Learning GRID

A newsletter form the Kaleidoscope Learning GRID SIG **Chief Editor: Nicola Capuano**

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In this Issue:

Editorial

Welcome to the third issue of the Kaleidoscope Learning Grid SIG newsletter, the first issue of "Year II". As anticipated in the last issue, our appointment is now quarterly. We are proud of this result reached with the contribution of all members of the steering committee that always succeed to provide their valuable and timely contribution.

I take this opportunity to welcome a new member of the steering committee: Thanasis Daradoumis from the Open University of Catalonia. Some more changes were made in the coordination team, the updated one includes:

- Giovanna Albano from the University of Salerno, Italy;
- Agathe Merceron from the Engineering School Leonard de Vinci, France;
- Lydia Montandon form ATOS Origin, Spain;
- Fionn Murtagh from the Queen's University of Belfast, UK;
- Alexandra Poulovassilis from the London Knowledge Lab, UK.

SIG members are now 66 coming from all European countries. We are still open for new subscriptions. Expressions of interest can be sent to capuano@crmpa.unisa.it.

A good news: we will have our first workshop! In next pages you will find the call for papers for the 1st International Kaleidoscope Learning GRID SIG workshop on **Distributed e-Learning Environments**.

The workshop will be held in conjunction with the 1st International ELeGI Conference on Advanced Technology for Enhanced Learning. Topics include (but are not limited to):

- challenging scenarios of distributed e-Learning;
- distributed and service oriented architectures and systems for learning;
- learning models that can be exploited in distributed e-Learning environments;
- service oriented e-learning platforms.

To find updated news about the workshop please refer to the Learning GRID SIG Web site at: http://kaleidoscope.grid.free.fr/ now reachable also from the main Kaleidoscope site.

Let's finally summarise the content of this issue.

The first article is about Virtual Learning Communities (VLC): one of the more interesting organisational models to exploit GRID technology. The article explains how VLCs work and how they can be technologically supported by GRID.

The second article is an ideal complement to the first one seeing VLCs from a pedagogical perspective. Which pedagocical model is best suited for such kind of organisational structure? How it can be adopted?

The usual "research project focus" section presents the Akogrimo project while the "technology watch" section presents a small overview of OWL and OWL-S languages.

Enjoy your read.

Pierluigi Ritrovato
Learning Grid SIG Coordinator

Call for Papers

1st International Kaleidoscope Learning GRID Special Interest Group Workshop on

Distributed e-Learning Environments

Held in conjunction with the 1st International ELeGI Conference1 on

Advanced Technology for Enhanced Learning

Hotel Oriente[2], Vico Equense – Napoli (Italy)
14th March 2005

Call for Papers

This workshop is the first of a series of workshops to be organised by the Learning GRID Special Interest Group of Kaleidoscope, a Network of Excellence sponsored by the Information Society Technologies Programme (IST) of the European Commission.

Background

GRID technologies are rising as the next generation of Internet by defining a new powerful computing paradigm by analogy to the electric Power Grid. In this vision, a customer of the GRID will be able to use his or her private workplace (Workstation, PC, UMTS phone, etc.) to invoke any application from a remote system, use the system best suited for executing that particular application, access data securely and consistently from remote sites, exploit multiple systems to complete complex tasks in an economical manner, or use multiple systems to solve large problems that exceed the capacity of any single system on the GRID.

Another interesting aspect of GRID technologies is their support for resource sharing and problem solving in dynamic, multi-institutional virtual organizations. In this vision, the sharing is not just the exchange of data or files but rather it is concrete access to resources (e.g. computers, software, data, network, etc.).

This sharing capability requires the definition and implementation of well-defined resource management policies to specify what is accessible, by whom and under which conditions. A set of individuals and/or institutions defined by such sharing rules form what is called a Virtual Organization (VO). This sharing capability and support for VO implementation has been one of the main key success factors of GRID as an enabling technology for e-science infrastructure.

GRID could be used as a technology “glue”, providing users with a uniform way to access resources by means of several kinds of devices. These technologies can provide, in a natural way, support for both distance and traditional learning activities by facilitating experimentation with and evaluation of new emerging didactical models focused on experiential and collaborative learning approaches in a contextualised, personalised and ubiquitous way.

Topics

What kind of new learning paradigms can GRID environments effectively support? How can GRID based VOs provide the right answers to the needs arising from the emerging ubiquitous learning solutions? How can GRID help to overcome the hydraulic view of e-learning, considering didactical communication as the information transfer from an instructor to a learner? How can the effectiveness and efficacy of GRID based learning systems be evaluated? What are the best implementation paths for GRID based e-learning solutions?

Papers of this workshop should focus on possible answers to one or more of the questions above and/or should fall into one or more of the following categories:

– challenging scenarios of distributed e-Learning;

– distributed and service oriented architectures and systems for learning;

[1] http://www.hlrs.de/corga-elegi/index.jsp

[2] http://www.hoteloriente.it/

- learning models that can be exploited in distributed e-Learning environments;
- service oriented e-learning platforms.

Conference Chair:

Pierluigi Ritrovato – Centro di Ricerca in Matematica Pura ed Applicata, Italy

Program Committee:

- Giovannina Albano – DIIMA, University of Salerno, Italy
- Nicola Capuano – Centro di Ricerca in Matematica Pura ed Applicata, Italy
- Atanasi Daradoumis – Open University of Catalunia, Spain
- Agathe Merceron – Engineering School Leonard de Vinci, France
- Lydia Montandon – ATOS Origin, Spain
- Fionn Murtagh – Queen's University of Belfast, UK
- Alexandra Poulovassilis – London Knowledge Lab, UK

Paper Submissions:

Authors are invited to submit papers of not more than 8 pages of double column text using single spaced 10 point size type on 8.5 x 11 inch pages, as per IEEE 8.5 x 11 manuscript guidelines[3]. Authors can submit their works as WORD or PDF files.

