

## The CHAIN Project

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The CHAIN project aims to further coordinate and leverage the experience of several e-Infrastructure projects and initiatives addressing various regions of the world and specifically those emerging in Asia and Africa, but also Latin America and the Mediterranean. CHAIN focuses on the harmonised and optimised interaction model for e-Infrastructure and specifically Grid interfaces between Europe and the rest of the world. The interoperation among regional infrastructures both at the management and organizational levels will be one of the major goals.

The project started on the 1<sup>st</sup> of December 2010 and it is now focused on two milestones related to:

- Collecting the information on the state of the art of regional Grid infrastructures and their organisational structures world-wide, in a unified format. This information will be further used to develop the first model for world-wide collaboration in e-Infrastructure and Grid in particular;
- Contacting Virtual Research Communities which can be considered of intercontinental span and/or willing to aggregate people and resources (computing, data repositories, etc.) from different regions of the world, to validate the above mentioned model.

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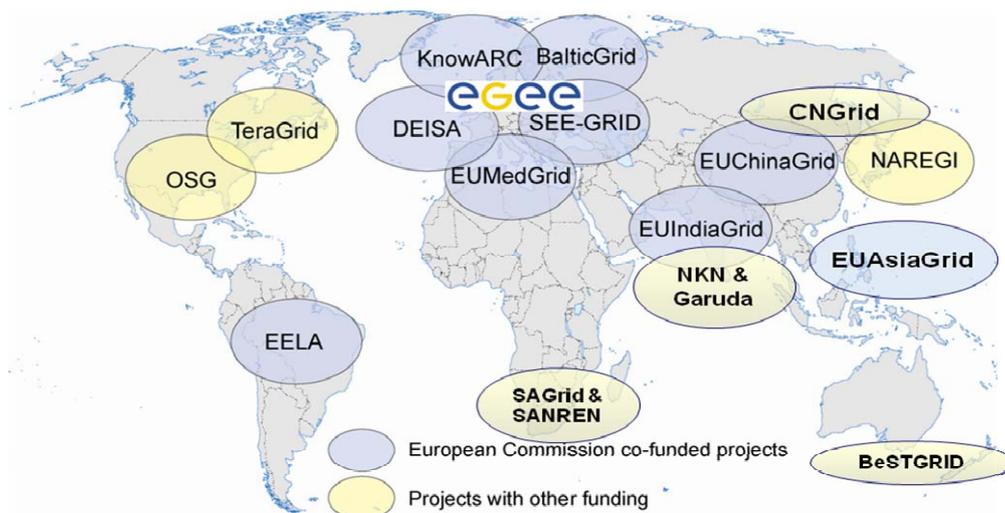
## 1. Introduction

Over the past years, the European Commission (EC) has invested to extend the European e-Infrastructure technology, both the operational and organisational principles, to a number of regions in the world, and reinforce the close collaboration and exchange of know-how with similar technologies in other areas [1]. A number of different collaboration models have thus been established between Europe and the rest of the world, while the projects implementing these collaborations have had impacts typically focused on their regions [2].

Thus, although big steps have been made to extend the European Grid principles to other regions, the results obtained so far have to be leveraged and customised so as to provide an overall model for sustainable interoperation between the European Grid Infrastructure and the external ones.

## 2. State of the Art

EC funding actions over the last decade have separately focused on the different layers of e-Infrastructures and, similarly, different world regions and their interactions with European e-Infrastructure actions have been carried out separately.



**Figure 1 - Regional Grid Infrastructures**

On the technology level, the coordination of different world-wide Grid efforts has been restricted to basic operational, organisation and technology know-how transfer/exchange.

Moreover, the co-ordination of Grids and HPC has been to some extent neglected, although there is a pressure to arrive to some agreement and to a more organised coexistence of the two approaches to scientific computing. Finally, the recent upsurge of other paradigms such as Virtualisation, Voluntary Computing and Cloud Computing which, although not in direct competition with Grids and HPC, should be evaluated in the light of a large world-wide e-Infrastructure.

The extension of the European e-Infrastructure to other regions of the world developed on three main tracks:

- Research and Education Networks (i.e., GEANT, ALICE, TEIN, EUMEDCONNECT, etc.);
- Grid Computing (i.e., EGEE, BalticGrid, EELA, EUAsiaGrid, EUChinaGRID, EU-IndiaGrid, EUMEDGRID, SEEGRID, etc.);
- Virtual Research Communities (Health, Biomedical, HEP, Earth Sciences, Cultural Heritage [3], etc.).

The CHAIN project [4] was thus proposed by the organisations that were coordinating the projects of the extension of the European Research Area in the field of Grid Infrastructures and those who are leading the e-Infrastructures in the other regions of the world.

### 3.The CHAIN project and its mission

The CHAIN project aims to coordinate and leverage the efforts made over the past years to extend the European e-Infrastructure (and particularly Grid) operational and organisational principles to a number of regions in the world. CHAIN uses their results to turn the vision of a harmonised and optimised interaction model for e-Infrastructures and specifically Grid interfaces between Europe and the rest of the world into reality. The project will elaborate a strategy and define the instruments in order to ensure coordination and interoperation of the European Grid Infrastructure with those emerging in other regions of the world (Asia, Mediterranean, Latin America and Sub-Saharan Africa).

