Healthgrids

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PharmaGrid workshop

June 31st 2003

Goal of the talk

- **Present a perspective on grid applications for health**
- **Present some pilot projects and initiatives through that perspective**

Health in this talk is used to cover all features related to healthcare from molecule to population

- Medical informatics
- Bio-informatics

BioInfoMed white paper (http://www.isciii.es)

A vision on grids for health

Sofie Nørager, European Commission, eHealth Unit

- Application of the existing GRID technology to health for both computing intensive applications and knowledge discovery.
  - **to connect databases of heterogeneous content (biology and medicine) enabling new knowledge discovery (research, drug design), better guidance and information (healthcare professionals).**
  - **to increase computing power for imaging, simulation and modelling thus allowing these fields to take into account more data and therefore to provide more accurate results.**
- Development of new middleware and new applications required to meet specific request from the Health domai (Ex. Security, heterogeneity of data …) .

Information Society Technologies

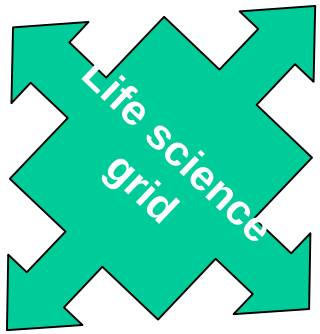
A grid for health

- From escience : a distributed environment for biomedical sciences
  - Research centres
  - University hospitals
  - Computing centres
- to eHealth : a distributed environment for daily medical practice
  - Hospitals
  - Regional health networks
  - Healthcare administrations
  - Physicians

The details of a biomedical science grid

University Hospitals
- provide data content
- need services

Biology Laboratories
- provide data content
- need services



Computing centres provide
CPU and storage

Bio/Medical informatics laboratories
- provide services
- need services

The actors of an eHealth grid

Physicians

Biological laboratories

Hospitals (Regional Health Networks)

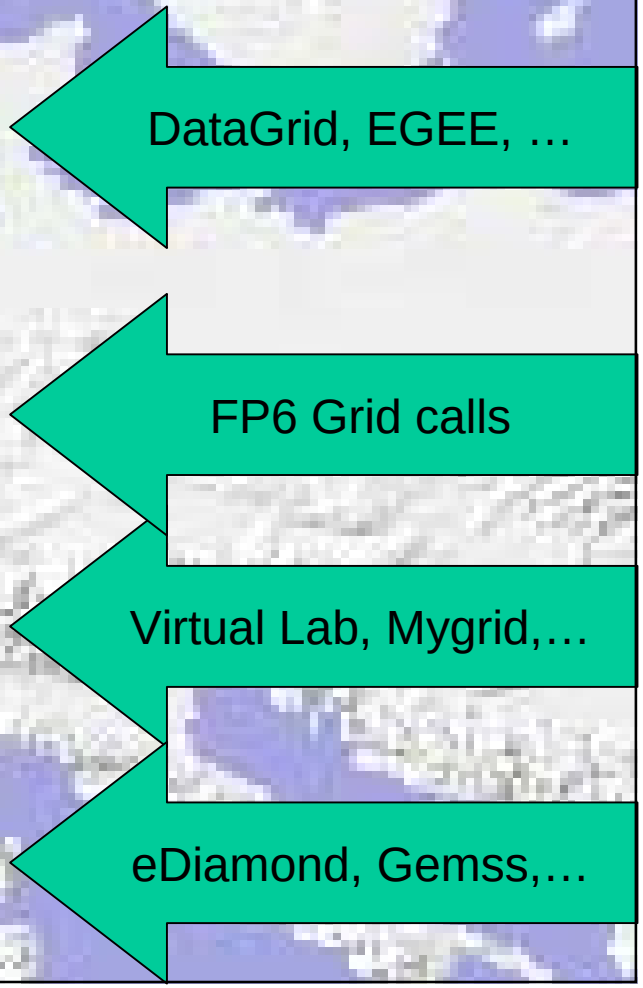
Computing centres

Healthcare administrations

Bio/medical informatics labs

What is required for a health grid ?