Submission implies the willingness of at least one of the authors to register and present the paper. Please email your papers to miano@cemsac.it with "ELeGI Conference – DLE Workshop – Paper submission" in the subject of the email or use our on-line service[4] and select the "**Kaleidoscope Workshop**" event.

Accepted papers will be published in the proceedings of the 1st International ELeGI Conference on Advanced Technology for Enhanced Learning.

Important Deadlines:

- Paper submission: February 10, 2005
- Notification of accept.: February 18, 2005
- Early registration: February 20, 2005
- Workshop: March 14, 2005

Workshop Registration Fees

The registration is free of charge for students and for participants of the 1st International ELeGI Conference on Advanced Technology for Enhanced Learning. If you want to register to the main conference you can use the online form[5].

Registration fees for people not registered to the main conference are 70 Euro to be paid directly on-site. Registration will be open the 13th and the 14th of March.

The registration fee is per person and will covers copy of the Conference proceedings, coffee breaks, a lunch break and a welcome cocktail on Sunday 13th March.

Logistical Information

The closest airport is in Naples. In one hour you can get Vico Equense from Naples Airport by bus. Further info about transport, plus a list of the Hotels and the social events' schedule will be provided in the next days.

For any further info: Nicola Capuano, niccap@crmpa.unisa.it

Virtual Learning Communities

Featured Article by Nadia Romano

A Virtual Learning Community (VLC) is composed by several members which collaborate to satisfy the common goal of sharing knowledge to build new knowledge. In this article we will describe this organisation model and will show how GRID technologies can help to build effective VLC.

Virtual Learning Communities

Nowadays, the use of modern communication technologies and global information networks greatly influences the way of work and the life of people. Millions of computer users all over the world use the Internet to find information, to ex-

[3] http://www.computer.org/cspress/instruct.htm

[4] http://www.hlrs.de/corga-elegi/paper_submission/indexaction

[5] http://www.hlrs.de/corga-elegi/registration/reginit

change opinions concerning shared topics, to communicate with geographically dispersed people, and, more generally, to satisfy their needs. In this way, people interacting with each other via computer mediated communication form a virtual community, which can be conceptualized as "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" [1].

According to the involved topics, the virtual communities can be classified as [2]:

- Communities of transaction, that facilitate the buying and selling of products or services.
- Communities of interest, that bring together members interacting extensively with one another on specific topics.
- Communities of fantasy, that encourage members to create new environments, personalities, or stories.
- Communities of relationship, that encourage members to share their own feelings or real life experiences.

In particular the communities of interest provide an interactive environment for people to share and exchange information and knowledge anywhere; this environment is suitable to support education and to promote the development of e-learning originating the Virtual Learning Communities (VLC).

An innovative solution for e-learning

The VLCs provide a more flexible alternative to traditional distance learning programs, increasingly helping schools. In fact, the primary impetus behind correspondence schooling and distance learning programs was the need to overcome geographical boundaries. People have traditionally enrolled in these programs because they lived in remote and sparsely populated zones and could not easily attend a regular school. Nowadays, the current technological advances are making it feasible to offer on line learning programs that are comparable to regular classroom education. These on line learning programs provide additional advantages other than the overcoming of geographical barriers because:

- Learners can work at their own space, either more quickly or more slowly than their peers.
- Learners can learn outside of regular school hours, according to their responsibilities or commitments at work.
- Learners can have health challenges or disabilities that prevent them from attending schools.

Furthermore, VLCs not only extend the opportunities for students inside schools, but also provide the potential for students to access to resources and programming from sites outside the school, originating an alternative mode for classroom-based learning. Learners can work on their studies wherever they have access to appropriate computer software programs and can access to all community resources such as a variety of information in the forms of database, pictures, movies, and multimedia. In particular, they can collaborate with other community students to share information and knowledge and to learn how to solve problems. The collaboration leads active members engagement in shared discussions that persist and accumulate over time and in this way new social relationships, among members, are created on the top of common goals.

VLC Life Cycle

An individual joins a particular community because he expects to satisfy its needs or he leaves the community because its goal has been satisfied. So, during the life cycle of a VLC it is natural that some members leaves the community or new members are engaged. In this sense, the VLC are dynamic groupings of individuals that evolve over time to adjust changes in requirements or to satisfy new requirements and a suitable model to represent its life cycle essentially consists of the following phases:

- **Creation**

  In this phase all relevant VLC opportunities are identified, evaluated, and selected. The creation of the VLC is based on the definition of membership, privileges, and ownership rules. These rules will be used in order to identify, evaluate, and select community members.

- **Operation**

  The VLC has to allow the tuning and cooperation between the members in order to effectively work together towards their goals. This phase, basically, involves the controlled

integration of distributed resources, services, and activities according to member roles.

- **Evolution**

  Membership and structure of VLC may evolve over time in response to changes of objectives or to adapt to new opportunities powered by learning scenarios. Evolution of VLC may necessitate amendment or adaptation of policy and enactment of business process.

- **Dissolution**

  When all members leave the community, for example because they have satisfied their goals, there are no reasons because the community continues to exist. In this case the community dissolution phase starts and all membership, privileges, and ownership rules become deprecated.

VLC Membership Management

An important requirement, which spans on all the VLC life cycle, is the creation and maintenance of loyalty between the members, because these are held together by a sense of belonging that rises from the feeling of togetherness and connectedness Without reciprocal trust it is not possible to establish relations and create collaboration between members. Due to the fluid boundaries and potentially anonymous shifting of members and identities inside the VLC, the members may need to maintain a trusted identity in order to gain the ability to directly contribute or participate to a virtual classroom, to facilitate problem solving by encouraging information exchange, to influence team members in the absorption of knowledge, and so on. Since members may never meet each other being distributed around the world, it is important to verify the their identities to trust them. Indeed, access rights are used for the determination of accessibility to the different functions and services within the VLC and are assigned according to status and identity of the individual members. The members of a virtual community can be identified using an authentication/authorization schema based on Public Key Infrastructure. Identity authentication would ensure that members know that the persons actually exists as the persons that they say they are, that there is a known location for those persons where they can be spoken to, the current situation of those persons, as well as their long term contact information. The authorization process enables to supervise the actions of each member inside the VLC. Each member acts according to a specific role and each role has associated a set of privileges.

