eInfrastructures in the Mediterranean, Status and Perspectives

Federico Ruggieri - INFN
Sharing the knowledge across the Mediterranean (4)
- Chania, 8.04.2008

FP6_2004_Infrastructures_6-SSA-026024
Summary

- What are eInfrastructures?
- Grids
- EUMEDGRID and EUMEDCONNECT
- The policy commitments
- Future perspectives
Many vital challenges require community effort
- Fundamental properties of matter
- Genomics
- Climate change
- Medical diagnostics

Research is increasingly digital, with increasing amounts of data

Computation ever more demanding
  e.g.: experimental science uses ever more sophisticated sensors
  - Huge amounts of data
  - Serves user communities around the world
  - International collaborations
... Research Infrastructures are at the core of the knowledge Triangle
The European Vision

- The Research **Network infrastructure** provides fast interconnection and advanced services among Research and Education institutes of different countries’
  - Projects: GEANT, SEEREN, EUMEDCONNECT, etc.
- The Research **Grid infrastructure** provides a distributed environment for sharing computing power, storage, instruments and databases through the appropriate software (middleware) in order to solve complex application problems
  - Projects: EGEE, SEE-GRID, EUMEDGRID etc.
- This integrated networking & grid environment is called **electronic infrastructure (eInfrastructure)** allowing new methods of global collaborative research - often referred to as **electronic science (eScience)**
- The creation of the eInfrastructure is a key objective of the **European Research Area**
GRID is an Extension of Web Paradigm

**Web:** Uniform Access to Information and Documents

**Grid:** Flexible and High Performance access to (any kind of) resources

On-demand creation of powerful virtual computing and data systems
Computing Grid

10 Gbps Links

Tier1

Tier1

Tier1

Tier1

Tier2

Tier1

Tier1

Tier2

Tier1

Tier1

Tier1

Tier1

Tier1

Tier1

CERN - Tier0
A simple GRID Computing Farm

- Computing Element
- Wide Area Network
- Storage Element
- Worker Nodes
- Disks

CE
WN
WN
WN
 WN

SE
The Globalisation of Grid Infrastructures

EUMEDGRID

EGEE

Sharing the knowledge across the Mediterranean (4) – Chania 8 April 2008
Several projects and initiatives in the Mediterranean area

- EUMEDCONNECT – An EUMEDIS funded initiative for interconnecting National Research & Education (communication) Networks (NREN).
- SEEREEN, SEE-GRID – See pres. by Panagiotis Louridas
- EUMEDGRID co-funded by EC under FP6 to foster the creation of a pilot Grid Infrastructure in the Mediterranean to be connected to EGEE.
- LinkSCEEM - See pres. by Panagiotis Louridas
The Network in the Mediterranean

The NRENs in the Region are EUMEDGRID partners.

EUMEDGRID partners: ARN - Dz, GRNET - Gr, GARR - It, JUNET - Jo, CYNET - Cy, MARWAN - Ma, RED.ES - Es, IUCC - Il, TUBITAK - Tr, EUN - Eg, MARWAN - M. The NRENs in the Region are EUMEDGRID partners.
EUMEDGRID in just one slide

- Seek, identify, and support e-Science communities in the Mediterranean and deploy their applications
- Disseminate, both “bottom-up” and “top-down”, the e-Infrastructure paradigm for long term sustainability of e-Science
- Set-up and manage a Pilot Grid Infrastructure
- Train users and site administrators to use and operate an e-Infrastructure based on the EGEE middleware
Sharing the knowledge across the Mediterranean (4) – Chania 8 April 2008

Authentication Infrastructure in EUMEDGRID

- "catch-all" CA
- under review
- in preparation
The “spread” of Knowledge: geo-distribution of training events
So far, 24 EUMEDGRID sites have been deployed in 13 countries, giving a total of 575 connected Servers and about 84 TBs of storage capacity.
A large portfolio of applications

A large number of applications, in several fields has been already deployed on the Grid:

- Particle Physics and Astrophysics
- Earth Sciences: Simulation of seawater intrusion in the aquifers (CODESA-3D).
- Archaeological applications (ArchaeoGrid)
- Bio-Informatics and Biomedical applications (WISDOM, etc.)
- ... and many others.
Grid-enabled Subsurface Hydrology application in the Mediterranean area

- Sustainable management of groundwater exploitation using Monte Carlo simulation of seawater intrusion in the Korba aquifer (Tunisia).
- Seawater intrusion in the aquifer is a very severe problem in some of the coastal zones of the Med Area.
Input for static fields: Topography; Land water distribution; Vegetation Cover

MM5 package contains files of digital data related to the present situation. The first work has been the modification of these files with data from geology, paleobotanic and paleozoology, archaeology etc. for reconstructing the ancient environment, landcover and landuse.