- GEANT and NRENs provide network infrastructure for research
- Grid infrastructure is under construction
  - Still hard to install a grid node
- Need to develop middleware
  - Security
  - Access to heterogeneous DB
- Need for high level user interfaces
- Need for pilot applications

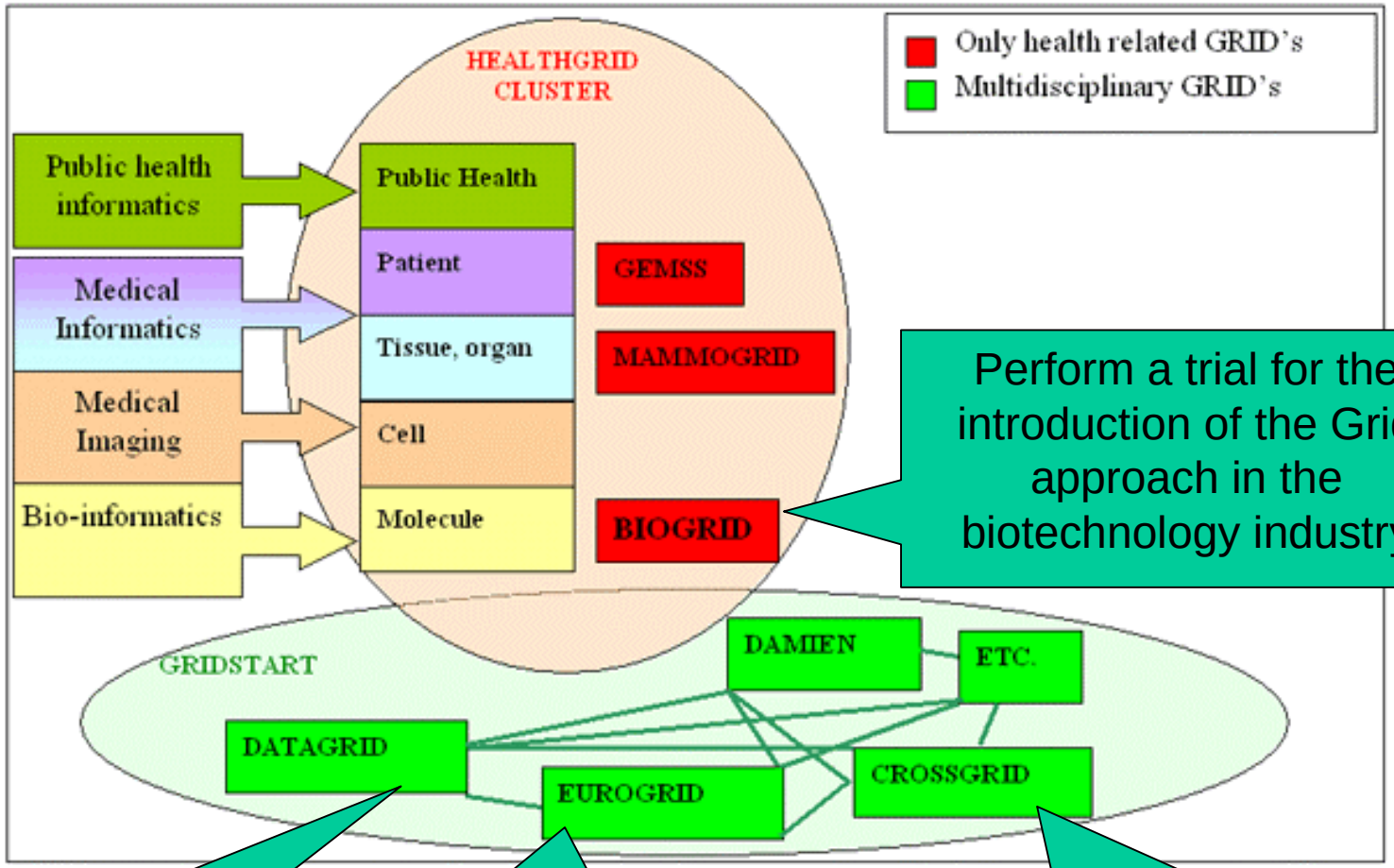


Health, a growing field of application for grid technology

- Multiplication of grid projects related to health in the last year in Europe, Asia/pacific and United States
- Every project is a piece of a large puzzle
- First initiatives to share/promote information/standards for life science/health grids
  - Healthgrid cluster of projects & association
  - GGF Life Sciences Research Group
  - Heaven/Bigger networks of excellence

1st HealthGrid Cluster Workshop – Brussels, 20th Sept. 2002

Initial Aim: to unite the EU-funded projects using GRID technology in health areas.



Perform a trial for the introduction of the Grid approach in the biotechnology industry

Biology & Medical Apps: Medical imaging

BioGrid Task: operate a Grid for biomolecular simulations

Computational Grid for "Virtual Arteries" Surgical support tool

DataGrid, prototype of a biomedical grid

- DataGrid is a european funded project
- DataGrid has three ambitious goals :
  - Develop a middleware
  - Deploy a testbed
  - Have large scale applications running on this testbed
- The biomedical work package faces three challenges
  - Make the middleware meet biomedical specific requirements
  - Run biomedical applications
  - Deploy grid nodes in biomedical laboratories

Biomedical technical requirements

Critical for development
Mid-term requirement
Long-term requirement

