware  
Basic Services

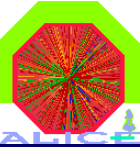
## OS & Net services

# GENIUS: how it works



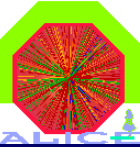
# Job Submission work-flow





# Present status and perspectives

- Current implementation of GENIUS already includes:
  - secure web transactions and user authentication and authorization;
  - browsing of remote files and creation of new ones;
  - interfaces for job submission/control (multiple RB's), to VO servers (users' and RC's), and to monitoring systems;
  - persistent (personal) book-keeping and spooler system
  - interactive analysis !
- Todo:
  - multi-jobs (parallel and sequential);
  - interface to data management and other grid services;
  - more experiment-specific customizations;
  - web-guided creation of JDL scripts.



# Conclusions and outlook

- Computational grids are “sold” as the framework of the highly distributed computing models of next generation high energy physics experiments, biomedics and Earth observations.
- Grids are also presented as the solution to bring enormous computing power and mass storage to the individuals like the web did with information.
- **But, if we really want to turn dreams into reality, let's make their use simple and easy for the new users.**