Kim[3] identifies six general user roles inside a typical VLC:

- **Visitor**

  They are users who have not yet been registered to the community and, therefore, they can only access to VLC public documents.

- **Member**

  They are generic members of community and they are identified via the community security authentication and authorization model. These users can access to some community protected services or documents, but they cannot contribute to management services.

- **Student**

  They are members that are registered for at least one course. In addition to member role privileges, they can communicate and collaborate with the other students of the course through collaborative tools and can access to course material.

- **Tutor**

  The tutor supervises course activities; he can manage courses learning materials, create examinations and tests, create groups of students, assign them tasks, supervise students work during the course, and decide what will be presented on the whiteboard.

- **Course Manager**

  He is responsible for the creation and management of the courses, and for all students and tutors subscribed to the courses inside VLC.

- **Community Administrator**

  Usually, there is someone who holds this role and has full access to community features.

Although there are several roles inside the community, there is not a single source responsible for the design, development and provision of learning materials. Moreover, the learner is not a passive recipient of information any more, but he becomes an active participant in the learning process, gathering ownership of what he learns and increasing knowledge through his innate curiosity about the world and how things

work. On the other hand, the tutor helps the students to construct knowledge rather than to reproduce a series of didactical sections, acting as a facilitator or a mediator of the learning process: he checks the students learning progress, guides learners to meaningful learning activities, and supervises the communication process inside the collaborative group, also allowing the learner himself to perform teacher activities in order to help other peers about specific questions.

VLC Services Specifications

The VLC has to provide a set of services to satisfy the members requirements. This services can be grouped in three build blocks as showed below:

- **Basic services**

  These set of services provides all basic features to manage distributed and heterogenous environments, like Notification, Resource Management, Information Services, Data Management, Metering Accounting and Billing.

- **Specific services**

  These services address all virtual community management issues, like the services for member profile management.

- **Core services**

  These services enables to manage all topics typical of the e-learning environments. In fact, they allow sharing of new knowledge, encourage collaborative work in order to improve aptitudes, to solve problems or to create new knowledge. In particular, the communication and collaboration services are fundamental for the design of the new e-learning paradigms.

Advanced technologies for VLC design

The key factor for VLC success lives in the used technologies. The development of technologies encourages the creation of new learning designs for interaction and collaboration among students and supports the active involvement of students in distributed learning environments. Furthermore, technology improves the development of tools for creating and retaining knowledge and sharing experiences among students, teachers and people. In particular, the design of the VLC can take advantages of the Grid technology features. Grid technologies were originally developed for e-Science contexts to support the scientific process, allowing the sharing and coordinated use of resources from different researcher groups. By using complex applications, like real time visualization of large scientific datasets and simulation of experiments via scientific instruments connected to remote computers, the scientists can generate, analyse, share, and discuss their insights and results in an effective manner. This promotes knowledge building process. The knowledge building process is the most innovative goal of modern e-learning systems which relay on the shift, in a pedagogical sense, from information transfer to knowledge building paradigm. In order to satisfy VLC requirements linked to this new paradigm, an e-learning system has to provide, specially, collaboration and cooperation capabilities among all learning process participants, and support the acquiring of new knowledge through experimentation and simulations. This is the point where the Grid comes in moving from e-Science to e-Learning context [4]. Up to now, complex applications, which are computationally intensive and handle large data sets, have been systematically ignored in the context of e-learning due mainly to technical feasibility problems and prohibitive costs. Grid computing can close this gap. Indeed, the main characteristic underlying Grid concept is the coordinated heterogeneous resource sharing and problem solving in dynamic, multi-institutional virtual organisations. This ability to integrate heterogeneous resources and provide a transparent access to them could be used to make available, inside a virtual community, sophisticated equipments, such as electronic microscope and complex virtual simulation could be designed and made available as service. For example, e-learning courses could be provided to support medicine students via photo-realistic visualizations of the complex model of the human body to prepare for practical exercises. Such visualizations, computed in real time could improve the understanding of the three dimensional locations of bones, muscles, and organs because students are embedded in a real context via virtual experimentations. The possibility to use powerful instrumentations is not enough in order to build new knowledge; it also occurs to share results and observations among participants that are characterized by different types and levels of expertise, different roles and different physical locations. A set of collaborative and cooperative capabilities can

address these requirements by adopting the newest Grid solutions. These solutions are based on a service oriented model and their central goal is to create structured knowledge adding semantic value to resources, services, and information dispersed on the Web (Semantic Grid).

Conclusion

In this paper we have described the VLC as a suitable solution for new e-learning didactical models. The most important aspect of the VLC is the engagement of the members via collaborative functionalities oriented to share knowledge and problem solving. The learner joins to a VLC to satisfy his needs and leaves the community when his goal has been satisfied. So, the VLC is learner requirements centred and a set of services are designed to provide customized learning solutions. The design of these services can take advantages of the service oriented model of the Grid technology and of the metadata concept to enrich knowledge with semantic value. In particular, the Grid enables to simplify the understanding of complex real situations via virtual simulations and it can close the gap between e-learning and e-science scenarios.

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Nadia Romano

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Pedagogical Models for VLC

Featured Article by Giovannina Albano

Introduction

Didactics was initially born as “ars docenti”, namely as theory exclusively concerned with teaching. This didactic vision has lead us to concentrate on the creation of lessons, activities, environments, games, etc. for a better teaching. Nevertheless, the opinion shared today by researchers of didactics is that by aiming all the efforts at teaching, gives no guarantees at a learning level. At present most researchers in Didactics of Mathematics embrace a “constructivist” vision of learning; the knowledge object, once in contact with the pupil, is transformed, re-constructed, thanks to the tools he possesses; the acquired knowledge can be seen as the product of the elaboration of the experience he deals with, and this elaboration consists in the interaction between the individual and his environment and in the way he feels the external world (D’Amore, 2003).

