Learning GRID

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

Newsletter #4: April 2005

Deliverable D 12.2.6

Prepared for the European Commission
under Contract No. NoE IST-507838 as a deliverable from

Task: **12.2: Networking and Dissemination**
Date of issue: **30/04/2005**
Version: **1.0**
Distribution: **public**

In this Issue:

Editorial

Welcome to the fourth issue of the Kaleidoscope Learning Grid SIG newsletter, the first issue after the Kaleidoscope review where our SIG had a very positive evaluation: it "is addressing a field that is very relevant for TEL" and "the work performed was highly satisfactory in comparison to the other SIGs" (from the review report).

Let me exploit this editorial to briefly report on the 1st International Kaleidoscope Learning GRID SIG Workshop on Distributed e-Learning Environments that was held the last 14th March in Naples. Thirty participants registered for the workshop, most of whom attended the meeting either presenting their own work or contributing to the general discussion. Eight papers were accepted after a review process and will be soon published on the "Electronic Workshops in Computing" of the British Computer Society.

After the welcome and an overview on the SIG work, the authors presented their work, involving the other participants in interesting discussions on distributed platforms and systems for e-learning, as well as collecting their feedback aimed at improving their current solutions.

Thanasis Daradoumis presented the experience and experimental results of the Open University of Catalonia's application of a GRID approach to on-line collaborative learning teams.

Enver Sangineto presented the project Diogene, a distributed e-learning platform whose facilities include (among others) automatic course generation and personalisation. Diogene was already presented on the first issue of this newsletter.

Agathe Merceron presented the concept of Reactive Learning Objects whose main aims are to encourage students activity, e.g. in adopting a learning-by-doing approach; and to encourage tutors professional activity, e.g. in offering them appropriate follow-up tools. She showed an architecture for dealing with Reactive Learning Objects and addressed the issues concerning its distributed version.

Alexandra Poulovassilis presented the SeLeNe (Self e-Learning Network) project. SeLeNe is a learning community of instructors, learners and content providers, which is creating a collection of shared Learning Objects and their metadata descriptions. More details about SeLeNe will be published in the next issue of this newsletter.

Paul Libbrecht presented the Activemath Learning Environment. It is a web-based learning environment which presents mathematical learning content in a web-browser. It is based on three main services: the *content-database*, whose role is to store XML files, serving fragments by ID and resolving their relations; *the learner-model* whose role is to store tables of estimated knowledge and update it following user actions and *the mathematical systems' service,* responsible to manage the lifecycle of sessions with computer algebra systems.

Roberto Iannone presented an extension of the Intelligent Web Teacher (IWT) platform supporting the IMS Learning Design standard. The aim of this extension is the personalisation of "Units of Learning" in a distributed delivery architecture.

Pierluigi Ritrovato
Learning Grid SIG Coordinator

Learning Design and distributed e-learning

Featured Article by Francesco Orciuoli

The need for e-learning systems supporting a rich set of pedagogical requirements is an important issue in the field of distance learning. Several initiatives take place in order to meet this need. Maybe, the most important is IMS Learning Design that provides a framework to formally describe pedagogies.

Nevertheless IMS Learning Design is hardly exploitable in distributed e-learning environments due to several limitations coming from design-time resource binding. This article will try to explain how to overcome these difficulties.

Introduction

Building individualized learning activities to support personalized instruction in an adaptive environment is a big challenge for the future of e-learning. The web offers the perfect technology and environment for individualized learning, since learners can be uniquely identified, content can be specifically personalized, and learners cognitive states progress can be monitored, supported and assessed [7].

An important result in e-learning field is achieved by IMS Learning Design (IMS-LD) that proposes a language for describing learning processes, called learning design scenarios, where users can play learning activities embodying several roles.

Although IMS-LD is very useful for instructional designer to model, in a machine understandable representation, a wide range of pedagogies, nevertheless it does not support, in a native way, personalized formative paths since real contents and services are bound at design-time to the specific learning scenario that models the learning process. IMS-LD early binding thwarts the use of learner profiles that could be used as directives in order to build, at run-time, personalized learning experiences.

Furthermore, nowadays several educational e-content repositories and networked infrastructures are available and accessible in order to delivery learning scenarios where services, users and contents are decentralized and selected at run-time in order to provide effective and reliable learning experiences all the time to final users.

The main goal of this article is to describe how to extend IMS-LD in order to model domain independent pedagogies as learning design scenarios running in a distributed environment. Domain-independent learning design scenarios will be used by teacher to construct domain specific units of learning by merging pedagogies with educational objectives extracted by ontologies used to model specific didactic domains. The units of learning will be bound with real contents and services at learners fruition-time in order to best fit their preferences and networked resources availability.

IMS Learning Design

IMS Learning Design is a specification used to describe learning design scenarios. It allows these scenarios to be presented to learners online, and enables them to be shared among systems. It can describe a wide variety of pedagogical models, or approaches to learning, including group work and collaborative learning. It does not define individual pedagogical models; instead it provides a high level language, or meta-model, that can describe many different models. The language describes how people perform activities using resources (including contents and services), and how these three things are coordinated into a learning flow.

IMS Learning Design describes how a learning design scenario unfolds through the analogy of a theatrical play. Just as a play can be staged with different actors, in a different theatre with alternative props, so learning design scenarios can be executed again with different learners and tutors, on different systems, with alternative learning resources or tools:

- The play is presented in a series of acts, in which roles are played by those taking part, for example learner, tutor, mentor, and so on.
- People playing the roles undertake a series of activities within an act. For a learner these might include discussing with classmates the relative merit of a piece of source material. A tutor's activity may be to comment on their conclusions.
- Each role is presented with its own learning objects (LO) and services (e.g. communication tools) within an activity.
- An act is completed after all the activities of a specified role, or roles, are finished. Alternatively, a time limit may be set, after which an act completes.
- As soon as an act is completed, the next one starts. The play finishes when all the acts

are completed, the learning design scenario finishes when all the plays are completed.

Services offer generic functions such as email, conferencing, searching and announcements. The locations of services are not specified during design, but are made available at run time, after people have been assigned to their roles. Both services and learning objects are referenced by activities. This means that these elements are located separately so that they can be reused and updated easily.

The model revolves around describing units of learning atomic or elemental units providing learning events for learners, satisfying one or more interrelated learning objective.

