3rd EGEE User Forum

Clermont Ferrand, France, February 13, 2008

contract no. : 031891

RINGrid: conceptual design of the remote instrumentation systems

RINGrid

REMOTE INSTRUMENTATION IN NEXT-GENRATION GRIDS

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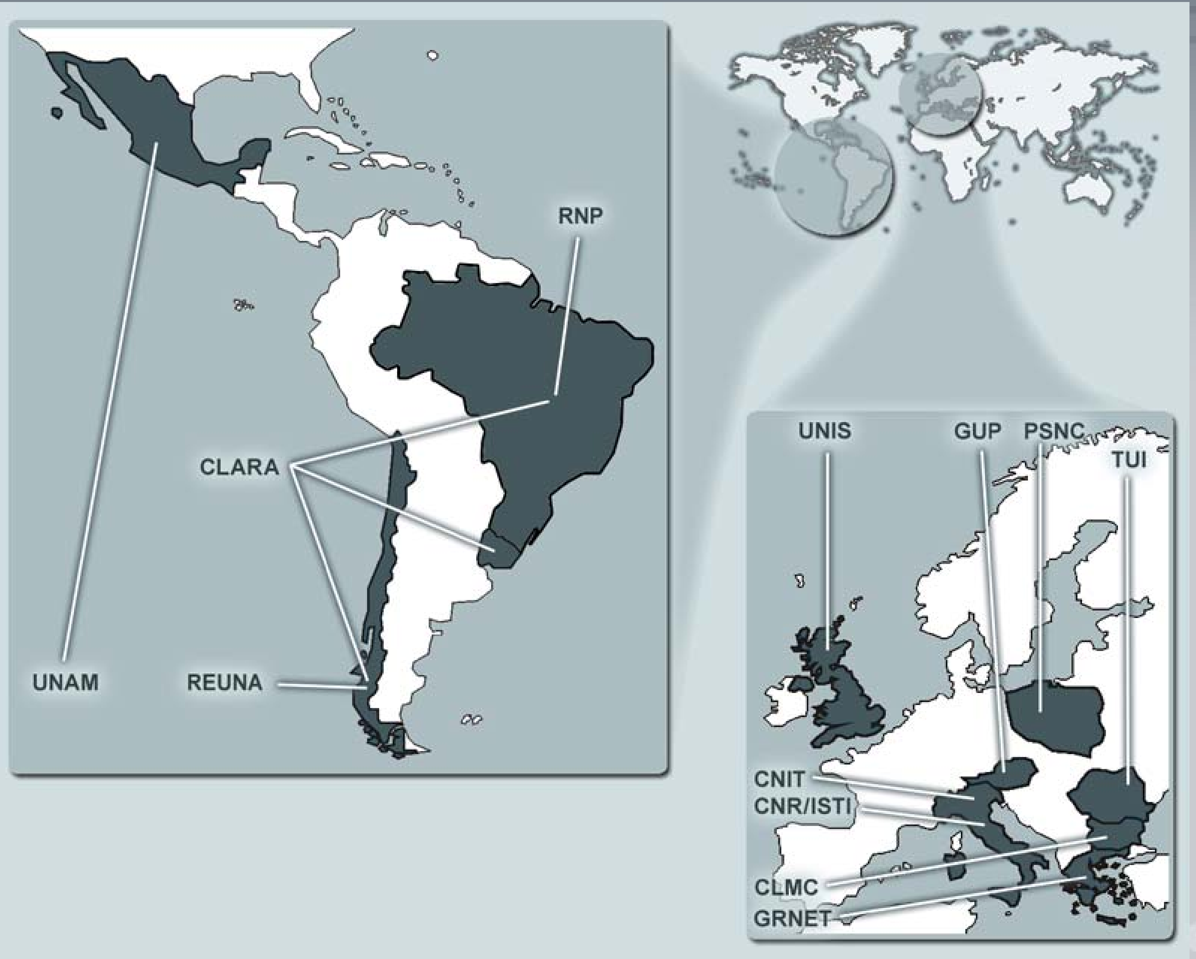
http://www.ringrid.eu/