We present a particular theoretical framework for knowledge construction in mathematics when e-learning environment are used. The model conforms to the e-learning model presented in (Albano et al, 2004b), where the entire learning process is modelled through the phases of didactic transposition, devolution, implication and institutionalisation, focusing on the detailed study of the first two phases. Here attention is paid to the implication phase, that is the learner’s action he makes on himself when he charges himself with constructing his own knowledge.

According to Brousseau (1997) «In modern didactique, teaching is the devolution to the student of an adidactical, appropriate situation; learning is the student’s adaptation to this situation». In accordance with the Theory of Situations (Brousseau, 1997), which is a clear constructivist theory, learning is produced in an active way, personally by the pupil, through the interaction with the milieu, in situations opportunely arranged by the teacher, which can be splitted into situations of action, formulation and validation, institutionalisation.

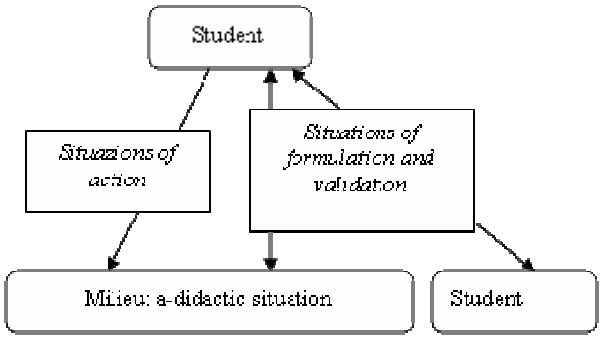
Moreover, as pointed out from Tall (1995), the knowledge construction is based on the following fundamental cognitive activities: perception of the world, action upon it and reflection on both

perception and action. This is the why his theory hypothesises that mathematical growth starts from perceptions of, and actions on, objects in the environment.

The paradigm here taken into account is the Brousseau's a-didactic situations.

A-didactic situations in e-learning environment

A-didactical situations seem to fit very well the e-learning environments: the student is implicated in constructing his knowledge interacting with a "milieu", properly designed by the author and the tutor in order to foster the devolution (interesting examples can be found in Laborde, 2001). We refer to various types of situation, distinguished w.r.t. the relation that may exist between a student and the milieu, according to the following model (Albano, 2004; Albano, et al., 2004):



- Situations of Action: are those in which the student interacts with the environment: «If the exchange of information is not necessary for obtaining a decision, if the students share the same information about the milieu, the "action" is dominant.» (Brousseau, 1997). The sequence of situations of action constitutes the process through which the learner constructs strategies, namely "teaches to himself/herself how to solve the problem. In this sense Brousseau talks of "dialectic of action" since the student on one hand can anticipate the result of his choices and on the other hand the chosen strategies can be confirmed or not by the experimentation/interaction with the environment. The situations of action promote in the student the rising of a "model", namely of a representation of the situation, which may be more or less implicit. On the basis of the model the student little by little constructs, he will do his following choices.

In e-learning environment, the student can be immerse in a "real" motivating and involving context, which foreseen some active phases and choices made and personally managed by the student, to whom the milieu replies. Such situations can be realised using "expressive tools", that can be distinguished in pedagogical tools (e.g. Dynamic Geometric Systems (DGS), microworlds, simulations) and calculation instruments (e.g. Computer Algebra System (CAS), spreadsheets, graphing calculators, databases), properly arranged by the author/tutor. Here the milieu acts as a black-box: the students changes some parameters and observes how the environment modifies.

In (Holey, Noss, 2003) digital technologies are reviewed w.r.t. their impact in mathematics education. Expressive tools give the student many advantages, such as: to manage competences greater than he actually has (e.g. to make difficult computations, to plot, to apply algebraic transformations, etc.); to have a direct and immediate feedback; to use many semiotic registers (algebraic, graphical, numerical); to concentrate his attention on qualitative aspects rather than procedures. Note that the action in e-learning environment has an added value w.r.t. the paper-and-pencil: for example a figure sketched with a DGS is not static, but through draw mode allows to outlined all the figures preserving some geometrical properties, fostering the student to make conjectures.

- Situations of Formulation: are those in which the student sends messages to the antagonist milieu with the intention of presenting an opinion. When the strategies are formulated, there are two strategies of feedback: one to the environment (milieu) that, once the formulated strategy has been applied, gives a response which can be positive or not; one to the other students he interacts with, who say if they have understood. The situations of formulation encourage the acquisition of explicit models and languages; if they have an explicit social dimension, we can talk of situations of communication (D'Amore, 1999).

In e-learning environment the student is asked to make explicit the implicit model that he has built "acting", for example he/she is asked to make explicit the relations intervening between the variables at stake, to write a formula, to realise an algorithm, etc. In this sense, building a

programme, by CAS as programming language at high level, allows new ways of modelling and representing mathematics. Here the milieu acts as a white-box, that is it replies by applying the received model and the student has the possibility to understand if the supposed model produces coherent results or not.

Since learning is a social construction, it is opportune that these situations are in particular situations of communication: the explicit models of each student can be shared and discussed with other students during virtual debates, forecasting a confrontation, in a collaborative learning process, through tools (synchronous and asynchronous) specific for the communication, the sharing of the resources, to support group processes (chat, videoconference, shared work on the same files).