In a unit of learning, people act in different roles in the teaching-learning process. In these roles, they work towards certain outcomes by performing learning and/or support activities within an environment, consisting of learning objects and services to be used during the performance of the activities.

The approach separates learning objects and services from the educational method used in the unit of learning.

IMS Learning Design specifies a language for describing learning activities, and gives a binding for this language to XML (Extensible Markup Language).

An IMS Learning Design player (the execution engine) is a software tool that interprets, at run-time, the XML notation of a learning design scenario as participants work through it. The player may be a stand-alone tool, or it may be part of a virtual learning environment (VLE).

In conclusion IMS Learning Design orchestrates e-learning scenarios by:

- Describing and implementing learning activities based on different pedagogies, including group work and collaborative learning.
- Coordinating multiple learners and multiple roles within a multi-learner model, or, alternatively, supporting single learner activities.
- Coordinating the use of learning contents with collaborative services.
- Supporting multiple delivery models, including mixed-mode learning.

IMS-LD and domain-independent pedagogies

The IMS Learning Design specifications are structured in three level. Level A includes activities, roles and environments. Activities (learning activities or support activities) can be grouped into activities structures and executed into specific environments. An environment is formed by learning objects and services provided to users during activity execution. Users are classified into roles (learners, teachers, tutors, etc…). Nowadays, learning objects are educational contents by which learners acquire knowledge and services are functionalities invoked during learning process in order to communicate with tutors or other learners. Level B adds properties (storing information about a single person or a group) and conditions (setting constraints upon the flow of activities) to the first level. Level C adds notifications (mechanism to handle messages passing between users) to the framework.

Focusing on Level A and B we observe that though IMS-LD presents a mechanism to personalize the learning experience at run-time using properties and conditions at Level B, however the instructional designer has to provide a fixed set of learning objects and services in which selecting contents and tools for learning experience final users. So we can consider that learning objects and services are statically bound to the learning design scenario.

Design-time resources binding (LOs and services) is affected by the following problems:

- **Learning design scenarios implement domain-dependent pedagogies**: the instructional designer is forced to establish “a priori” the didactic domain, building the environments tied to the scenario’s activities.
- **Learning processes cannot be really adaptive (based on learner profiles)**: systems for learning material delivery cannot take into account learner preferences and cannot select, at run-time, learning objects that best fit learners characteristics.
- **E-learning scenarios don’t exploit some advantages of distributed infrastructures**: the early binding of resources at design-time thwarts the opportunity for dynamic selection of learning objects and services that best fits learning process needs. Of course, these needs can be better supplied if the source of resources is a whole virtual organization (on a networked infrastructure) than the environments linked to the learning design scenario.

Our proposed solution consists in modifying the learning design scenario authoring process specified by IMS-LD in order to provide only requirements for a desired LO rather than a reference to a real LO. Requirements can be expressed using a subset of *IMS Learning Resource Metadata* (IMS-MD) [8] specification. These requirements will be transformed in references to real LOs at learning design scenario execution-time. A learning design scenario with pending references to LOs can be considered a *template learning design scenario* [12]. In the next sections we propose a complete e-learning sample scenario in which an instructional designer describes a pedagogy using a template learning design scenario, an expert models a didactic domain, a teacher prepares a unit of learning based on the constructed template learning design scenario and the provided ontology. At last, a learner runs the unit of learning in a personalized way.

A complete e-learning scenario: building a Unit of Learning

A unit of learning (UoL) is a sequence of learning objects (enriched by services provided to final users) assembled by a teacher to explain some concepts.

In this section we show the overall process needed to build a unit of learning (based on a learning design scenario) that can be personalized at run-time with respect to learner preferences.

Pedagogy construction (first step). First of all, the instructional designer builds a pedagogy using IMS-LD language though he doesn't specify real learning objects for each activity (through environments) in the play, on the contrary he/she assigns, for each LO in the learning design scenario, some requirements that learning objects should fulfil in place of setting references to real learning objects. The needed requirements are values for the following properties: *learning resource type* (LRT), *interactivity level* (IL) and *interactivity type* (IT) [8].

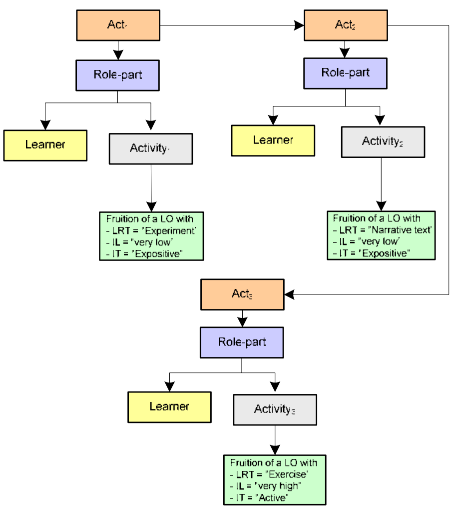

Figure 1.

IMS-LD, through the mechanism of environments, allows to specify more than one resource (LOs and services) within each activity but, without lack of generality, we will use only one resource for a single activity and one activity for each act. The constructed template learning design scenario (or LD document) is illustrated in figure 1.

The previous LD document is based on an inductive method in which learners have to study a "not interactive" LO, a "narrative text" LO and finally they have to test the acquired knowledge interacting with an "exercise".

Didactic domain modeling (second step). In this step, domain experts model didactic domains through ontologies definition [4]. In our example we show the result of modeling process performed by an expert of "Calculus" domain. An example of ontology is shown in figure 2.

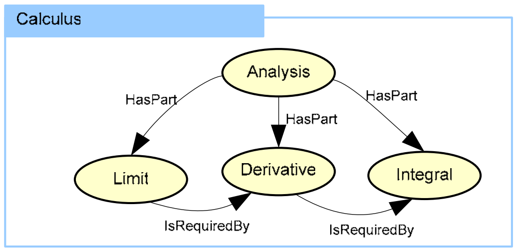

Figure 2.

Here we refer to the ontology-based approach illustrated in [3].

Unit of Learning construction (third step). Last step engages teacher that realizes the UoL overlapping domain-independent pedagogy and domain specific concepts that represent the learning objectives of the UoL.