RINGrid - overview

- **RINGrid stands for *Remote Instrumentation in Next-generation Grids***
- **Call: FP6-2005-Infrastructures-7**
- **Specific Support Action**
- **Contract no. 031891**
- **Duration: 18 months, from October 2006 – March 2008**
- **Main goal: conceptual design in remote instrumentation**

Participants

- PSNC, Poland
- JKU, Austria
- GRNET, Greece
- CLMC, Bulgaria
- TUI, Romania
- UNAM, Mexico
- CLARA, Uruguay
- CNIT, Italy
- CNR, Italy
- UNIS, UK
- RNP, Brazil
- REUNA, Chile



- Wide spectrum of instruments and different attitudes to measurement conducting

Objectives

- Identification of instruments and user communities, definition of requirements
- Synergy between remote instrumentation and next-generation high-speed communications networks and grid infrastructures
- Trend analysis and recommendations for designing next-generation remote instrumentation services
- Promoting egalitarian access to European e-Infrastructure opportunities
- Dissemination of project results to scientific and business groups of users
- Collaboration with other projects e.g. GridCC, EXPReS, int.eu.grid, EGEE and groups e.g. e-IRG, OGF

Division of work

WP1 - Project management

WP2 - Identification of instruments and user communities, definition of requirements

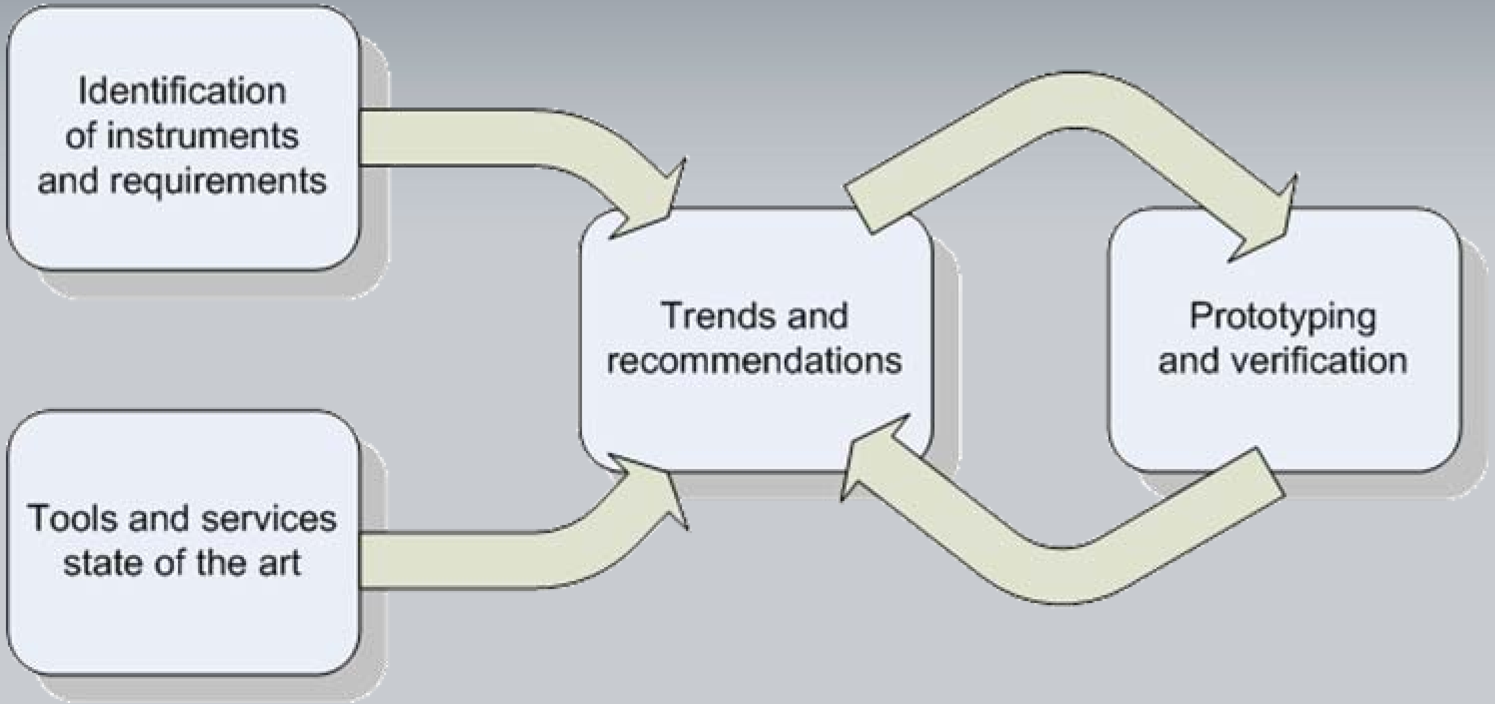
WP3 - Evaluation and requirements for infrastructures