The partners of the project are both European (INFN, CIEMAT, GRNET, CESNET) and non European (UbuntuNet Alliance-Malawi, IHEP-China, PSA-India) organisations relevant in managing eInfrastructures. The CHAIN consortium, consisting of leading organisations in all the regions addressed by the project, will ensure global coverage and most efficient leveraging of results with respect to preceding regional initiatives.

The objectives of the CHAIN project can thus be divided into three main areas:

1. Define a strategy and a model for external collaboration, in close collaboration with EGI.eu, which will enable operational and organisation interfacing of EGI and external e-Infrastructures. This strategy will take into account current organisational models, while, regarding operational models, a peering model will be defined between Europe and other continents.
2. Validate this model, as a proof-of-principle, by supporting the extension and consolidation of worldwide Virtual Research Communities (VRCs), which work on common areas (e.g. Bioinformatics, Climate Change, etc.) and/or increasingly require distributed facilities (e.g., large instruments, distributed data and databases, digital repositories, etc.) across the regions for trans-continental research. The limited support for such existing communities will be complemented by a coordinated activity of support for the international expansion to other prospective communities that have not exploited yet the full benefits of large intercontinental e-Infrastructures.

3. Propose and explore concrete steps towards the coordination of European initiatives and projects (esp. EGI InSPIRE and PRACE) with other similar and corresponding activities (e.g. EUMEDGRID-Support, EU-IndiaGrid2, LinkSCEEM2, the Indian National Knowledge Network, GISELA).

### 3.1 Current activities and future actions

At least two main categories of regions can be distinguished in the existing landscape of Grid Infrastructures and we can define them as “Greenfields” and “Advanced regions/countries”. Their characteristics can be summarised as follows:

- Greenfield Regions/Countries did not have previous Grid and e-Infrastructures activities and, in general, have scarce knowledge and/or experience in deploying/managing large e-Infrastructures. Sometimes, the scientific community showed isolated spots of research activities with high computing demands. In those regions gLite and European approaches have been exported; the Grid infrastructures have been promoted and are, in general, not yet sufficiently mature to be sustainable. In Africa, the same process is even just starting.
- Advanced Regions/Countries have e-Infrastructures already started/deployed and, in some cases using a locally developed Middleware. A fair to good knowledge and experience in e-Infrastructures is generally coupled with high quality research groups and institutions with worldwide collaborations. At least two of these countries have already well defined Grid infrastructures (i.e., China and India) and use middleware different from gLite. Internal (national) sustainability seems not to be an issue, due to large government investments.

Sometimes, the regional coordination is lacking and it is difficult to shape the demand of collaboration with Europe in a Regional perspective: the bilateral agreements are always preferred by the single countries.

Interoperability and interoperation have been so far addressed in the activities of short lived (2 years long in most cases) projects with different speeds and time shifts due to the different EU calls within which they were submitted and approved. In this context, coordination, alignment of results, and common road-maps are difficult to achieve, although being strongly pursued by all previously mentioned projects.

The CHAIN project is assessing the current state of the art to produce a set of guidelines that will support the start-up or continuity of e-Infrastructures depending on the particular region. The activity will promote the emergence of agreed solutions for interoperation and, possibly, interoperability with countries and regions that are presently using different middleware. At the same time, the consortium is studying and will propose a coherent scheme of cooperation and interoperation of EGI.eu with external e-Infrastructures taking into consideration the specificities of the different regions. The study will provide the assessment of the existing services, and will suggest the necessary services to support interoperation.

A questionnaire has been prepared to collect up to date information about the state of the art in all relevant regions. Sections are covering the existing infrastructure,

deployed middleware, existing and anticipated interoperation with other regions/grids, organizational setup and policies and all the information that is considered relevant for the analysis. Two streams for collecting input (target audiences) are planned: a Regional level, a sort of a summary for the whole region (one per region) to be taken care by the Regional Grid Representatives and a National level, requesting information about the NGI (if there is any), taken care of by NGI Representatives. The questionnaire is on-line at <http://survey.chain-project.eu> and a printed version is also available for download from the above link. The closure date will be the end of May 2011 and the first results are expected to be available by July 2011. The full analysis will take more time and the plan is to have it finished by September 2011.

CHAIN is also leveraging on the cross-region communities and applications and promotes inter-regional, e-Infrastructure based, research collaborations. A limited number of reference communities will be chosen but the activity also aims to promote the continuity of support to the large spectrum of communities that are already supported by the existing regional projects. Initial contacts with VRCs (e.g., WeNMR, WRF4G, DC-NET/INDICATE) were set-up at the Launch Event in Rome in December 2010 and a “Preliminary call for interest for reference communities” and its consequent “Shortlist of reference communities ready” have been published on the project web site ([www.chain-project.eu](http://www.chain-project.eu)).