Input for non-static fields: Sea-Surface Temperature; Initial and boundary conditions 3-dimensional fields of basic meteorological parameters such as temperature, wind and humidity.

Data used are available from paleoclimate simulation results written in a file format compatible with MM5 package.
First EUMEDGRID Grid School
(Cairo, Egypt, 17-28 April 2007)

- 9 applications selected, all “gridified”, several with a web interface based on GENIUS (biology, engineering, mathematics, physics, cognitive sciences, etc.)
- 80 nodes, 4 grid sites, 6 Mb/s connection installed in a hotel
### New Applications deployed during EGSAP-1

<table>
<thead>
<tr>
<th>Application</th>
<th>Scientific Domain</th>
<th>Country of proponent</th>
</tr>
</thead>
<tbody>
<tr>
<td>HERO</td>
<td>Bio-Informatics - uses BLAST to implement an algorithm that compares primary biological sequence information (amino-acid sequences of different proteins or the nucleotides of DNA sequences).</td>
<td>Egypt</td>
</tr>
<tr>
<td>GROGET</td>
<td>Engineering - simulation system for generating trajectories allowing a robot the goal seeking and collision avoidance</td>
<td>Morocco</td>
</tr>
<tr>
<td>PAREL</td>
<td>Mathematics - math simulation software</td>
<td>Tunisia</td>
</tr>
<tr>
<td>SimCommsys</td>
<td>Engineering - Monte Carlo simulation system for Error Control Coding in Communication Systems.</td>
<td>Malta</td>
</tr>
<tr>
<td>HuM2S</td>
<td>Bio-Informatics - agent-based complex systems modelling human memory.</td>
<td>Turkey</td>
</tr>
<tr>
<td>JP2_GRID</td>
<td>Engineering - JPEG2000 algorithm for compression of huge images (Gigabits)</td>
<td>Tunisia</td>
</tr>
<tr>
<td>MINSP</td>
<td>Theoretical Physics – String Theory</td>
<td>Syria</td>
</tr>
<tr>
<td>SACATRIGA</td>
<td>Engineering to study the thermal-hydraulic behaviour of Moroccan TRIGA MARK II research reactor.</td>
<td>Morocco</td>
</tr>
</tbody>
</table>
High Policy Event in Brussels

Policy agenda for e-Infrastructures in the Mediterranean Countries

EU-MED Event
Brussels 23-24 October 2007

Jointly organised by EUMEDGRID, EUMEDCONNECT and GEANT2

- More than 60 high level participants (Ministers, Politicians, EC Officers, Telecom Operators).
- High profile speakers (HRH Princess Sumaya of Jordan, Mr. Mashour Abudaka Minister, Palestine, Dr. Najib Abdul Wahed Deputy Minister of Higher Education for Scientific Research, Syria, etc.) and qualified participation of European Commission.
- Final panel expressed a strong support for the continuation of e-Infrastructures in the Mediterranean.
Combined effort of EUMEDGRID, EUMEDCONNECT and GEANT2

Distributed in the folder of the Ministerial event in Cairo.

Available on the Web in PDF format and on request to po@eumedgrid.eu (subject to limited availability)

EUROMED Ministerial Conference on the Information Society

»Building an Enabling Environment for the EUROMED Information Society«
Cairo 27 February 2008

14. The Ministers stressed the fundamental need to ensure interconnection of research networks to support, inter alia, the creation of grid-enabled scientific e-Infrastructures able to make ICT Research and Development cooperation between Europe and the Mediterranean countries more efficient; they recognised the fundamental role that EUMEDCONNECT played in interconnecting the National Research and Education Networks (NRENs) in the region and with Europe, enabling collaboration in multiple domains with high scientific and societal impact, and considered it essential to guarantee the sustainability and promotion of the initiative.
Perspectives (1) - Networking

- The Pan-Arab Network Study
- CAMREN Consortium
- A second phase of EUMEDCONNECT
- Network Access point (NAP) for the Arab States.
The study is based on the possibility of usage by the research and education community of a fibre network across the Mediterranean (MED-BELT) based on power lines. The estimated costs are between CAPEX 34-44M USD (depending on actual technology), OPEX: 3M USD per year in the two cases of acquiring the fibres or renting respectively. The plans were completed in November 2005, but have not yet been taken forward.
The Arab Mediterranean NRENs recognized the importance of a regional infrastructure and they realised the need for a consortium to establish a regional network, to support applications, e-services and to assist researchers in the region.