- Situations of Validation: are the situations in which the messages exchanged with the milieu consist in assertions, theorems, demonstrations, both sent and received, namely the affirmations must be subjected to the judgement of the interlocutor who must be able to give a feedback, to protest, to reject a reasoning, to express some counter-examples, etc. The student is required to justify his assertions, to test their validity in a more formal and general manner than the simple observation of the results produced by the model implementation. In this phase an important aspect concerns the debate with the other students. These situations have to lead the student to evolve and revise his opinion, replace false theories with true ones, to organise the demonstrations. In this sense CAS used to verify generalisations, supporting students in making sense of their algebraic generalisations at a semantic level. In mathematics proof can be produced using expressive tools: attention should be given to new kind of proofs, such as those ones based on the use of logical value of algebraic operators and on the use of graphs.
- Moreover, in e-learning environment a virtual area can be organised (such as a discussion forum) asking the student to produce and share a document with his models and proofs. The debate with other students is considered essential: each student has to "contest" the proofs given by the others and defend his own theses.

Once the student has completed the described process, the institutionalisation allows the passage from knowing (as personal construction) to knowledge (as a socially shared construction).

Conclusions

Many researchers state that the new technologies might give the opportunity to produce a deep understanding of a given topic. As pointed out in (Holey, Noss, 2003), since most of the students interacting with digital technologies spontaneously articulate justifications of their actions along with explanations of why their actions produces the expected feedback (or not), the Theory of Situations of Brousseau seems suitable to model learning processes in e-learning environment. The counterpart is represented by new obstacles that might be arisen (Drijvers, 2000) that requires new pedagogical contexts.

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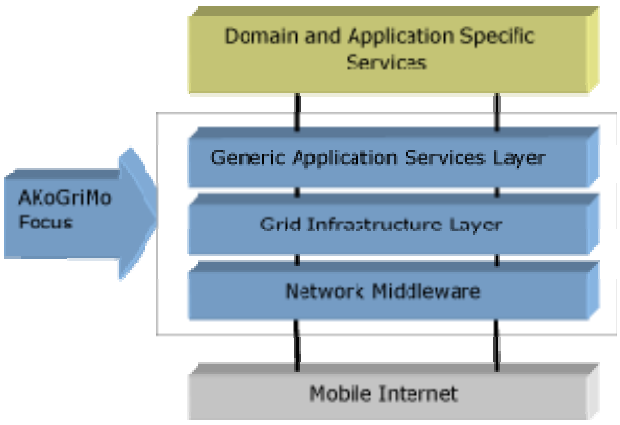
Research Project Focus: Akogrimo

Mobility has become a central aspect of life for European citizens - in business, education, and leisure. Due to rapid technological and societal changes, there has been an astonishing growth of technologies and services for mobile users. Large investments have been made in order to provide the necessary infrastructures across Europe. In 2003 the number of Internet connected handsets or mobile hosts equalled the number of fixed Internet connected. Taking into account this evolution, Akogrimo — by leveraging the large base of mobile users — is aiming to radically advance the pervasiveness of Grid computing across Europe.

Introduction

Akogrimo will bring together the market orientation and pervasiveness of mobile communication technology in everyday life with the promise of a dynamically concerted use of resources and services provided through Grid infrastructures.

By integrating the widely disjoint worlds of data communication, telecommunication and distributed service architectures, the final result of the Akogrimo exercise will be a commercial operator-oriented architecture and platform, which supports the deployment of Grid services in a worldwide perspective.



The 'Next Generation GRIDNET'.

Selected scenarios showing the potentials of the innovative Akogrimo approach for the quality of life of the public citizen, for business opportunities for both small and medium enterprises as well as large companies including network providers will validate the Akogrimo architecture.

The vision of Akogrimo is accordingly a world in which:

- Grid services, pervasively available, are eventually meeting the 'everywhere at any time in any context' paradigm
- Grid services, comprising personalized knowledge and semantics, are allowing for ad-hoc, dynamic, and possibly federated formation of complex problem solving scenarios in everyday life, in business and science - to fixed, nomadic and mobile citizens
- network and service operators are able to develop new business activities and to provide profitable services in such an integrated world based on Grid and Mobile communications concepts.

Scenarios

The realization of a challenging framework merging Grid service architectures with the underlying mobile network technology requires an iterative realization approach. Iterations of the framework need one or more non-trivial scenarios that are able to validate the features and capabilities that are added to the framework. The approach within Akogrimo foresees to define, in the scenario specification phase, performance requirements and to validate early versions through prototypes or 'validation scenarios' testing a limited set of the functionality. Following the framework's evolution, the validation progresses from system component level to the complete demonstrator.

The three scenarios foreseen so far for validation impose demands that firstly reflect requirements from 'traditional' Grid applications, namely access to distributed data and compute intensive services. In addition the scenarios demonstrate the need for mobile dynamic virtual organizations (MDVO) exhibiting the ability to dynamically adapt the organizational structure to changing local situations (through context awareness, availability of shared mobile resources). Within these MDVOs, complex workflows based upon Grid infrastructure and Grid services to access data from distributed, sometimes even mobile databases will be to dynamically established and processed. Of particular relevance is the integration of location based services and spontaneous usability.

The IP(v6) capable network supporting the scenarios and their related requirements will be constructed and derived from the infrastructure built in Stuttgart and Madrid in the context of

the IST Moby Dick and Daidalos projects. This infrastructure integrates IP-based Mobility, AAA, QoS and network security on a pure Mobile IPv6 platform.

At the moment the following scenarios have been identified:

- **Akogrimo eLearning**

  The Akogrimo eLearning scenario will be embedded in the frame of the E-Learning domain. The focus in this scenario will be to build a showcase for new ways of learning that is made possible by the Akogrimo infrastructure. It is planned to liaise with the Integrated Projects ELeGI and to utilise the Mobile University testbed of the Daidalos project in order to increase the impact.

- **Akogrimo eHealth**

  The Akogrimo eHealth testbed explores Grid technology and the Mobility paradigm in the healthcare domain. It builds on previous successful results from a 6-year German priority research program. Target users of a Grid based healthcare information system are the European citizens, mobile pervasive demand for healthcare services (eg chronic diseases), and from the healthcare service suppliers all types of healthcare service providing institutions and stationary or mobile professionals which include healthcare advisors, pharmacies, nursing services, hospitals, emergency service devices and emergency stations.