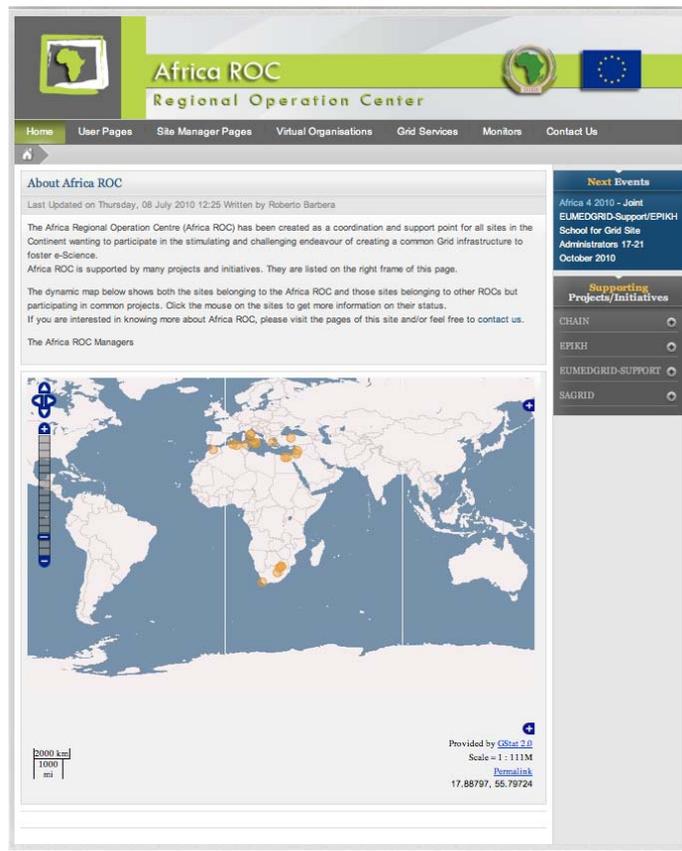


Figure 2 - The Africa ROC Web site ([roc.africa-grid.org](http://roc.africa-grid.org))

Since the very start, the CHAIN project supported the Africa Regional Operation Centre (Africa ROC) that has been created as a coordination and support point for all sites in the Continent willing to participate in the stimulating and challenging endeavour of creating a common Grid infrastructure to foster e-Science. Africa ROC is supported by many projects and initiatives such as: EUMEDGRID-Support, CHAIN, EPIKH, and SAGrid. Thanks to EUMEDGRID-Support, the geographical coverage spans also the Middle-East and Gulf area.

The plan is to use the same tools that EGI is using to monitor the sanity and efficiency of the European Infrastructure allowing the site managers, the local support and second level support to get familiar with such tools. This will allow a smooth transition of sites willing to join EGI and/or a much easier interoperability between EGI and other African/Regional Infrastructures. The portal and its services can also be seen as a test bench for similar initiatives in other regions and the success of such a challenging initiative is stimulating the interest of many countries in Africa, Asia and Middle East. The cloning of Africa ROC web pages and tools into a China ROC has already started.

The project is carrying out as well a large activity of dissemination focused on different targets by means of the organisation of thematic workshops (the first one has been organised at ISGC2011/OGF 31 in Taipei), with real intercontinental participation, on topics of large scientific and/or social impact that are, or could be, better addressed by the adoption of e-Infrastructures and, at the same time, promote the stability and interoperability of existing and emerging e-Infrastructures and gathering of feedbacks by means of a limited number of high-level conferences, the first being the Conference on the “Role of e-Infrastructures in the Research of Climate Change” that will be held in Trieste (Italy) in May 2011, organised in collaboration with ICTP, EU-IndiaGrid2 and EUMEDGRID-Support.

#### **4. Conclusions**

The CHAIN project is in the second quarter of its first year and has already achieved one of its goals: gather the relevant organisations and projects in order to discuss interoperability and interoperation issues across the continents and specifically EU, Africa, Asia and Latin America. A questionnaire has been released on the project web site in order to have an up to date picture of the state of the art of e-Infrastructures in the different regions of the world. A clearer picture of the Grid Infrastructures in several regions of the world is expected by the end of the current year.

#### **References**

- [1] G. Andronico et al., "e-Infrastructures for International Cooperation", chapter of the book "Computational and Data Grids: Principles, Designs, and Applications", N. Preve (Ed.), IGI Global, in press.
- [2] G. Andronico et al., "e-Infrastructures for e-Science: A Global View", Journal of Grid Computing (2011), DOI 10.1007/s10723-011-9187-y.

- [3] G. Andronico et al., "e-Infrastructures for Cultural Heritage Applications", chapter of the book "Handbook of Research Technologies and Cultural Heritage: Applications and Environments", G. Styliaras, D. Koukopoulos, F. Lazarinis (Eds.), IGI Global 2011, ISBN 978-1-60960-044-0 (hardcover) and 978-1-60960-045-7 (ebook).
- [4] The CHAIN project web site: <http://www.chain-project.eu>.