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**Deliverable D4.2**

“Report on the applicability of the preliminary results of the organisational study”

Version 1

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Abstract:
This deliverable presents the status of the pilot to demonstrate the applicability of the preliminary results of T4.1 work. The activity involves different regional situations but with a common basis of gLite installation. The follow-up activity is also presented.
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1. Executive Summary

The CHAIN project has worked to involve Virtual Research Communities to explore the use of different regional eInfrastructures by intercontinental communities wishing to cooperate and use common infrastructures and applications in a truly shared environment.

An increasing number of VRCs is showing interest in the collaboration with CHAIN and the initial shortlist of VRCs that have signed a MoU has been enlarged to the following communities: We-NMR and jModelTest (Biology), WRF4G (Weather Forecasting), LSGC (Health), DC-NET/INDICATE (Digital Cultural Heritage).

Other communities have been also contacted and showed their interest.

On the basis of the survey performed in the first year and of the contacts with the VRCs an analysis of the requirements and a roadmap have been prepared and a preliminary roadmap has been proposed for interoperability. It is based on a long term interoperability plan based on standards and on a short term interoperability at Application Level based on Science Gateways.

Science Gateways have been proposed by CHAIN in agreement with other regional projects (e.g. EUMEDGRID-Support and GISELA) and have been adopted in VRC specific project such as DECIDE and INDICATE.

A concrete plan of testing this approach has been prepared and an initial test has been performed initially limited to gLite based regional infrastructures with a further extension to Unicore sites.

The MyJobMap tool, recently made available in the Science Gateway, allows to have a geographical view on where the jobs, launched by the SG on behalf of the user, are currently running.

The test will include new types of regional Grid infrastructures as soon as the JSAGA plug-in is ready for that specific middleware.

The final test/demo will be made at the next EGI Technical Forum in Prague in September 2012.

The demo could possibly be replicated and/or extended in other conferences and workshops before the end of the project (30 November 2012).
2. Introduction
The regions addressed have been selected on the basis of the activities performed in the last six years by projects co-funded by the EC: SEE-GRID and SEEGRID-SCI (South East Europe), EELA, EELA2 and GISELA (Latin America and Caribbean), EUMEDGRID and EUMEDGRID-Support (North Africa and Middle-East), EUChinaGRID (China), EUIndiaGrid and EU-IndiaGrid2 (India), and EUAsiaGrid (Asia-Pacific). In all the regions the European experience and best practices were “exported” and studies of interoperation and interoperability were supported. The common basis is thus the existence of gLite based installations and this is the starting point of the pilot proposed by the CHAIN Project.

2.1. Purpose
The purpose of this deliverable is to provide a preliminary view of the activity performed by the project to demonstrate the applicability of the preliminary results of T4.1 work.