- **1. Large user community**
  - **anonymous/group login**
- **2. Data management**
  - **data updates and data versioning**
- **3. Security**
  - **disk / network encryption**
- **4. Limited response time**
  - **fast queues**
- **5. High priority jobs**
  - **privileged users**
- **6. Interactivity**
  - **communication between user interface and CE's**
- **7. Parallelization**
  - **MPI site-wide / grid-wide**
- **8. Pipeline processing**
  - **pipeline description language / scheduling**

Status of biomedical applications

- deployed
- tested on EDG
- under preparation

- Bio-informatics
  - **Phylogenetics : BBE Lyon (T. Sylvestre)**
  - **Search for primers : Centrale Paris (K. Kurata)**
  - **Statistical genetics : CNG Evry (N. Margetic)**
  - **Bio-informatics web portal : IBCP (C. Blanchet)**
  - **Parasitology : LBP Clermont, Univ B. Pascal (N. Jacq)**
  - **Data-mining on DNA chips : Karolinska (R. Médina, R. Martinez)**
  - **Geometrical protein comparison : Univ. Padova (C. Ferrari)**
- Medical imaging
  - **MR image simulation : CREATIS (H. Benoit-Cattin)**
  - **Medical data and metadata management : CREATIS (J. Montagnat)**
  - **Mammographies analysis ERIC/Lyon 2 (S. Miguet, T. Tweed)**
  - **Simulation platform for PET/SPECT based on Geant4 : GATE collaboration (L. Maigne)**

Grid-Enabled Medical Simulation Services
GEMSS

Main GEMSS Goals:

- Secure and lawful Grid provision of med. sim. services,
- Build 6 Grid-enabled med. prototype applications,
- Build suitable middleware on top of common standards,
- Install and evaluate a GEMSS test-bed,
- Anticipate privacy, security and other legal concerns related to providing medical services over the Internet.