WP4 - Future emerging trends and recommendations

WP5 - Dissemination, standardisation and cooperation with other projects

WP6 - Prototyping and verification

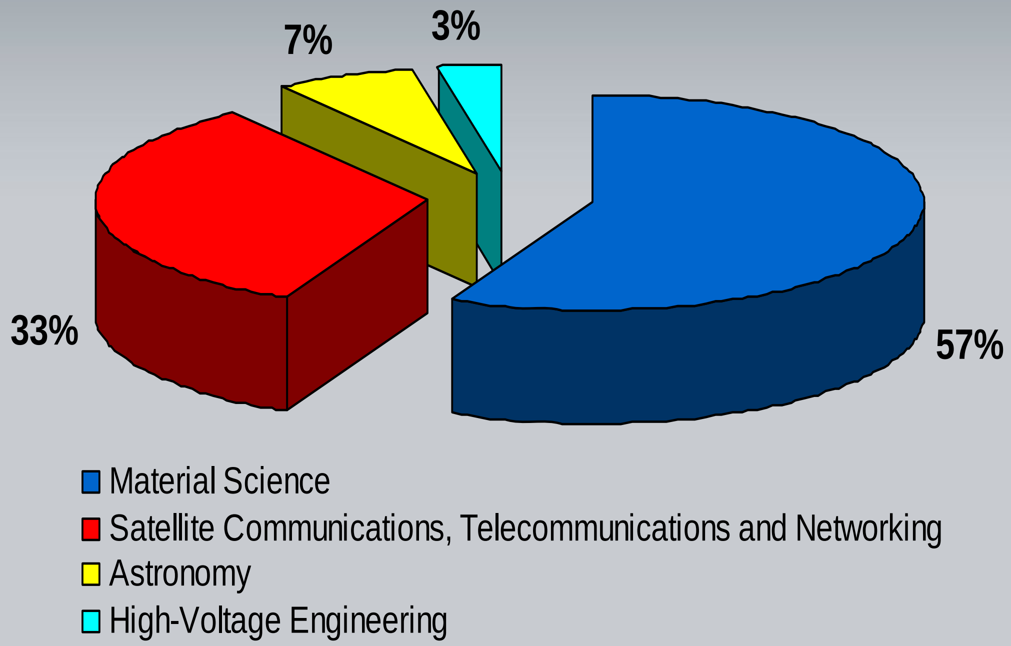
Analysis flow



Identification

The systematized and analyzed information about measurement procedures, technical specifications of instruments, services and possibilities for remote access

- Technical parameters about remote accessibility of instrumentations
- Users requirements in different scientific areas



Examples of identified infrastructure (1)

- **Europe**: bioorganic chemistry, radio astronomy, spectroscopy, satellite communication, telecommunication, high-voltage engineering, environment quality assessment and pollution control
- **Latin America**: material science, laser scan microscopy, diffractometer, food processing

  - *Poland*

Scientific field:	**Biooganic Chemistry**
Equipment	Varian UNITY 300MHz NMR spectrometer
	BRUKER AVANCE 600MHz NMR spectrometer
Scientific field:	**Radio Astronomy**
Equipment	32m Radio Telescope in Piwnice, Poland