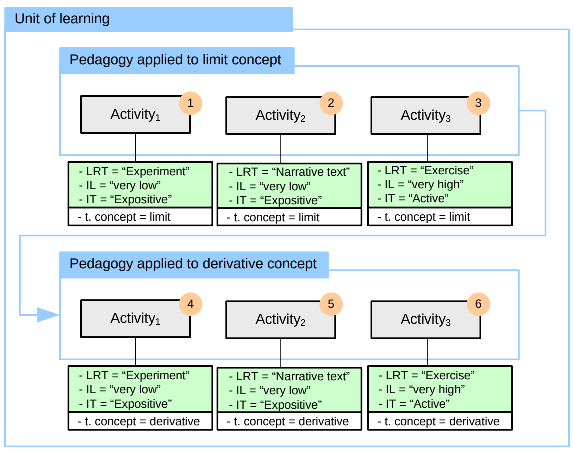

Figure 3.

In our example, teacher chooses the pedagogy (template learning design scenario) of figure 1, the ontology of figure 2 and the concept "derivative" as educational objective of his/her UoL. An automatic process uses inputs from teacher in order to:

1. Extract and organize in a sorted sequence all pre-requisites of the concepts "derivative", from selected ontology, obtaining the path [Limit, Derivative];
2. Join the selected template learning design scenario with the sorted sequence resulting from the previous point;
3. Obtain the activities flow shown in figure 3 constructed applying the original pedagogy to each concept in the path [Limit, Derivative].

The activities flow is an enriched template learning design scenario with an additional requirement (concept) for each desired learning object. In the example of figure 3, the values for property called concept will specify that desired learning objects for activity 1, activity 2 and activity 3 have to explain the concept of "limit" in the domain of "Calculus". Instead, desired learning objects for activity 4, activity 5 and activity 6 have to explain the concept of "derivative" in the domain of "Calculus".

So, the UoL is ready to be published and executed inside the infrastructure defined in the next section.

A complete e-learning scenario: a distributed delivery infrastructure

The distributed infrastructure that allows the delivery of the UoL, built in the previous section, is depicted in figure 4. It is based on three types of distributed services:

- **UoL Delivery Service**, that allows the playing of the UoL for authorized users (enrolled to the learning experience as learners, tutors, etc...).
- **Localization Service**, that allows to localize needed services. In particular, in our example, the Localization Service can be invoked in order to find available repositories storing correct (with respect to requirements in template learning design scenario) learning objects.
- **Repositories**, that are services providing two main ports. The first port is invoked to query the learning objects archive in order to obtain a list of metadata representing LOs satisfying the query. The second port (delivery) is invoked to obtain the GUI (Graphical User Interface) that renders a specific learning object delivery.

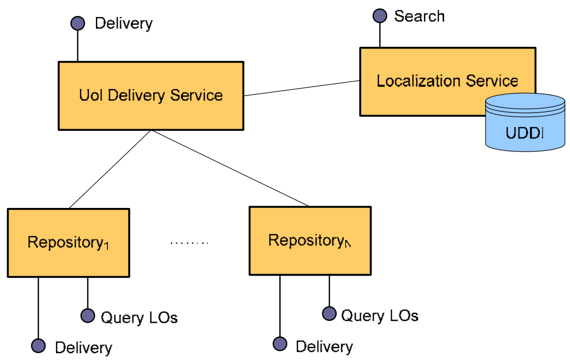

Figure 4.

Delivery ports return frames of mark-up code (typically XHTML) that represent GUIs. These ports can be implemented as WSRP (Web Service for Remote Portlet) producers [1]. Search and Query LOs ports can be implemented as standard Web Services.

In figure 5 we present the detailed architecture of UoL Delivery Service that is composed by three tiers: 1) Services Connectors for remote services invocations; 2) Enhanced IMS-LD Engine [5] for learning flow resource binding and execution; 3) UoL Player for UoL rendering.

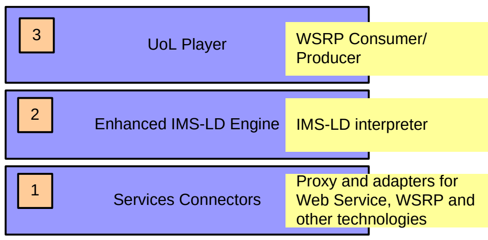

Figure 5.

An UoL delivery will walk across two phase: **startup** and **run**.

The first one is an initialization step where the UoL Delivery Service:

- Retrieves the concepts, within the UoL, interpreting the enriched LD document that describes it.
- Invokes (with respect to the didactic domain covered by UoL) the Localization Service in order to obtain the URL of one or more repositories providing learning objects. Localization Service maintains a registry (possibly UDDI) based on a primary level index that

maps associations between didactic domains and repositories storing LOs related to these domains.

- Performs queries over retrieved repositories with respect to concepts obtained by UoL. Queries return lists of metadata representing learning objects related to the required concepts.
- Applies filters over lists, obtained in the previous step, using parameters associated to all activities in the UoL in order to obtain a single LO for each activity. If the applied filter returns more than one LO for the same activity the system can select a single LO using learner preferences (preferred media type) and the technical.format field [8] of learning objects metadata.
- Performs binding between activities and real LOs (resource identificator and repository URL) obtaining a personalized unit of learning.

The second one is the an execution step where for each activity the UoL Delivery Service:

- Detects the resource identificator and the repository URL.
- Gets WSRP mark-up code from the right repository delivery port using values obtained in the previous step.
- Composes the obtained WSRP mark-up code with the overall GUI of UoL and returns the complete WSRP mark-up code to the client.

Conclusion

In this article we have described our solution for the construction and execution of personalized learning experiences based on: 1) an extension of IMS Learning Design to meet the need for domain-independent pedagogies; 2) an ontology-based approach to model didactic domains in which we can plunge the domain-independent pedagogies to obtain units of learning ready to be personalized and executed; 3) a distributed infrastructure for personalized units of learning delivery.

As future works, we are planning to develop the presented delivery architecture extending the IWT (Intelligent Web Teacher) platform implemented by MoMA [11]. Furthermore, we are planning to enrich the IWT platform with a set of authoring tools to cover all phases of units of learning building process. Nowadays, we are making experience with some open source software like Coppercore [9] for learning design scenarios execution and Reload [10] for learning design scenarios authoring.

References

[1] Schaeck T. and Thompson R. - Web Services for Remote Portlets (WSRP) Whitepaper, 28 may 2003.

[2] N. Capuano, M. Gaeta, A. Micarelli, E. Sangineto - An Intelligent Web Tutoring System for Learning Personalization and Semantic Web Compatibility. Proceedings of the 11th International Conference on Powerful ICT Tools for Teaching and Learning. PEG 2003, St. Petersburg, Russia, 2003.