2.2. Terminology glossary
This subsection provides the definitions of terms, acronyms, and abbreviations required to properly interpret this document.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ALICE</td>
<td>A particle physics experiment at the Large Hadron Collider at CERN</td>
</tr>
<tr>
<td>APGI</td>
<td>Asia/Pacific Grid Initiative</td>
</tr>
<tr>
<td>APAN</td>
<td>Asia Pacific Academic Network</td>
</tr>
<tr>
<td>ASGC</td>
<td>Academia Sinica Grid Computing centre</td>
</tr>
<tr>
<td>ASREN</td>
<td>Arab States Research and Education Network Organisation</td>
</tr>
<tr>
<td>ATLAS</td>
<td>A particle physics experiment at the Large Hadron Collider at CERN</td>
</tr>
<tr>
<td>CHAIN</td>
<td>Co-ordination and Harmonisation of Advanced e-Infrastructures</td>
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<tr>
<td>CLARA</td>
<td>Cooperacion Latino-Americana de Redes Avanzadas; Coordinator of Latin America NRENs</td>
</tr>
<tr>
<td>CMS</td>
<td>A particle physics experiment at the Large Hadron Collider at CERN</td>
</tr>
<tr>
<td>CNGrid</td>
<td>China National Grid</td>
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<tr>
<td>EELA</td>
<td>E-science grid facility for Europe and Latin America</td>
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<td>EELA-2</td>
<td>E-science grid facility for Europe and Latin America 2</td>
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<tr>
<td>EGI</td>
<td>European Grid Initiative</td>
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<tr>
<td>EGI-InSPIRE</td>
<td>European Grid Initiative-Integrated Sustained Pan-European Infrastructure</td>
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<td>EUAsiaGrid</td>
<td><a href="https://www.euasiagrid.org/">https://www.euasiagrid.org/</a></td>
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<tr>
<td>EUChinaGRID</td>
<td>Interconnection &amp; Interoperability of Grids between Europe &amp; China</td>
</tr>
<tr>
<td>EUIndiaGrid</td>
<td>Sustaining and enabling interoperability between Europe and India</td>
</tr>
<tr>
<td>EUMEDGRID</td>
<td>Sustainability of e-Infrastructures across the Mediterranean</td>
</tr>
<tr>
<td>FTS</td>
<td>File Transfer System</td>
</tr>
<tr>
<td>GISELA</td>
<td>Grid Initiatives for e-Science virtual communities in Europe and Latin America</td>
</tr>
<tr>
<td>HEP</td>
<td>High Energy Physics</td>
</tr>
<tr>
<td>LHCB</td>
<td>A particle physics experiment at the Large Hadron Collider at CERN</td>
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<tr>
<td>LHC</td>
<td>Large Hadron Collider</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>NREN</td>
<td>National Research and Education Network</td>
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<tr>
<td>ROC</td>
<td>Regional Operation Centre</td>
</tr>
<tr>
<td>SLA</td>
<td>Service Level Agreement</td>
</tr>
<tr>
<td>TEIN</td>
<td>Trans-Euraisa Information Network</td>
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<td>UbuntuNet</td>
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<tr>
<td>WLCG</td>
<td>Worldwide LHC Computing Grid</td>
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3. The general plan

The activity started with the data collected through the questionnaire published by the project. This questionnaire (see Deliverable D2.1 at http://www.chain-project.eu), published in spring 2011 intended to gather updated information on the National and Regional Grid Infrastructures in several continents. The regions addressed cover the whole world except developed countries and regions like EU, Russia, North America (USA and Canada), Oceania and Japan. The work continued with the analysis on the data obtained from the survey and from other sources and summarised in a deliverable on the “Specificities of the various regional e-Infrastructures” (D4.1). A list of recommendations was also produced and exposed the deliverable “Interoperability and interoperation guidelines” (D2.2). The findings of these activities performed in the context of the work-packages 2 and 4 were then matched with the requirements exposed by the Virtual Research Communities (VRC) that were contacted by the CHAIN project (WP3), participated to the workshops organised (WP5) and, in some cases, signed a MoU defining the collaboration framework between them and CHAIN. The VRC requirements have been analysed and a roadmap has been exposed in the deliverable “Road-map of trans-continental e-infrastructures for virtual communities” (D3.2). The general picture that emerged from these activities has produced a preliminary vision of the current situation and of the possible strategies for the future evolution. A series of actions that could be undertaken has also been derived from this vision.

The main points that constitute the basis of the current study are the following:

1. Clear need for a large and active users base community as one of the basic pillars for sustainability
2. Governmental support with some committed resources
3. Skilled community of site and resources administrators
4. e-Infrastructure operations management tools possibly integrated with user support system in a Regional Operation Centre
5. Regional organisation(s) supporting the synergies and coordination of the national initiatives

In the following subchapters the current activities and main directions are detailed for all these aspects.

3.1. The Science Gateway approach

The study performed so far with the cooperation of other eInfrastructure projects has made evident that one of the fundamental issues related to the general diffusion of Distributed Computing Infrastructures (DCI) and their sustainability is related to the enlargement of the basis of users. The proposed approach to solve the problems and overcome the obstacles that make difficult the uptake of e-Infrastructures has been centred on the development of Science Gateways.

The framework for Science Gateways proposed and fostered by CHAIN is fully web-based and adopts official worldwide standards and protocols, through their most common implementations (see following sub-chapter 4.5).

The Science Gateway is supposed to provide also a short term answer to Interoperability when several different e-Infrastructures have to cooperate in order to fulfil the requirements of intercontinental VRCs.