Examples of Identified infrastructure (2)

- *Brazil*

Scientific field:	Material Science at LNLS www.lnls.br
Equipment	Synchrotron Light Source – 11 beam lines
	JEOL High Resolution Transmission Electron Microscope (HR-EM), model JEM 3010 URP
	JEOL Field Emission Scanning Electron Microscope (FEG-SEM), model JSM-6330F
	JEOL Low Vacuum Scanning Electron Microscope (LV-SEM), model JSM-5900LV
Scientific field:	**Optical Astronomy at LNA www.soartelescope.org**
Equipment	4.1 m optical telescope at Southern Astrophysical Research Telescope (SOAR), Cerro Pachón, Chile

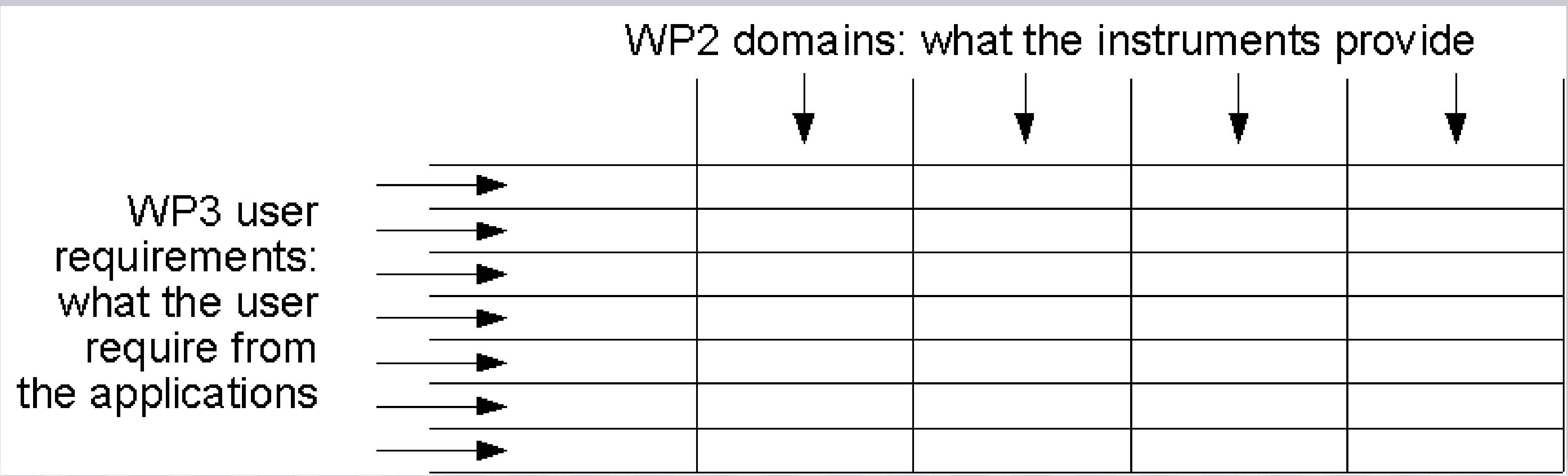
Full list available on the RINGrid project web site

Technical analysis

- Evaluation of existing network/grid infrastructures for RI
- Analysis of scientific instrument requirements with respect to
  - research network infrastructure
  - state of the art of grid middleware
- Definition of technical requirements for RI systems
- Information system with results accessible via web

Requirements vs. capabilities

- How user requirements and technical possibilities deal with science domains?