[3] N. Capuano, M. Gaeta, A. Micarelli, E. Sangineto - An Integrated Architecture for Automatic Course Generation. Proceedings of the IEEE International Conference on Advanced Learning Technologies. ICALT 2002, Kazan, Russia, 2002.

[4] D. Fensel - Ontologies: a Silver Bullet for Knowledge Management and Electronic Commerce. Springer, 2001.

[5] IMS Learning Design Best Practice and Implementation Guide (Version 1.0 Final Specification). Available from: http://www.imsglobal.org /learningdesign/index.html

[6] IMS Learning Design Information Model (Version 1.0 Final Specification). Available from: http://www.imsglobal.org/learningdesign/index.html

[7] H. Hummel, J. Manderveld, C. Tattersall and R. Koper - Educational modelling language and learning design: new opportunities for instructional reusability and personalised learning. Int. J. Learning Technology, Vol. 1, No. 1, 2004

[8] IMS Learning Resource Meta-Data Information Model (Version 1.2.1 Final Specification) - Available from: http://www.imsglobal.org/meta data/index.html

[9] Coppercore project: The IMS Learning Design Engine - Available from: http://coppercore.sourceforge.net/index.html

[10] Reload tool - Available from: http://www.reload.ac.uk/tools.html

[11] MoMA srl, Intelligent Web Teacher v 2.0 White paper.

[12] Pythagoras Karampiperis and Demetrios Sampson - Designing Learning Services for Open Learning Systems Utilizing IMS Learning Design.

Francesco Orciuoli

Centro di Ricerca in Matematica Pura ed Applicata, Italy

Learning GRID Scenarios

One of the aims of our SIG is to define scenarios of use of a Learning GRID. The second issue of this newsletter presented five scenarios defined by SIG members. Six more scenarios will be presented below. New scenarios come from Akogrimo: a project dealing with GRID and mobile technologies applied to e-learning. More details on Akogrimo can be found on the third issue of this newsletter.

First Scenario: Networking Course by eLearning

Pedro is a literature student and has decided to study a Computer Network course next semester. This is a special course offered to students not related to Information Technologies which allows learning basic concepts on networking and focused on the Internet. This course is performed by the use of an eLearning platform. Pedro is a typical Internet user and would like to learn basic concepts related to IP technology.

The eLearning course is based on Internet concepts, covering historical issues as well as basic technical issues on IP technology which allows students to learn how the internet works and basic capabilities to design and configure simple networks.

While Pedro is travelling from Madrid to Paris by train, where he plans to visit the Louvre Museum, he decided to progress in this distance networking course during the long trip.

By using his PDA, he can access to the eLearning platform after being identified in the system and the platform informs him about his status in the course. Next topic to cover is the IP protocol. So, Pedro can read documents on IP addressing available in the platform and perform several network simulations to build medium and large enterprise environments. He is quite interested in enterprise networking because he belongs to a group of three students that must present a design and configuration of a company network to demonstrate they had learnt IP basic topics. The simulator allows him to modify addressing configurations in order to analyse the efficiency in the transmission and switching resources as well as the scalability of the network. The output of the simulator is based on numerical results since the graphical capabilities of his terminal don't allow a high quality video. Pedro doesn't understand some of the results of a case study, so he decides to switch on his laptop and request the platform to provide graphical information of a flow of packets between two hosts. The platform shows in the laptop a virtual reality representation which allows Pedro to see himself riding an IP packet from the source to the destination, learning the reasons for the decisions and the packet modifications in each hop.

By analysing this case, some questions related to IP masks arise and Pedro decides to contact directly to some assistant in real time by using a videoconference application in his PDA. Due to the immediate entrance of the train in a tunnel, the PDA decide to avoid UMTS videoconferencing service and use the public WLAN infrastructure available in the train to contact the assistant by using VoIP without video.

After solving the questions, Pedro decides to establish a connection with his colleagues to try to discuss and hopefully finish the work of this topic. The eLearning platform puts the three students in contact and, taking into consideration their personal work, allows consolidating a unique network design. They use a cooperative network design application provided by the eLearning platform to consolidate the work done locally by each member and to discuss some design decisions. There are some disagreements on the addressing design so they decide to proceed with two proposals to solve it.

They order different simulations with the different solutions to be able to compare them and ask the system to provide network addressing designs of real networks with similar capabilities and environments.

After the process, they agree on a final solution (Pedro finally was right) and decide to submit the addressing design work to the professor and wait for their approval to go further into the last topic of the course: multimedia applications.

This scenario describes a process that can be predefined. The available services are known. They don't have to be selected or configured dynamically. Context specific information is only needed to select the most suitable network. The process flow itself is not related to the situation the user is in. The only system to be considered as knowledge based is the eLearning platform by itself, but there is no use of knowledge based systems for the configuration of the workflows and processes.

In accessing the Grid via multiple nodes e.g. PDA or laptop in fast moving environments (train) to get in contact with multiple distributed infrastructures and applications the student exploits the idea of Grids and mobility. He takes part in a VO in being an active participant of it. The student provides "mobilization service" by carrying a PDA. The PDA, a simple computer hardware resource, facilitates access to the Grid to obtain information, and transmit parameter to launch simulations, but is not a part of the running network simulation. Thus, it takes the part of a service requester. Solely, the videoconferencing capability states a service provided by the resource, but the resource is not shared for multiple requesters, and it's not obviously a part of a higher level service (where e.g. any kind of image analysis or transformation would be done). As a result, the resource is mobile, exploits Grid services, but poses no relevant services to the Grid.

Second Scenario: Featuring Immersive Virtual Reality

A student is learning water table and aquifer behaviour by using an eLearning platform. While he is at home, he studies aspects of the water table and aquifer behaviour by interacting with books and some multimedia resources through the remote eLearning platform. Initially, he connects his PDA to the platform by using a WLAN home network and accesses to introductory books which provide him initial knowledge on that matter. After this basic knowledge, he needs to contact a professor to answer some questions. The professor is busy in a meeting but he proposes to him to answer his questions by using a virtual reality service provided by the platform.

So he decides to use a dynamically generated set of services which are brought together and delivered to the student according to his user profile and current device capabilities to create an immersive virtual reality situation.