- **Akogrimo Disaster Handling and Crisis Management (DHCM)**

  Akogrimo DHCM involves incidents where various crises or disasters should be handled by rescue services and other mission-critical mobile personnel, who have to collaborate within time-critical and dangerous situations such as large sport events, concerts or special locations such as airports or railway stations.

Conclusions

Akogrimo adds a new dimension to the Grid. Mobility and network integration has not been addressed so far by other initiatives. With a merged infrastructure enabling cross-layer communication between network and Grid middleware new kind of applications are possible that attract not only researchers in specific domains but enable the provision of services for the public citizen making a pervasive Grid possible.

Refereces

[1] Akogrimo: http://www.mobilegrids.org

[2] Moby Dick: http://www.ist-mobydick.org

[3] Daidalos: http://www.ist-daidalos.org

[4] ELeGI: http://www.elegi.org

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Technology Watch

This section presents Technologies, Specifications and Standards related to the e-Learning GRID world. A brief description will be given together with a set of references to "must read" articles and documents.

OWL

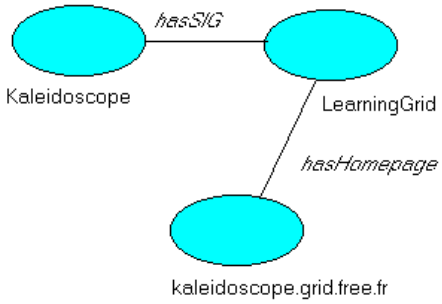
OWL is a Web Ontology language and a W3C recommendation since February 10, 2004 [1]. It has been developed by the Web Ontology Working Group as part of the W3C Semantic Web Activity [2].

The aim of the Semantic Web activity is to facilitate the sharing and reuse of data over the Web. To be able to share and reuse data, one needs search engines that understand not only their structure but also their content. For example, to reuse a document about *painting*, what needs concepts or tags in the document that indicates that it is about *painting*. To some extend, this is done by the language XML. However, *painting* may mean building painting as well as painting by artists. It is therefore needed to make clear what concepts mean and how they relate with each other. This is the purpose of an ontology. According to [3], an ontology is 'an explicit specification of a conceptualisation'. In the Semantic Web context, an ontology is composed of a well-defined vocabulary and explicit assump-

tions regarding the intended meaning of the vocabulary. To use ontologies, one needs first to build them, hence the need for ontology languages.

OWL is a logic based ontology language. It is a successor of DAML+OIL [4] and extends RDF/RDFS [5,6]. One of its aims is to provide better support for automated reasoning.

RDF [5] stands for Resource Description Framework. A resource is any object that can be pointed to by a URI, Uniform Resource Identifier [7]. Roughly speaking, URIs are well coded strings that identify Internet accessible resources. URLs, Uniform Resource Locators are particular URI. RDF organizes resources by linking them via statements. Statement are <subject, relation, object> triples and constitute the data model of RDF. An example is <Kaleidoscope, hasSig, LearningGrid>. A subject can be an object for another statement. Thus, RDF allows for organising resources in a labelled, directed graph as shown below. These data models can be represented in an XML syntax.



RDFS, RDF Schema [6], adds to RDF a vocabulary to describe classes and relations. For example, terms such as *Class, Property, subClassOf, type, range, domain* have a definite syntax and meaning in RDFS. Using them, one can describe other classes and properties, for example:

<NetworkOfExcellence, type, Class>

<JoinedActivity, type, Class>

<SIG, subClassOf, JoinedActivity>,

<hasSIG, type, Property>

<hasSig, range, SIG>

<hasSig, domain, NetworkOfExcellence>

This makes it possible to have more complex queries while searching for resources (one can use inheritance for instance).

However, RDFS is still too weak to describe resources with enough details. OWL adds more terms, taken form description logics, to describe classes and properties. For example, it is possible to express relations between classes like *disjointness*, to express constraints on a class like *cardinality* or to express that a property is *symmetric* or *transitive*.

OWL has three increasingly expressive sub languages: OWL Lite, OWL DL and OWL Full.

OWL Lite is restricted in its constructors and axioms. For example, cardinality constraints permit only cardinality values of 0 or 1. Tool support and migration from some other thesaurus should be easier for OWL Lite.

One can think of OWL DL as RDF/RDFS plus Description Logics, which is complete and decidable.

OWL Full offers maximum expressivity but no computational guarantee. For example, in OWL Full a class can be treated simultaneously as a collection of objects and as an object in its on right.

For a gentle introduction to Web Semantic and OWL, see [8]. For more background on heterogeneous data and ontologies, see [9].

References

[1] www.w3.org/TR/owl-features/.

[2] www.w3.org/2001/sw/.

[3] T.R. Gruber. A translation Approach to portable Ontology Specifications. Knowledge acquisition, 5(2), 1993.

[4] http://www.daml.org.

[5] www.w3.org/RDF/.

[6] http://www.w3.org/TR/2002/WD-rdf-schema-20021112/.

[7] http://www.w3.org/Addressing/.

[8] S. Bechhofer, I. Horrocks, P.F. Patel-Schneider. Tutorial on OWL, ISWC Conference 2003, http://www.cs.man.ac.uk/~horrocks/ISWC2003/Tutorial/.

[9] B. Amann. Du partage centralisé de ressources Web à l'échange de documents intensionnels - Thèse CEDRIC, CNAM, Paris, 2003. Habilitation à diriger des recherches.

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OWL-S

OWL-S [1] means Semantic Markup for Web Services [2]. It is a successor of DAML-S [3] and a W3C member submission since November 2004. We present the main features of this submission in the following.

OWL-S is an ontology for services built on OWL. Its aim is to facilitate the discovering, the invocation, composition and monitoring of Web services by users and system agents. The authors of OWL-S agreed that three essential types of knowledge need to be provided about a service. Each type is characterised by a question. The three questions are:

- What does the service provide for prospective clients?
- How is it used?
- How does one interact with it?