Let’s thus introduce the concept of Interoperability as it is defined in Wikipedia. “Interoperability is a property referring to the ability of diverse systems and organizations to work together (inter-operate). The term is often used in a technical systems engineering sense,
or alternatively in a broad sense, taking into account social, political, and organizational factors that impact system to system performance”. Moreover, according to ISO/IEC 2382-01 (Information Technology Vocabulary, Fundamental Terms), interoperability is defined as follows: "The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units”.

**Figure 1 - The Science Gateway architecture**

The deployment of Science Gateways is thus in line with previous definitions and suggests a simple approach to attack the interoperability issues in very short time. The CHAIN project has thus planned to use the Science Gateways and a detailed description of the architecture and implementation is give in the sub-chapter 4.5. The architecture was thus best specified into a series of components that will constitute the basic parts of a general Science Gateway interoperable with several e-Infrastructures. The architecture has been implemented by the INFN group in Catania and adopted by two projects: EUMEDGRID-Support and GISELA.

### 3.2. Accessibility

One of the key elements of the Science Gateway is the authentication through Federations of Identity Providers (IDP). The use of IDPs facilitates the registration of new users and allows making indispensable the use of personal Grid digital certificate. The authorisation is managed through a local LDAP repository that attaches privileges to the different users according to their roles and VRC. The job submission is made by using robot digital certificates and keeping a log of all the transactions related to all the users.

### 3.3. Regional Operation Centres

Capability to submit jobs to several e-Infrastructures does also imply that these e-Infrastructures should also interoperate. The CHAIN project has provided recommendations to follow the path towards ROCs.
ROC stands for Regional Operations Centre and it ensures that NGIs and their site administrators are co-ordinately involved in the provisioning of the global infrastructure. It provides:

- Overall user and site administrator support through a dedicated regional support portal and trouble ticketing system;
- Tools for monitoring the regional infrastructure and its performance;
- Coordinated actions with other external bodies or Grid organizations to act as a consistent, reliable and homogeneous Resource Infrastructure Provider.

Africa & Arabia ROC has been gradually set up and organized in its core support functions for newly born Grid sites and site administrators in Africa and the Arabian Peninsula, and it has been provided by a joint effort from four projects: EUMEDGRID-Support, CHAIN, SAGrid, and EPIKH.

The most important services offered by the Africa & Arabia ROC are: Nagios to perform tests of the infrastructure, the Grid Operation Centre DataBase (GOCDBO) that collects information about the grid sites and their related services and the user support system based on XGUS that manages user tickets. Nagios, the GOCDB and the support system are integrated in the Dashboard that completes the suite of the infrastructure monitors. Although these services provide a different functionality to the end users, they have an important thing in common. All these services are provided by the same software packages used by the European Grid Infrastructure (EGI). The use of the same tools adopted by EGI has a big importance in terms of sustainability of the services themselves since patches, software changes and expertise on these tools can be easily managed rather than adopting proprietary and customized solutions. Another key point on adopting standard services is that Africa & Arabia ROC sites can eventually join the European infrastructure in a very easy way since they are using the same software packages and their users are used to work with the same tools.

After the successful operations set up by Africa & Arabia ROC, the installation has been cloned in China ROC for a similar portal supporting the Chinese community.
In the first step, where only gLite based e-Infrastructures were involved, the availability of a consistent and homogeneous structure of ROCs has greatly simplified the initial speed-up of having running Science Gateways in the EUMEDGRID-Support and GISELA portals.

3.4. The Virtual Research Communities involved

The process of contacting and analysing the requirements of the Virtual Research Communities has been already described in the Deliverable D3.2 “Road-map of transcontinental e-infrastructures for virtual communities”. Here we update the information of that deliverable with the most recent agreements signed.

At the date of this document the following VRCs have signed a MoU for collaborating with CHAIN:

- **We-NMR** (http://www.wenmr.eu/) is a project which aims to optimize and extend the use of the NMR and SAXS research infrastructures through the implementation of an e-Infrastructure in order to provide the user community with a platform integrating and streamlining the computational approaches necessary for NMR (Nuclear Magnetic Resonance) and SAXS (Small Angle X-ray Scattering) data analysis and structural modelling.

- **WRF4G** (http://www.meteo.unican.es/es/software/wrf4g) is a Grid version of the well-known Weather Research and Forecasting (WRF) modelling system application. It is widely used by the meteorological agencies and many other groups in the Earth Science domain.