He must move to the university to attend a presence lecture, so he changes the session from his home computer to his PDA. When he arrives at the university, the platform informs that the virtual reality environment is ready for use but the PDA capabilities do not allow a virtual reality scenario, so the platform notifies him potential locations where he can perform the immersion.

After that, he goes to the nearest one in which he can interact with the system by using special tools like gloves and glasses, where he explores and develops their own personal understanding and knowledge, without physically move to the real scenarios. This allows him to go deeper on the behaviour and characteristics of aquifer behaviour and water tables.

He experiments different situations, by immersing in different virtual situation exiting in real life. In each virtual site he meets with students and interacts with them. Learning occurs in a natural way by product of experiments and interactions with other students.

Virtuality in this scenario is the main focus. He changes his physical location, but he is more a nomadic user, who settled once, begins the usage of the Grid. The services accessed by student are mainly information, communication, and service locating services. Apart from the service requests and the specification of his mobile computer hardware, the student does not provide any additional information or resources to the Grid. He exploits Grid capabilities like session maintenance, but is not an active service provider himself.

Evaluating this scenario can be done with the same argumentation and results as it was done in the previous scenario. Only user profiles are context knowledge that could be used to a context or user specific configuration of the process described in this scenario.

Third Scenario: Featuring the Virtual Laboratory

This year the head of the High School "Akogrimo" has informed the students about a new feature to be introduced during this year. The old laboratory of chemistry has been closed and will be replaced by a quite modern one which will be used by the student. He informs that for this purpose the students will have to access by using a network computer and that it will be possible to attend remotely or in site.

Students access the system by using different terminals: PDA, laptop, PCs, etc. to a virtual laboratory to carry out experiments. There is also an agreement among the high school and multiple entities with supercomputer facilities allowing to specify complex analysis and to test them in different involved entities. Students are identified in the system and a status of their work is stored at their user profile.

During the performance of the test, typically done in groups of three students they have capabilities to discuss among the group members independently of where are located each one and to try to contact the professor to answer some questions. From time to time a synchronization period allows comparing results between groups and getting partial marks.

Sometimes, the output of the virtual laboratory is based on numerical results but in some cases they can also show graphical representations. Depending on the terminal capabilities of each student, the output is adapted. When the students access the laboratory, it informs them about the status of the work in progress, as sometimes it needs long periods of time for distributed simulations or aggregation of information located in multiple sites, to allow the student to break without loosing the work done before.

Multiple, even mobile, resources accessing a simulated, virtual surrounding in a virtual organisation makes the strength of this scenario. The students in this case are involved in a common workflow. Access to their elaborated work is granted for collaboration, reviewing, and simulation. As described these information or knowledge resource are available on the Grid, but not or even preferably not provided straight through the mobile computer hardware. The typical mobility aspect is missing, because the students work in wireless and distributed, but not in moving environments.

The integration of distributed information is a characteristic feature of this scenario. A knowledge processing grid service could facilitate this task. Beyond this no knowledge based process control or workflow configuration is needed. The Grid facilitates the interaction of the users, but no coordination support is provided.

Fourth Scenario: The Field Trip

This scenario, based on the traditional field trip augmented by appropriate use of information and communication technologies, illustrates experiential, contextualised, collaborative and personalised learning for knowledge creation and sharing. Figure 1 depicts the scenario.

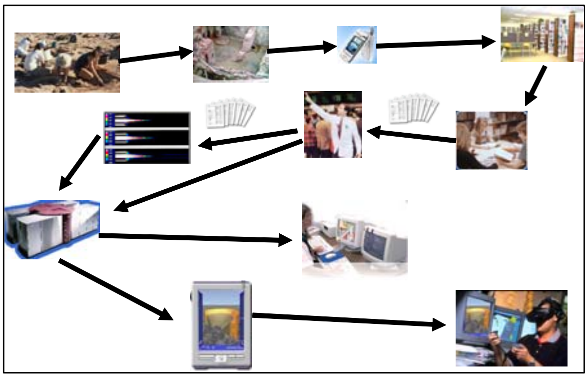

Figure 1. The Field Trip Scenario

There is a group of students, all equipped with a 4th generation PDA, that for their Archaeology spring exam are working on the Field Trip project. During their activity they store information, experience, emotion, in terms of photos, video clips, text notes, audio comments, etc. The PDA, using the user profile and context dependent information automatically indexed these contents using appropriate metadata. The information collected by all students are send via the appropriate network (the PDA will negotiate with the network service provider operative in that zone which kind of network communication will be used according to the bandwidth necessary, the price, etc.) to the Field Trip (FT) Grid service created by the teacher of the course for their project. The PDA will use user biometric data for secure access to Grid based virtual learning organisation and for data ciphering. The FT Grid service, orchestrating speech to text Grid services (provided by Company A) and advanced semantic tool for text interpretation virtualised as Grid services (provided by Company B), will analyse the student's information comparing them with the learning objective foresees for the project experience and formalised in an ontology based knowledge representation (concepts to be learned, goals to reach, relationships, etc.). It summarises them from the learning point of view in term of progress and weakness to the teacher. It stores all the information in a multimedia repository Grid service. At the end of the day the students working in the field trip meet for sharing their experiences and for consolidating the knowledge acquired. They will use the PDA speech recognition capability for sending commands to the search engine in order to retrieve the information and for their visualisation. During these sessions it is frequently necessary to consult digital libraries (provided by different organisations) for finding new information or for checking some hypothesis done and/or evaluations made about the provenience of discovered objects.

During the daily work in the field trip some collaborative sessions with other students in the school are needed in order to share their experiences. To this purpose the students collect with their PDA some photo of the field trip and the objects discovered and send them to the Virtual Collaboration Grid service asking to make them in 3D. The VC Grid service invokes the high performance 3D modelling and rendering tools (provide by the High Performance Computing Centre of the University) virtualised as Grid services in order to make the 3D reconstruction and rendering them. In order to make more productive the experience the FT Grid service, using the context data and the information collected by the single student, provide them the possibility to discuss with selected (by the teacher) experts on the field (historical period, zone, objects nature, etc.). Moreover, using semantic based Grid service searching and location capability it will provide information about the availability of other groups in the same zone or in different zones but with affinity with their work and belonging to different Grid enabled virtual learning organisations in order to share their experience.