Consequently, the authors have divided the ontology into three main parts: the service profile, the process model and the grounding.

- The *service profile* answers the first question and provides a way to describe the services offered by the providers, and the services needed by the requesters. The service profile provides one description of a service trough the class profile. Using the OWL *subClassOf* it is possible to create specialised representations of services. The class profile contains three pieces of information: (i) information about the provider (the entity that provides the service) (ii) information about the function performed by the service (inputs required, possibly with pre-conditions, and outputs produced, possibly with effects) (iii) features that specify characteristics of the service (category, quality rating, plus additional information).
- The *process model* answers the second question and specifies the ways a client may interact with a service. The interaction with a service is viewed as a process. A process can be atomic. It expects inputs and produces outputs. It can be composite. It that case, it maintains some internal state that evolves each time the client sends inputs. *Input* and *Output* are *subClassOf* the general class *Parameter*. Other classes provided include *Atomic Process* and *Composite Process* both *subClassOf Process*. Among the properties defined in the *process model*, let us mention *hasInput, hasOutput, hasPrecondition, hasResult.*
- *Grounding* answers the last question and specifies the details on how to access the service (protocol, message formats, serialisation, transport and addressing). The service model and the process model are thought of as abstract representations In contrast, grounding deals with the concrete level of specification. It shows 'how the (abstract) inputs and outputs of an atomic process are to be realized concretely as messages, which carry those inputs and outputs in some specific transmittable format'. The authors have chosen to use WSDL, Web Services Description Language [4]. The main idea is that an OWL-S atomic process corresponds to a WSDL operation and OWL-S inputs/outputs correspond to VSDL messages.

Work on OWL-S involve several teams at different levels. OWL-S service examples can be found at [5]. Work on an OWL-S editor as well as related projects can be found at [6]. For more background on web services, one can consult the first two issues of this newsletter, in particular the technology watch part [7].

References

[1] http://www.w3.org/Submission/2004/SUBM-OWL-S-20041122/.

[2] http://www.w3.org/2002/ws/.

[3] http://www.daml.org/services/daml-s/0.7/.

[4] http://www.w3.org/TR/wsdl.

[5] http://www.mindswap.org/2004/owl-s/services.shtml.

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[7] A. Gaeta. Web services, Web Service Resource Framework. Learning Grid Newsletter 1 and 2., 2004.

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News

By Angelo Gaeta

Roadmap for the development of LAMS

The Learning Activity Management System (LAMS) has generated substantial interest among those working with IMS Learning Design, because it makes it easy for teachers to sequence activities for learners. Unfortunately LAMS has so far not produced IMS LD compliant code. This now seems to be set to change, with the introduction of an import and export features for IMS-LD level A.

The LAMS roadmap is as follows: the current period of LAMS beta testing was completed in October/November of 2004 when the full Version 1 release of LAMS was announced. In February 2005, LAMS V1.1 will be released, and at the same time, the open source code for this version will be made freely available to the public under the GPL.

This release will also include any open source code developed for Government funded projects. Finally, an IMS Learning Design V1.0 Level A import and export feature will be developed for LAMS by July 2005.

You can find more information on LAMS at: http://www.lamsfoundation.org/news/future.html.

CopperCore v2.2 released

December 15th 2004

The Open Universiteit Nederland (OUNL) released the 2.2 version of CopperCore. CopperCore is world's first open source IMS Learning Design Engine that supports all three levels of IMS Learning Design (A, B and C).

CopperCore, a J2EE runtime engine for IMS Learning Design which can be used to incorporate IMS Learning Design in your own applications. The targeted audience are therefore system developers. CopperCore provides three API's and a Test Suite. Here are some characteristics:

- full support for IMS Learning Design including level A, B and C;
- has three API's covering publication, administration and delivery of IMS Learning Design;
- exposes J2EE, native Java and SOAP interfaces;
- provides a validation library;
- includes a command line interface to most of the API calls;
- includes an example of a publication interface;
- includes an example of a web delivery interface;
- platform independent;
- has built-in support for three relational databases (MS SQL Server/MSDE, PostgreSQL and HSQLDB);
- is ready for use with JBoss 3.2.x application server, but runs on other application servers as well;
- licensed under the GNU GPL.

CopperCore is one of the OUNL's contributions to the Alfanet project. This project aims to develop new methods and services for active and adaptive learning and is funded by the European Commission under the 5th Framework Programme. In the SLeD project funded by the JISC e-Learning framework the OUNL and the Open University (UK) continued the Alfanet work and jointly developed the current full release. Furthermore there is collaboration with the RELOAD project in which an IMS-LD editor is developed.

Learner Information Package v1.0.1 Specification Released

January 17th 2005

Learner Information is a collection of information about a Learner (individual or group learners) or a Producer of learning content (creators, providers or vendors). The IMS Learner Information Package (IMS LIP) specification addresses the interoperability of internet-based Learner Information systems with other systems that support the Internet learning environment.

The core structures of the IMS LIP are based upon: accessibilities; activities; affiliations; competencies; goals; identifications; interests; qualifications, certifications and licences; relationship; security keys; and transcripts.

The intent of the specification is to define a set of packages that can be used to import data into and extract data from an IMS compliant Learner Information server. A Learner Information server may exchange data with Learner Delivery systems or with other Learner Information servers. It is the responsibility of the Learner Information

server to allow the owner of the learner information to define what part of the learner information can be shared with other systems.

Learner Information Package v1.0.1 is final specification is a maintenance release of the Learner Information Package v1.0 Specification. Many typographical and elaborative changes were made to clarify and correct the supporting documents. For more information and to download Schema and examples see:
http://www.imsglobal.org/profiles/index.html

GridWay Project to Release GridWay 4.0 Develop. Release

January 14th 2005

The GridWay Team is proud to announce the development release of GW4.0, which incorporates improved functionality and robustness for interacting with the Globus Toolkit services. More information and download at
http://www.gridway.org.