- **jModelTest/ProtTest** are two applications that belong to the Life Sciences domain and, in particular, to the Evolutionary Biology. Both are freely available on-line (http://darwin.uvigo.es/) for the statistical selection of best-fit models of nucleotide substitution (jModelTest) and amino-acid (ProtTest3) replacement for a given set of aligned sequences.

- **LSGC** (http://wiki.healthgrid.org/LSVRC:Index), the Life-Science Grid Community initiative has as main goal to serve the European Life Sciences community in its exploitation of the grid.

- **DC-NET/INDICATE** (http://www.indicate-project.eu and http://www.dc-net.org) are working on coordinating policy and best practices regarding the use of e-Infrastructures for Digital Cultural Heritage. The projects aim at establishing and stimulating a network of common interest made up of experts and researchers in all the...
relevant fields, whose sustainability will be planned on a long term beyond the project lifetimes.

The following list of communities and projects have also been contacted.

- **DECIDE** (http://www.eu-decide.eu/) objective is to design, implement, and validate a Grid-based e-Infrastructure building upon neuGRID and relying on the Pan-European backbone GEANT and the NREN. Over this e-Infrastructure, a service will be provided for the computer-aided extraction of diagnostic markers for Alzheimer's disease and schizophrenia from medical images.
- **SuperB** will be a heavy flavour factory that will provide complementary information to LHC, looking at rare decays with a very high luminosity electron-positron asymmetric collider (http://superb.infn.it/)
- **agINFRA** aims at deploying an open infrastructure for the sharing of digital agricultural content, including in the infrastructure resources ranging from raw observational and experimental data through to publications. It also promotes the sharing of data amongst the wider scientific community to build trust. It will ensure outcomes and significantly advance the state-of-the art in agricultural e-infrastructures
- **Climate Change and Seismology modelling** are other promising areas where synergies can be found with WRF4G and new “quasi deterministic” approach is used for seismic hazard assessment with an advanced approach based on ground motion modelling respectively.
4. The current status of the applications
The Deliverable D3.2 has already shown the findings that were extracted from the consultation activity with the VRCs. The points highlighted in that document were related to:

- Technical issues ranging from the adoption of standards to the specific configurations of CPUs and Queues and the minimal amount of required storage;
- Some less quantified technical topics related to data transfer performances, availability of workflows, monitoring, service level agreement (SLA) and, possibly, intellectual property rights and privacy.
- A sustained demand of training, not only in the general ICT field, but also in specific tools and applications commonly used by scientific communities, including but not limited to Science Gateways.

On top of this it has to be underlined that not all the communities addressed were “easily” involved. In some cases the initial evaluation was very promising such as the case of Climate Change community that was successfully gathered in a high level conference in Trieste and which has very strong governmental support and coordination (i.e. IPCC).

4.1. WeNMR
We-NMR is already based on a portal that allows accessing a large number of applications and tools. It was considered not feasible in the short time to migrate the applications to a Science Gateway. On top of that, some of the applications have a workflow that requires part of the preparation work to be done on specific servers.

The proposal is thus to select one application that has no such constraints and satisfies the requirements of both easy migration and quite substantial computing power required. A possible candidate is GROMACS (GRoningen Machine for Chemical Simulations) a well known and widely used application for chemical simulations.

4.2. WRF
The WRF application has been already ported and packaged in WRF4G (Weather Research and Forecasting For Grid). The application can thus be transformed in a portlet running from a Science Gateway whenever an adaptor for adapting GridWay metascheduler paradigm to SAGA one will be developed. The reason for this is that WRF4G relies much of its services on GridWay.

4.3. jModelTest
The applications jModelTest (a Java version of ModelTest) and ProtTest3 were recently gridified by the Centro de Investigaciones Energéticas Medioambientales y Tecnológicas in Madrid (CIEMAT). jModelTest application (in both sequential and distributed releases) is currently being embedded in a portlet in order to be used through a Science Gateway; later on, the same operation will be done with ProtTest3.