Initial conclusions (1)

- Many instruments are not so demanding as can be expected
- Scientific devices are usually not integrated with grid environment
- RI data storage and collaboration tools are poorly integrated with middleware architecture
- Visualisation tools which controls instruments via grid need further development
- **Qos Issues**
  - Grid and Networking technologies are sufficiently mature to support QoS-enabled workflows over networks that allow to set-up Bandwith-On-Demand VCs
  - Cross-layer Interaction between Grid and Network QoS is still an open issue
  - Resource discovery may be driven by the status of the underlying network and Grid middleware should be used to negotiate end-to-end QoS

Initial conclusions (2)

- User interactivity must support
  - Collaborative tools for user-to-user, user-to-operator and user-to-system administrator cooperation
  - Reliable synchronization services for metrological applications that require calibration and measurement
- Virtualization of scientific instrumentation
  - Invoke a uniform WS vs. a customized WS and methods
- User Mobility and Wireless Networks can be the basis for relevant breakthrough concerning data acquisition and user service delivery
- Grid middleware and networking technologies seem to be sufficiently mature for the widespread deployment of IPv6.

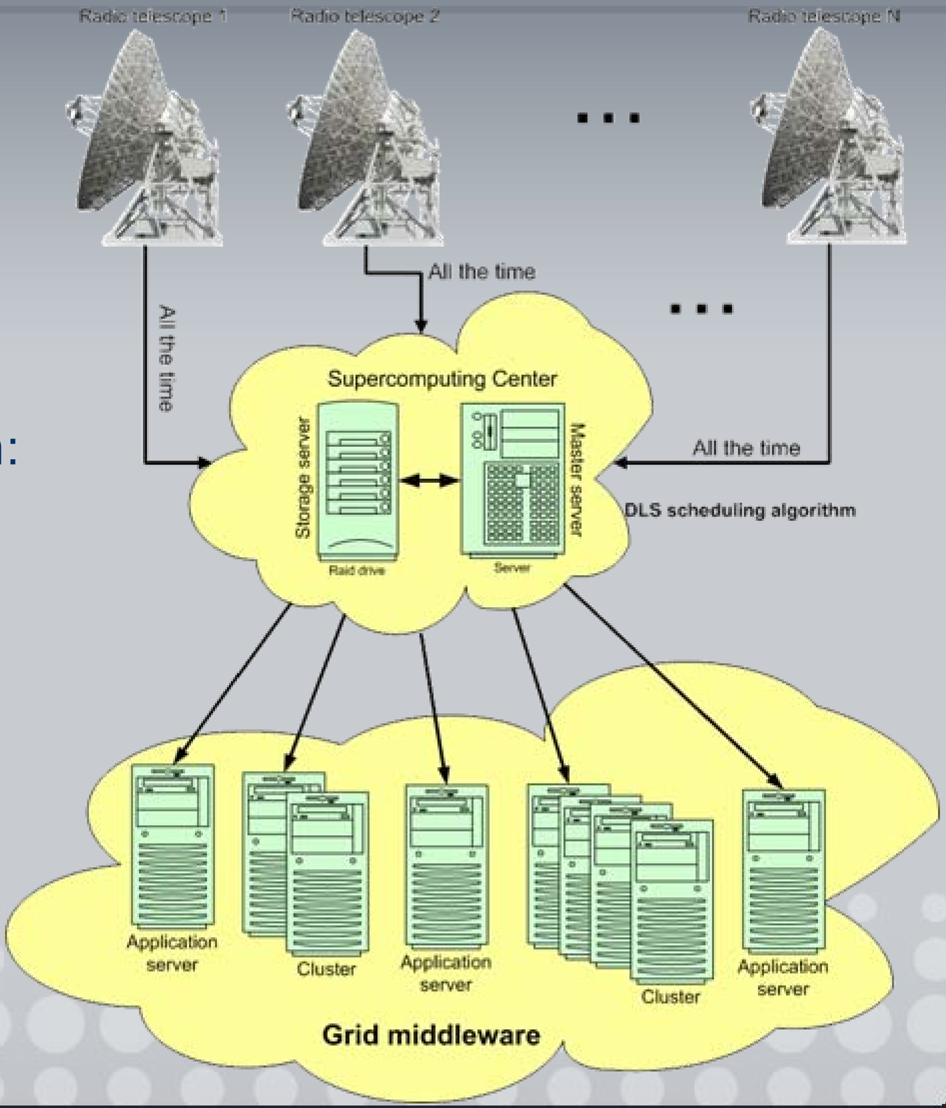
Recommendations and guidelines (1)