- These countries decided to establish the Consortium of Arab Mediterranean Research and Education Networks (CAMREN)
- The final Consortium agreement is expected to be signed in April 08
EUMEDCONNECT2

- EC EUMEDIS funding ended Dec 2007; MED partners keeping EUMEDCONNECT going to end Q2 2008,
- Tendering started for higher capacity, more cost effective EUMEDCONNECT2 infrastructure
- Active promotion for FP7 and other research projects such as tele-medicine and environmental applications.
- CAMREN is intending to support it and NRENs contribution is around 50% of the cost.
- EC is currently planning a 18 months further funding support.
- Medium-Longer term sustainability plans have to be developed during the course of the project.
This initiative aims at providing access points to connect Arab internet networks such that traffic between Arab countries passes through those points. Information sent to destinations outside the Arab region passes through those points. The backbone for the NAP initiative will be based on optical fibre cable interconnecting all NAPs.

Logical layout for Arab NAPs
Perspectives (2) – EU Calls


- Call 4 (call identifier: FP7-INFRASTRUCTURES-2008-2)- INFRA-2008-1.2.2: Scientific Data Infrastructure, will be open on 6 May 2008.

- Call 5 - INFRA-2009-1.2.x - ICT based e-Infrastructures (grid infrastructures, virtual research communities)
Perspective (3) - Ideas

- Extend the successful experience of EUMEDGRID to sub-Saharan Africa and to other countries (DREAM).
- Train and disseminate (EPIKH) – see P. Louridas
- Propose not only Computing and Data Grids but also an e-Infrastructure for sensors in Earth Science, Agriculture, Climatology, Water Management, Meteorology, Civil Protection.
- Build upon new communities: Archaeology, Vulcanology, Climate change for: data collection and repositories, development of cross-disciplinary tools and applications.
Definition of a Roadmap for an e-Infrastructure in Africa and the Middle-east

Coordinated by

Mario Reale  GARR  Italy
mario.reale@garr.it
DREAM is a project proposed under the EU FP7 Call
- FP7-INFRASTRUCTURES-2008-1 / INFRA-2008-3.2 Coordination & Support Action
- Its main scope is in delivering policy definition and dissemination on e-Infrastructures in the Mediterranean and in Africa
- It builds on the experience and achievements of EUMEDGRID. Benefits from its
  - pilot Grid infrastructure, to be expanded in capacity and geographical coverage
  - human network spanning all the Mediterranean
- Proposed Total Budget around 1.7 Million Euros
  - 1 Million requested EU contribution for 2 years
- It’s a consortium of 12 partners:
  - GARR, CERIST, CNRS, CYNET, EUN, GRNET, HIAST, INFN, IUGAZA, JUNET, UoM, UT
DREAM goals

- Promote e-Infrastructures in the Mediterranean countries and sub-Saharan Africa
- Perform a global survey on existing and emerging eInfrastructures in the Med Countries and Sub-Saharan Africa
- Define a global roadmap towards e-Science providing a set of recommendations to NRENs, NGIs, Governmental bodies, Funding Agencies, Industries
- Support emerging NGIs and CAs at the policy level
- Set up a Tutorial road-show on Grids and e-Infrastructures for system administrators and end-users
- Enlarge the demand and the offer of e-Science for research
  - Increasing awareness on its benefits
  - Easing the access to e-Science in these countries
- Define a roadmap for a sustainable e-Infrastructure for the next few years.
- Implement selected e-Science support actions in Africa.
The Mediterranean Network (MedNet) is a network of broadband seismic stations installed in the Countries surrounding the Mediterranean Sea and maintained by INGV (IT) in cooperation with many geophysical institutes.
Conclusions

- e-Infrastructures are fundamental for long term development and to mitigate phenomena like: the Digital Divide and the Brain Drain.
- The development of countries needs to be supported by e-Infrastructures to rapidly close the gap with the more advanced regions.
- EUMEDGRID and EUMEDCONNECT created e-Infrastructures and a “human network” across the Mediterranean.
- They promoted (and are still fostering) the creation of NRENs and NGIs as building blocks for such e-Infrastructures.
- A first step forward has been made towards the creation of Mediterranean e-Infrastructures for e-Science.
- Further steps are:
  - Extension of this fruitful experience to other countries and specifically to the sub-Saharan countries.
  - Consolidation of the e-Infrastructure with medium and long-term sustainability.
Thank You!

Fondation Partager le Savoir
Sharing Knowledge Foundation

FP6_2004_Infrastructures_6-SSA-026024