4.4. Other interested communities
The SuperB, the Climate Change and Seismology communities are very interesting candidates because some of their applications have been already ported in a Grid environment and the potential interest of large communities spanning several continents. In addition, the latter has common links with WRF4G.
The health community, represented by the LSGC and DECIDE are very relevant for the social impact of their applications. The preliminary discussions with DECIDE have posed interesting issues related to the privacy and accessibility of data (brain images). The DCH community has already experimented a Science Gateway in the context of the INDICATE project and thus the inclusion of this community in the CHAIN test should not generate too much work.

4.5. Preliminary results

The current situation of middlewares is depicted in the following table.

Table 1 - Middlewares in the regions addressed by the CHAIN project

<table>
<thead>
<tr>
<th>Middleware</th>
<th>Infrastructure</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMD</td>
<td>EGI</td>
<td>Europe</td>
</tr>
<tr>
<td>GOS</td>
<td>CNGrid</td>
<td>China</td>
</tr>
<tr>
<td>GARUDA</td>
<td>GARUDA</td>
<td>India</td>
</tr>
<tr>
<td>OurGrid</td>
<td>The OurGrid Community</td>
<td>Brazil</td>
</tr>
</tbody>
</table>

Here we quickly recall the main characteristics of these middlewares.

- UMD: Actually packaged by EGI, based on EMI and Globus; it is participating to the GIN@OGF group and working towards a compliance to standards.
- GOS: Actually at version 4.0, maintained from several institutions headed from Chinese Academy of Sciences; strongly based on GLOBUS, but actually completely rewritten in Java with a quite different layout.
- GARUDA: Based on GLOBUS 4.0.7 and the meta scheduler GridWay 5.7 the resources information system is based on GLOBUS MDS, not on BDII; certificates of the euindia VO are directly mapped on CEs’ gridmapfile without VOMS; the data management is limited to gridftp in the head node of CE, without gridftp clients in the WNs.
- OurGrid: Is a peer-to-peer computational grid targeted to run Bag-of-Tasks applications on the idle cycles of corporations' desktops. It is based on three main elements:
  o OurGrid Broker: a scheduler, usually installed on the machine of the user that is submitting jobs to the grid;
  o OurGrid Peer: in charge of managing the desktops on a site, i.e. an administrative domain; it also allows the discovery and allocation of desktops that are available in remote sites;
  o OurGrid Worker: runs in the desktops that are made available to the grid; is in charge of identifying when the desktop can be used by the grid, and protect the desktop from any harm that could be caused by the grid jobs it executes.

We have analysed 2 interoperability levels:

- Services level: Interoperability between web services of different middlewares. It could be transparent to the users and they are thus not aware of using resources outside their usual infrastructure. It requires consistent work from middleware developers. More promising in the long term, more difficult to implement in short term.
Applications level: Solution to submit specific applications to several infrastructures; can be obtained, for example, by using metaschedulers or science gateways. In order to shield the users from the complexity of the middleware details it should implement mechanisms to choose automatically the target grid infrastructure. It requires simpler contribution from middleware developers.

Due to the time limitations imposed by the project duration, we will relay on the second interoperability level (Application level) for the CHAIN interoperability test to demonstrate that:
- e-Infrastructures can be made interoperable among each other using standards (with the meaning of interoperability given above).
- VRC-specific applications can be submitted from anywhere and run everywhere.

The following requirements have been defined by the CHAIN project for the interoperability test:
1. User interface is only web based, for simplicity;
2. Users must be transparently authenticated & authorised on all e-Infrastructures without any additional human intervention;
3. There must be the smallest possible interaction with both site managers and e-Infrastructure operators;
4. No modification of the middleware should be requested to developers.

The current environment foresees a test/demo that is based on an implementation of the Science Gateway (SG) with JSAGA plug-in for gLite, Unicore and Globus. The framework for Science Gateways proposed and fostered by CHAIN is fully web-based and adopts official worldwide standards and protocols, through their most common implementations:
- Web interface: JSR 168 and JSR 286 standards (also known as "portlet 1.0" and "portlet 2.0" standards)
- Authentication: OASIS Security Assertion Markup Language (SAML) standard and its Shibboleth and SimpleSAMLphp implementations;
- Authorisation: Lightweight Direct Access Protocol, and its OpenLDAP implementation;
- Digital certificate management: Cryptographic Token Interface Standard (PKCS#11) standard and its Cryptoki implementation
- Application interface: Open Grid Forum (OGF) Simple API for Grid Applications (SAGA) standard and its JSAGA implementation.

