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A statement on Remote Instrumentation Services

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What are Remote Instrumentation Services (RIS) and why should they be deployed in the Future Internet?

Access, configuration, monitoring, control and management of remote laboratory instrumentation gained growing interest with the development of the so-called e-Science. Remotely controlling a device, sending commands and acquiring measurements is not new - it has been done and it is being done in a whole range of different applications. However, a *Remote Instrumentation Service* is more than this:

- It should provide a set of standard capabilities to perform whatever functionality may be required;
- It should construct suitable *abstractions* of the remote instrumentation, in order to make it visible as a manageable resource;
- It should present the user standard interfaces, and allow browsing the "distributed laboratory space", choose different pieces of equipment, configure their interconnection, orchestrate experiment executions, collect, process and analyze the results, and make them available to the scientific community through experiment data repositories, organized as Digital Libraries.

In order to accomplish such tasks to a full extent, instruments should become full class members of a Service Oriented Architecture (SOA), much in the same way as computing and storage devices are. Test sites should be developed, providing: i) isolation from and relative independence of the underlying networking infrastructure; ii) tools for resource allocation and management; iii) standard user interfaces; iv) non-trivial Quality of Service (QoS) control and QoS-aware workflows; v) integration in Grid and peer-to-peer (p2p) overlays. All this can be put in perspective within the framework of the Open Grid Services Architecture (OGSA), by enhancing existing service capabilities.

The RIS Networking Scenario

The networking part of RIS testbeds needs to:

- Recognize the presence of multiple networks in the transport and access area, and their impact on QoS;
- Provide Bandwidth-on-Demand (BoD), or, in general, the dynamic creation and management of circuit-switched connectivity over datagram networks (e.g., via GMPLS in the control plane) for bandwidth-demanding instrumentation (e.g., in e-VLBI, large-scale physics experiments, etc.);
- Capitalize on IPv6;
- Be open to mobility management (traveling standards, data acquisition, services to the mobile user);
- Enhance the role of sensor networks as large-scale data acquisition devices and of satellite links for aggregate (sink level) data collection from harsh or uneasily accessible areas;
- Allow flexible cross-layer or cross-domain (service / networking / infrastructure) interaction.

Liaisons

A number of European projects in the e-Infrastructure area (Capacities Program in FP7) have been and are currently dedicated to RIS

- GRIDCC (Grid Enabled Remote Instrumentation with Distributed Control and Computation) - FP6 - *ended 2007* - http://www.gridcc.org
- RINGrid (Remote Instrumentation in Grid Environment) - FP6 - *ended 2008* - http://www.ringrid.eu
- DORII (Deployment of Remote Instrumentation Infrastructure) - FP7 - *ongoing* - http://www.dorii.eu

A standardization group has been created (Remote Instrumentation Services in Grid Environment - RISGE) in the framework of the Open Grid Forum (OGF). See http://forge.gridforum.org/sf/projects/risge-rg for details and use cases.