- Workflows – instrument oriented
  - User-level – no computer skills needed, browse the distributed laboratory space and find the instrumental resources that are most appropriate to solve the user's problem
  - Middleware level – automation in workflow processing: input/out data transfer, application launching etc.
- Methods of translation of the user's description of the experiment into a description language
- Work on simple and intuitive service composition, experiment description languages, non-functional QoS description, easy to manage GUIs
- Definition of suitable ontologies, and a hierarchical description, in terms of successive aggregations of related objects

Recommendations and guidelines (2)

Network

- Bandwidth-on-Demand (BoD)
  - Automatic, on-line
  - Only for experiment duration
- Need for especially in eVLBI system:
  - 4 tel. – 128 Mb/s
  - 10 tel. – 512 Mb/s
  - 16 tel. – 1 Gb/s
  - 32 tel. – 4 Gb/s



Recommendations and guidelines (3)

- IPv6 implementation in RIS systems - relieve the addressing and NAT problems related with a potentially huge amount of manageable entities constituted by small instruments, or by large-scale instruments composed by a myriad of smaller addressable parts.
- SIP protocol using to p2p interaction of instruments - set up a distributed, self-organized network of laboratories and end-devices
- Information Services could be used for frequent distributing real-time experimental data. Usual mechanisms are adequate for huge and relatively not so frequent transfers

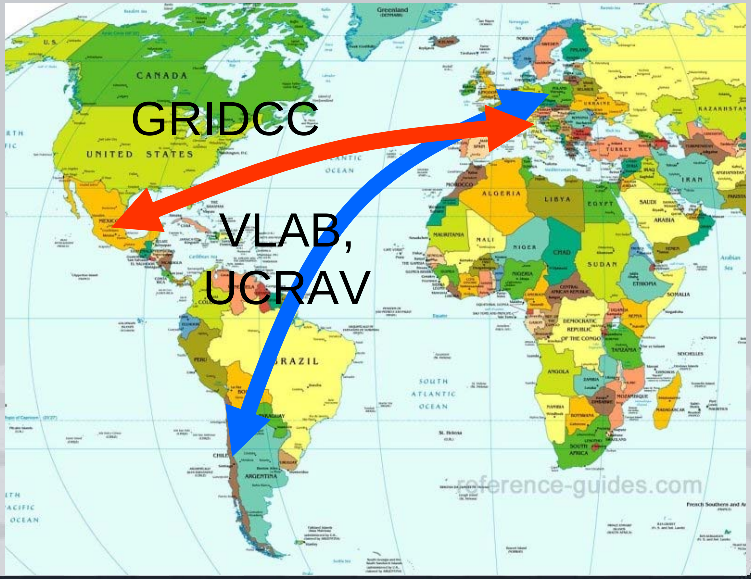
Verification & prototype

Testbeds:

- PSNC Virtual Laboratory (http://vlab.psnc.pl/)
- GridCC (www.gridcc.org)
- CLARA (www.redclara.net)

Objectives:

- Specification and working out of 'use cases', which match the profile of requirements set by the previous work packages
- Preparation of prototype installations
- Execution of tests and collection of remarks concerning results achieved and user experiences, documenting all relevant information in a formal report
- Analysis of the verification process results and production of a coherent list of recommendations for instrumentation grid infrastructures



White paper

- The final project results will be summarized in one document
- Guidelines for remote instrumentation systems developers
- The document will be sent to cooperating instututes interested in remote instrumentation
- Paper can be accessible after project finish

RISGE

- **Remote Instrumentation Services in Grid Environment (RISGE)**

  - OGF research group established by RINGrid project and cooperating institutes/projects: GridCC, int.eu.grid, Edutain@Grid, g-Eclipse, DEGREE, BalticGrid, VLab, etc.
  - Objectives consistent with RINGrid
  - Ringrid outcome especially white paper will be taken into account during standardization work

Thank you for your attention!

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www.ringrid.eu