The SG will run a limited number of applications from the selected communities and these will be submitted transparently to different Grid Infrastructures across the world. The current status of the other plug-ins foresees the following developments currently under discussion with the respective middleware software developers.
- CNGrid is based on GOS (Grid Operating System); a JSAGA plugin has been discussed and an implementation would be possible at the next school that will be organised in China
- GARUDA is currently using the DRMAA implementation packaged with GridWay; the current implementation complies with the DRMAA specification version 1.0. A possible solution is thus to access GridWay through a SAGA adaptor to DRMAA (SAGA→DRMAA→GridWay) but a JSAGA adaptor is not currently available. The options are thus to develop a JSAGA adaptor for DRMAA or for GARUDA directly. The former will possibly be a more general solution and will be further investigated.
OurGrid a JSAGA plug-in is currently under development.

The Job Engine component shown in the Figure 4 is made of a set of libraries to develop applications able to submit and manage jobs on a grid infrastructure. It is compliant with the OGF SAGA standard, it is optimized to be used in a web portal running an application server (e.g., Glassfish, Tomcat, etc.) based on J2EE, it can be used also in stand-alone mode and JSAGA is the SAGA implementation adopted.

A powerful accounting & auditing system is included in the Job Engine. It is fully compliant with EGI VO Portal Policy and EGI Grid Security Traceability and Logging Policy. The following values are stored in the DB for each job submitted:
- User ID
The CHAIN project has thus started to define a validation test based on the model of the Science Gateways. The following options have been evaluated:

- Avoid authorizing User VO(s) at all sites of the various e-Infrastructures. This would break requirement 3 and could require quite some time to be done. The certificates of the Science Gateway(s) to be used for the test are registered in the gLite VOMS servers and Unicore XUUDB.

- Avoid to create a (super)-topBDII that gathers all the topBDII’s of the various e-Infrastructures. This would break requirement 3 and require a grid service to be managed by CHAIN. Information can become outdated. Instead insert the list of the topBDIIs/WMSs/TargetSystems of the various e-Infrastructures/middleware in the configuration of the portlets of the test applications and let the Grid Engine choose at job submission resource managers and services to be used.

The initial CHAIN demo has followed the present layout (i.e. mainly gLite-based e-Infrastructures) this has facilitated the fulfilment of the previously exposed requirements.

A preliminary test has been launched with the configuration described in theErrore. L'origine riferimento non è stata trovata. accessing both gLite based and Unicore based sites.

The Science Gateway has also a tool named MyJobsMap which allows to follow on a geographical map where the jobs, submitted by the SG on behalf of the user, are currently running. The snapshots of this tool are presented in the following.
Table 2 - E-Infrastructures/Projects participating to the first pilot demonstration

<table>
<thead>
<tr>
<th>e-Infrastructure/Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUAsiaGrid</td>
</tr>
<tr>
<td>EUChinaGRID</td>
</tr>
<tr>
<td>EU-IndiaGrid</td>
</tr>
<tr>
<td>EUMEDGRID</td>
</tr>
<tr>
<td>GISELA</td>
</tr>
<tr>
<td>IGI (Italy)</td>
</tr>
<tr>
<td>SAGrid (South Africa)</td>
</tr>
</tbody>
</table>

Figure 7 - MyJobMap of the jobs launched by the Science Gateway
Figure 8 - Blow-up of the LA sites running the SG jobs

Figure 9 - MPI jobs run on both gLite and Unicore sites
5. Conclusion

The CHAIN Project has successfully contacted a consistent and well diversified number of VRCs that are willing to collaborate in the validation of the CHAIN findings and proposed roadmap.

The first test has been organised around the Science Gateway technology, initially involving gLite only e-Infrastructures in different regions and it will be possibly extended to other Grid infrastructures with different middlewares (i.e. Garuda, CNGrid) when the JSAGA plug-ins will be available.

From the operational perspective, the test is supported by the Regional Operations Centres who manage the sites in different regions.

The final test/demo will be made at the next EGI Technical Forum in Prague in September 2012.

The demo could possibly be replicated and/or extended in other conferences and workshops before the end of the project (30 November 2012).