GEMSS Test-bed Applications

Name	Domain	Class	Users
Maxillo-facial surgery simulation	Medicine – pre-surgical planning	Distributed supercomputing / On demand	Medical doctors, researchers
Neurosurgery support	Medicine – intra-operative planning	On demand	Medical doctors, researchers
Radiotherapy planning	Medicine – Monte Carlo treatment simulation	On demand / distributed supercomputing	Medical end-users; Doctors, researchers
Inhaled drud delivery planning	Medicine – air flow dynamics	On demand / distributed supercomputing	Medical end-users; Doctors, researchers
Cardio-vascular system simulation	Medicine – blood flow dynamics	On demand	Medical end-users; Doctors, researchers
Advanced image reconstruction	Medicine – nuclear / in vivo diagnostics	On demand	Medical end-users; Doctors, researchers

Summary

Status of Work:

GEMSS is about to finalise its design phase:

client-server arch. based on web services (OGSA-compliant).

Outlook: prototype system – Feb. 2004

final GEMSS system – Aug. 2004

Contribution to Standardisation:

GEMSS is assessing its involvement in GGF, IETF or W3C.

Final Strategy has yet to be decided.

To widen the impact of the healthgrid cluster, the Healthgrid association

HEALTHGRID

- To disseminate information on grids for health
  - Summaries and links to health related grid projects
  - Available tools (software platforms, middleware,…)
  - Tutorials
- To foster exchange between projects, end users and technology developers
  - To avoid reinventing the wheel
  - Through conferences
- To promote standards
  - Involvement in GGF Life Science Research group
- Open to any new member
  - Contact point : Y. Legrè (legre@clermont.in2p3.fr)
  - Web site : http://www.healthgrid.org

Scientific advisory Board :
H-C Hoppe (Pallas)
G. Lonsdale(NEC)
R. McClatchey(UWE)
V.B

Administration board :
C. Bessège
F. Hernandez (CNRS)
V. Hernandez (UPV)
N. Jacq (CNRS)
Y. Legrè (UA)
J. Leunissen (EMBnet)

Healthgrid conferences

- Jointly organised by CERN, CNRS and EMBnet with the support of the eHealth unit DG-INFSO
- Meeting point for actors of grids for health
  - End users = healthcare professionals / providers + academic & industrial researchers and developers from bio-informatics and medical-informatics
  - Grid applications developers
  - Technology developers
- First conference in Lyon (January 2003)
- Next conference in Clermont-Ferrand (January 2004)

Healthgrid conference, Jan 29-30 2004 (Clermont-Ferrand, France)

- Topics
  - middleware and infrastructures to build an healthgrid
  - needs and requirements from users community
  - results of existing pilots around Europe and the world
- Pharma community should participate actively (C. Jones in Steering committee)
- Web site : http://clermont2004.healthgrid.org

Other attempts to organize the community : networks of excellence

- HEAVEN : to pioneer a health grid
  - Submitted to IST call 1 (eHealth)
  - Partners : CNRS, CEA, CERN, DKFZ, EMBnet, EPCC, Geneva University Hospitals, IBM, INFN, Karolinska Institute, Moscow Telecommunication Centre, NEC C&C Research Laboratories, SIEMENS AG, Universidad Politecnica de Valencia (UPV)
- BIGGER : to grid-enable bioinformatics resources
  - Led by EBI
  - To be submitted to RTD call 2

GGF Life Science Grids Research Group

- Still in its infancy : first meeting at GGF7, second meeting at GGF8 (Seattle, last week)
- Mid term goals
  - Reference Architectures for Life Science Grids
  - Workflows
  - LSG requirements document
- Short term : identify life science grid projects in the world

Conclusion

- Health is a growing field of applications for grids
- But there is a long way to go from eScience to eHealth : technical, legal, ethical
- For grids to meet health specific needs
  - Specific requirements must be expressed (pharma)
  - Need for dissemination and tutorials
  - Need for dialog between technology developers and end users (prism)
  - Need for pilot applications
- Welcome to the Healthgrid association and Healthgrid conference (Jan 29-30 2004)

www.healthgrid.org

Healthcare daily practice

Hospital

Healthcare administration

Physician