In this scenario, the typical Grid perspective in combination with mobility is described: Changing physical location of nodes, active building of VO and processing of context related information in distributed areas, also the need for timely high performance computing power. The student provides different multimedia information directly over the PDA and other additional input sensors to the Grid. The processing is done by a Grid service. Thus, the PDA and corresponding sensor are becoming a relevant resource to provide Grid services in a VO, actively. Another very important point can be seen in the relocation of higher Grid services (or at least parts of these services) on a mobile computer hardware resource - the dynamic set up and maintenance of Grid services and VOs on the PDA of the teacher in this particular case. All members of the course and the teacher can access and process all collected information. Solely, the shared access to the mobile resource is a criterion not directly needed.

Numerous Grid services described in this scenario are knowledge based services, for instance the service that evaluates the learning progress. The results of this evaluation can be used to advice the next steps the students should do. Additionally, sensor data which describe the field the study is done is also considered in the evaluation of the learning progress. The learning results of each student are prepared, transferred into documents and images, and made available to the other learners in the group.

Fifth Scenario: English plan

A group of students with a similar initial level are in an immersion program that ends with the access to an official certification exam. The program consists on a week trip to New York. Each day the student has to send a report to his/her tutor about a concrete subject and based on the activities program designed by the tutor. The student uses the pronunciation testing service to repeat two or three times the developed report and so improving his/her pronunciation.

For example: A visit to the New York Stock Exchange. During the night before, the student, using his PDA and the hotel Wi-Fi network, consults in the service basic documentation as contextual vocabulary, terms for travelling through the city, online dictionaries, chats and forums, and related work made by other students about similar subjects. The relationship among the students is established taking into account their personal situation, level, etc. When the student ends the reports, he/she accesses to the Evaluators Virtual Network via a voice authentication mechanism, and perform an official exam.

As part of the exam, some students collaborate creating a virtual scenario which reproduces some of the activities taking place during their travel to New York. Besides, the program will be in a language knowledge community, where they can interchange experiences, search information and transform the reports in explicit knowledge available by everyone in the community.

The scenario described can be realized by using Mobile Grid technology. But no essential requirement is described. The user exploits the capabilities of his mobile computer hardware (PDA) to access services provided through the Grid. He transfers audio and video signals to a Grid service and acts as a services requester only. No resource provided by the user is needed to orchestrate a higher level Grid service upon the Virtual Organisation the user is participating in. Mobility can improve the convenience to use the service, but is no prerequisite for the execution of described Grid service.

Like all described eLearning scenarios apart from “The field trip”, the knowledge based capabilities are integrated into the learning environment service. A relation to other services and the combination of multiple knowledge based services to fulfil tasks is not obviously needed. The learning guidance is scarcely assisted by any structured process flow. Each learner has a freedom to choose the appropriate learning, or teaching partners and materials. The knowledge is mainly focused on the service requester, the learner, itself.

Sixth Scenario: How to elaborate a business plan

A business man, responsible for the opening of an enterprise branch in Japan, must show a business plan to his new partners in a future meeting. His intention is to improve it before the meeting. He has access to the corporative resources that he needs, adapted to the user location and the device used.

Although he is confident about how to create the plan, he downloads to his PDA, using the Wi-Fi network in the airport, a course about how to make a business plan.

During the flight he reads the course and some doubts arise. He connects with a Grid service that allows locating an available tutor on that moment and providing a videoconference service. With the answers, the business man can start working.

When he has an initial business plan, he accesses to a profitability simulator service (one of the active learning services available) where he can match the economics data of his business plan.

The Analysis of this scenario is very similar to the “English Plan” described about. The user consumes Grid services such as Virtual Assistance, Learning Support, or Simulation. The participation in the VO is limited to call the service, provide parameter or configuration information. Mobility and location specific information are of minor importance for the proper service execution.

The given description only requires a static configured information service providing instructions on how to develop a business plan. This knowledge is provided explicitly, but is not exploited to created process where the business man can interactively create the business plan. A combined application of several knowledge based systems can be indispensable to link all information necessary to compile a comprehensive business plan.

Giuseppe Laria

Dep. of Information Engineering and Applied Mathematics, University of Salerno, Italy

Research Project Focus: AstroGRID

Introduction

Astronomical objects emit information in every portion of the electromagnetic spectrum (infrared, radio, ultraviolet, X-ray, gamma ray, and more), and not just in the visible or optical portion. There is specific astronomical equipment specially designed to detect that information, and there is also computer infrastructure to store and analyse the data received by these instruments.

In addition to the data management and storage difficulties, astronomers and computer scientists have to deal with the problem of how to process this data. It is at this point where things became critical, since at the moment of processing astronomical data there cannot be agreed standards for all the range of information that is collected. Hence information regarding a particular astronomical body can be stored in different formats in different data centres, and even the same object can be catalogued with a different name. This is due to the lack of wide accepted international standards to catalogue, process and access astronomical information.

In this context the Virtual Observatory (VO) – under the umbrella of the International Virtual Observatory Alliance [2] (IVOA) – is playing an important role, helping with information standardisation to interconnect different astronomical data centres around the world. This process is usually called data “federation”.

Figure 1 shows a simplified example of how the astronomical data is collected in observatories, the aims of the VO is make this information widely available for astronomers and scientists, effortlessly and at hand’s reach.

The IVOA is organised in different working groups with people belonging to the following VOs: the Astrophysical Virtual Observatory (European Union), China-VO, VO-India, the Canadian-VO, the Spanish-VO, DRACO (Italy), VO-France, the German Astrophysical Virtual Observatory (GAVO), the Hungarian-VO, the Japanese-VO, the Korean-VO, the National Virtual Observatory (NVO-US), the Russian-VO and AstroGrid (UK).

AstroGrid Project

AstroGrid [1] is a £10 million project aiming to produce more economic, faster and effective astronomy through the generation of open standards and interfaces in alliance with the IVOA. The AstroGrid framework helps to enable different data centres across the United Kingdom to publish services and data into a data-grid infrastructure accessible on the Web.