All components developed as part of the GridWay framework are released as "open source" under the GPL license to encourage innovation and pass full freedom to our users.

The GridWay framework provides a submission agent that incorporates the runtime mechanisms needed for transparently executing jobs in a Globus-based Grid. Its modular architecture for job adaptation to a dynamic environment offers the following benefits:

- Easy to deploy: GridWay is a client tool that does not require new services, apart from Globus basic services.
- Easy to extend and adapt: GridWay modules allow its communication with the Grid services available in a given testbed. In fact, it could be used as a building block for much more complex service-oriented.
- Easy to use: It is not bounded to a specific class of application generated by a given programming environment, which extends its application range and allows reusing of existing software.
- Easy to scale: Its decentralized architecture gives the possibility of boosting scalability.

First release of OMII middleware

December 6th 2004

OMII_1 is the first middleware to be released by the Open Middleware Infrastructure Institute (OMII), whose mission is to become the UK source for reliable, open-source Grid Middleware.

The OMII was launched earlier this year and is based in the School of Electronics and Computer Science at the University of Southampton. OMII is a £6.5m project funded by the UK e-science programme and led by Professor Peter Henderson and Professor David De Roure.

OMII has taken the middleware that exists on the market and refined the codes so that it is packaged in a way that meets users' needs. The OMII Grid infrastructure does this by providing a number of common services, such as security and accounting, which are available to all deployed applications and which as a result benefit from a consistent security policy.

The OMII_1 base is a freely downloadable, open source web service container with WS-security enhancements. By adding the OMII_1 services to this container, its capability is extended to provide a secure and accountable file and compute grid.

Developers can write standard web-services and benefit from the security and authorisation model of the OMII_1 infrastructure. Users can interact with the OMII_1 grid using either a command line tool or through any application using the supplied java API.

OMII_1 is available at:
http://www.omii.ac.uk/repository/omii_1.aspx.
Registration is required.

Next Appointments

When	What	Where
February 7-11, 2005	**GlobusWORLD 2005** GlobusWORLD is the premier Grid conference featuring the Globus Toolkit®. If you want to learn about the Grid, go straight to the source. Only GlobusWORLD is organized by designers and developers of the toolkit that is central to virtually every major Grid deployment worldwide. **http://www.globusworld.org**	**Boston Massachusetts USA**
March 14, 2005	**1st International Kaleidoscope Learning GRID Special Interest Group Workshop on Distributed e-Learning Environments** This workshop is the first of a series of workshops to be organised by the Learning GRID Special Interest Group of Kaleidoscope. It is held in conjunction with the 1st International ELeGI Conference on Advanced Technology for Enhanced Learning. Conference topics include: challenging scenarios of distributed e-Learning, distributed and service oriented architectures and systems for learning, learning models that can be exploited in distributed e-Learning environments, service oriented e-learning platforms. **http://www.hlrs.de/corga-elegi/index.jsp**	**Vico Equense Napoli,Italy**
March 14-16, 2005	**1st International ELeGI Conference on Advanced Technology for Enhanced Learning** ELeGI is an EU-funded Integrated Project that aims at facilitating the emergence of a European GRID infrastructure for e-Learning and stimulating research of technologies to enhance and promote effective human learning. The main purpose of the conference is to bring together researchers, academics, professors, educational scientists and technologists in all areas of ICT and human learning who are interested in exploring methodologies and systems and sharing current research on advanced technology for enhanced learning. **http://kaleidoscope.grid.free.fr/Workshop.htm**	**Vico Equense Napoli,Italy**
May 4-6, 2005	**CF '05 2005 ACM International Conference on Computing Frontiers** The increasing needs of present and future computation-intensive applications have stimulated research in new and innovative approaches to the design and implementation of high-performance computing systems. This challenging boundary between state of the art and innovation constitutes the computing frontiers, which needs to push forward and provide the computational support required for the advancement of all science domains and applications. This conference will focus on a wide spectrum of advanced technologies and radically new solutions and is designed to foster communication between the various scientific areas and disciplines involved. **http://cf05.ac.upc.es/CFP.html**	**Ischia Napoli, Italy**

When	What	Where
May 9-12, 2005	**CCGrid '05 - Cluster Computing and Grid 2005** Commodity-based clusters and Grid computing technologies are rapidly developing, and are key components in the emergence of a novel service-based fabric for high capability computing. Cluster-powered Grids not only provide access to cost-effective problem-solving power, but also promise to enable a more collaborative approach to the use of distributed resources, and new economic products and services. CCGrid2005, sponsored by the IEEE Computer Society (final approval pending), is designed to bring together international leaders who are pioneering researchers, developers, and users of clusters, networks, and Grid architectures and applications. The symposium will also serve as a forum to present the latest work, and highlight related activities from around the world. **http://www.cs.cf.ac.uk/ccgrid2005/**	**Cardiff, UK**
May 9-12, 2005	**CLAG '05 - The Second International Workshop on Collaborative and Learning Applications of Grid Technology and Grid Education** Education and collaboration are now emerging as very important application fields of grid technologies. On the one hand, the grid may also enable access to large amounts of heterogeneous resources that can be employed for educational purposes. Examples include remote laboratories, 3D virtual environments and educational services. Thus, the use of grid computing could provide significant benefits for education at different levels: K-12, high school, university, skill training and learning for life. On the other hand, there is an increasing interest in developing new tools and applications in order to support collaboration between users within a grid context. Distributed high quality visualization, distributed grid workflow management, and enhance group and presence management and visualization contribute to realize Grid-based collaboratories. Such collaboratories are being developed for the scientific community, but in the near future they will be adapted for collaborative work or collaborative learning purposes, as it has happened to other technologies developed by the scientific community. Complementary to these is the desire to create a forum for the discussion of innovative and exemplary materials and approaches to education about the grid and emerging grid technologies and standards. **http://research.ac.upc.es/clag/clag2005.htm**	**Cardiff, UK**