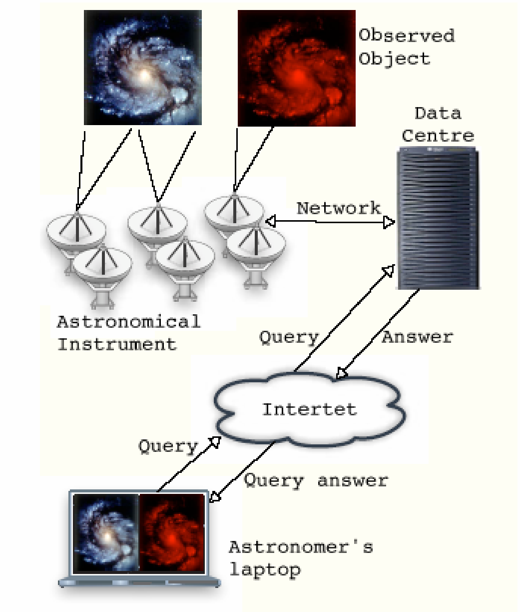

Figure 1. Astronomical data capture process

Such a framework also makes it easier for the different astronomical data centres to interact; it offers a wide range of analysis and visualisation tools through a common interface.

As aims to define astrogrid goals a series of "key science drivers" [6] have been specified through consultation with astronomers and internal meetings. In the following section we can see an example of 10 key science drivers, which form a set of AstroGrid's requirements.

- Discovery of High Redshift Quasars
- Locating galaxy clusters at a range of redshifts
- Brown Dwarf selections, involves optical and near
- Deep Field Surveys
- Low Surface Brightness galaxy discovery
- Solar Coronal Waves
- STP Solar Event Coincidence
- Supernova galaxy environments
- Solar Stellar Flare Comparison
- Magnetic storm onsets

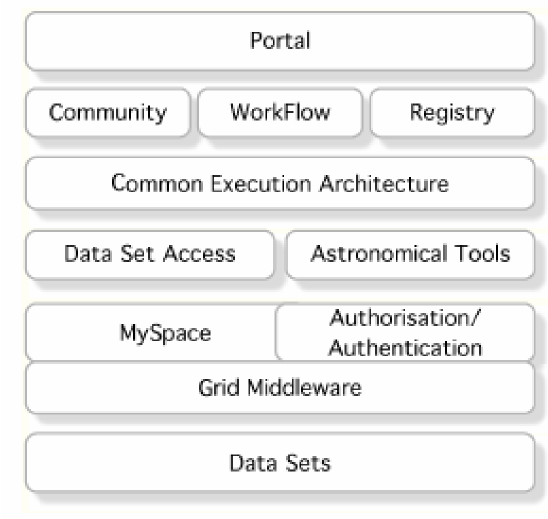

Figure 2. The AstroGrid Architecture

AstroGrid Architecture

In concordance with the construction of the VO, AstroGrid has a modular architecture as illustrated in Figure 2, where a high level architecture abstraction is shown.

- **Portal**: Server-based component which delivers an interface for accessing services in the VO. In AstroGrid all the components which need to interact with the users will do so through a Portlet.
- **Community**: Allows the construction of flexible communities within a group. Once the permission has been assigned to a community administrator, he/she will be responsible for assigning rights to individuals.
- **WorkFlow**: Enables the construction of complex tasks like building queries and data analysis, upload/download data and render the output in a different format like tables or images.
- **Registry**: Contains descriptive information about resources available, which is based on IVOA standards. A resource can be a data set, web service, service, information on other registries.
- **Common Execution Architecture**: CEA is an abstraction of application components and the necessary parameters to run it.
- **Data Set Access**: Interface component able to take a standard query, translate it into a dataset and execute it, and return later the result to the data centre.
- **Astronomical Tool**: A number of essential astronomical tools such as object catalogue

builder SExtractor and photometric redshift analyser HyperZ (which are freely available) are incorporated to AstroGrid through a portal wrapper.

- **MySpace**: Defines a virtual space to allocate both temporal and long term data, such as data sets generated by queries submitted to databases. MySpace is not necessarily in a local repository, but it will interact with the user as easily if it were on a local machine.
- **Authorisation / Authentication**: Component in charge of identification and granting of access to the users, as well as maintaining security in AstroGrid.
- **Grid Middleware**: Allows AstroGrid to integrate different astronomical data centres and to share resources in a co-ordinated way.
- **Data Sets**: Data allocated in a distributed way in different data centres across the United Kingdom in AstroGrid's case, and across the globe once the Virtual Observatory alliance will be fully working.

AstroGrid Development Process and Collaborative Work

The AstroGrid philosophy is one of an open collaboration of researchers. To allow people to work in partnership effectively, a range of web-based tools are used. In such a collaborative software development project there are different obstacles to be overcome before the collaborative development can become effective. Firstly, good communication is essential in many aspects. Developers need to be aware of information regarding the project as a whole, information regarding specific sections, and they need to be able to directly communicate with other developers. The latter is of high importance in the AstroGrid case. Developers working within the project are assigned tasks in so-called development cycles which are specified by astronomers through definition of science cases (which are the key science driver present in the above section).

In some cases more than one cycle or iteration is necessary to achieve a goal. In any case task assignment is under constant review by the project leaders, with a view towards reallocating human resources when and where they are needed.

The benefit of an approach like this is a highly cross-trained development team. For example in the case of a member's absence another developer who has previously worked on that area can be assigned the task. The fact that, at some point, they would have worked in the particular area will mean they can quickly reintegrate themselves into the development team for the particular project module. However, adequate facility for communication must be in place for developers to be able to exchange ideas and to make and to respond to queries.

AstroGrid and Web Services

Architecture and development process present the framework for AstroGrid, but how is this architecture to be put in place? And, more importantly, how different VOs communicate with each other? At the heart of its architecture AstroGrid (and the other VOs) is working with widely accepted standards such as XML, and the following web services protocols:

- Simple Object Access Protocol, SOAP [3]: is used as a wrapper for XML messages providing an XML-RPC mechanism.
- Web Services Description Language, WSDL [4]: is used to describe services available.
- Web Services Registry [5] [7]: AstroGrid in conjunction with the VO is developing its own registry standard. Thus an astronomer can search, get details and make use of services depending on authorisation.

References

[1] AstroGrid. (2005). Astrogrid portal, http://www.astrogrid.org

[2] IVOA. (2005). International Virtual Observatory Alliance, http://www.ivoa.net

[3] SOAP. (2005). Simple Object Access Protocol, http://www.w3.org/TR/soap/

[4] WSDL. (2005). Web Services Description Language, http://www.w3.org/TR/wsdl

[5] Registry. (2005). IVOA Resource Registry, http://www.ivoa.net/twiki/bin/view/IVOA/IvoaResReg

[6] AstroGrid Science Problems, http://wiki.astrogrid.org/bin/view/VO/ScienceProblemList

[7] R. Plante, G. Greene, R. Hanisch, T. McG-lynn, W. O'Mullane, R. Williams, R. Williamson. (2004). Resource Registries for the Virtual Observatory. Astronomical Data Analysis Software and Systems XIII ASP Conference Series, Vol. 314, 2004 F. Ochsenbein, M. Allen, and D. Egret, eds.

Pedro Contreras and **Fionn Murtagh**

University of London, UK

Technology Watch

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

Open Knowledge Initiative

Introduction

The Open Knowledge Initiative™ (O.K.I.™) is a multi-institutional, multi-year project led by MIT and Stanford and funded by the Andrew W. Mellon Foundation. It is a highly collaborative effort to enhance learning by creating an open programming environment that supports sharing and pedagogical experimentation. It develops specifications that describe the communication processes between the different components integrating an educational software environment. Furthermore, it describes also the interaction with other systems. Since it was born in 2001 it has created big expectations in the learning community that are in their way to become real. The project is in the middle of its second phase of development and is expected to be concluded by the end of 2006. However, it seems that the O.K.I.™ work is nowadays a compulsory reference for all of those working in the e-learning and education field, thus the continuity of the initiative appears as clear.

Description

The Open Knowledge Initiative™ represents a great effort towards the standardisation of e-learning components, applications and systems promoting the creation of a solid learning community by using Learning Management Systems (LMS) compatible among them. It defines architecture on how the components of a Learning Management System should communicate and interact. However, O.K.I.™ is not to be considered only as an academic initiative as it is seeking to open new markets for educational tools and contents by focusing on modularity and integration in a learning environment.

O.K.I. develops specifications in order to create components and systems that may be interconnected and interoperable. This will lead into the possibility of interconnecting different complex components obtaining full e-learning environment functionality. To reach this aim, the Open Knowledge Initiative has developed since 2001 what has been called Open Services Interface Definitions (OSID) that are defined as *an abstraction layer between the programmer and the enterprise infrastructure systems of his or her campus* [1].

The OSIDs defined are: Assessment, Agent, Authentication, Authorisation, Course Management, Dictionary, Filing, Grading, Hierarchy, ID, Login, Repository, Scheduling, Share, SQL, User Messaging, Workflow and Workflow. These allow the interaction and interconnection among all the actors and components involved in a regular web based learning scenario [2].

O.K.I.'s OSIDs provide access to two categories of services for the support of enterprise applications:

1. *Common services* that address infrastructure systems critical to most enterprise applications, including educational ones, which range from authentication to workflow.
2. *Educational services* that include elements of direct value to educational applications, such as Assessment. (Testing and quizzing students online) and Course Management (providing access to student information systems) [3].

All the development was initially done with Java technologies and during the project life-time, other technologies have been incorporated such as C#, Perl or PHP. Although O.K.I. develops open source code, this does not mean that the final result is free. It offers some trial versions for free but with no guarantee and no support. As it was stated before, this software is more than a pure academic initiative and it has a high commercial value.

Benefits

As presented in the above paragraphs, the main obtained benefit in using the O.K.I.™ architecture, is the interoperability and communication facilities. This results in an extremely valuable property which is scalability. Once the architecture is adopted, the inclusion of new components and/or functionalities is very quick an easy to perform. Moreover, there is a set of benefits that are worth to be mentioned, and which appear in the following list:

- *Flexibility*: Given the architecture that O.K.I.™ proposes adding new functionality can be done in a very easy way. The new functionalities should be encapsulated within a new component that should have the same communication protocols that the rest of the objects. This ensures the incorporation of the new features without any problem.

- *Scalability*: The structure presented by the O.K.I.TM allows the creation of complex systems with no boundaries related to the size of the courses, number of students attending the courses or possible locations. It has been tested and proved to be a robust and stable architecture with no size or workload restrictions apart from those imposed by the technology itself.
- *Cooperative development*: The common structure proposed and the standardisation in communication procedures makes the O.K.I.TM an optimum way for cooperative development. All the actors involved in the educational procedure (educators, students, content providers, authors, etc.) may contribute to the enlargement of the community. This allows to share materials and knowledge in an easier way for all. It also means a clear market advantage for those following the O.K.I.TM rules as far as they may interchange applications, components and contents among each other without caring about the final integration.
- *Contribution to Standards*: The O.K.I. is linked to the main movements for standards' creation. It is contributing to the standardisation in the education field by working on the existing standards and developing new ones. This includes a partnership with the IMS Global Learning Consortium[4], the Advanced Distributed Learning Network (who provides the Sharable Content Object Reference Model, SCORM)[5] and the Java Administration Special Interest Group[6] among others. The main significance of what has been explained before is that the work of the O.K.I.TM has been validated from various points of view and is being recognised by the main actors involved in the market.

Links

As it was mentioned in the previous paragraph, the O.K.I TM is linked to the main standardisation groups. It is not the mission of O.K.I. TM to produce specifications but to have an impact on future ones trying to establish them in accordance with the market needs.

To accomplish this goal of impacting on the future educational standards, O.K.I. TM is linked with the most relevant standardisation bodies regarding education and learning community and with companies involved at worldwide level in education and e-learning market.

The main organisations collaborating with the Open Knowledge Initiative are the following:

- *Commercial partners*: Giunti Interactive Labs, Nolaria Consulting and Verbena Consulting.
- *Standardisation partners*: IMS Global Learning Consortium and Advanced Distributed Learning Network.

With these alliances and collaborations, O.K.I. TM ensures that some of the most important actors are involved and that they have the possibility of influencing the specifications from the market point of view.

Learn more about the O.K.I.

The description presented here is just a very brief summary of what is O.K.I.TM. In order to learn more about them and their work the main references to visit are:

- Jeff Merriman, "About O.K.I.", July 2004.
- Jeff Kahn, "O.K.I. Case Studies – Federated Searching", December 2004.
- Scott Thorne, "Service Architecture Analysis", November 2004.
- Scott Thorne, Jeff Kahn, "O.K.I. Architectural Concepts", March 2003.
- Vijay Kumar, Jeff Merriman, Scott Thorne, "Full Report to Mellon Foundation", February 2004

All these may be consulted on the O.K.I. Project website www.okiproject.org. Other sources to be consulted are the following:

- http://sourceforge.net/projects/okiproject. On this web site you will find the complete Java specification for the Open Service Interface Definitions.
- http://www.okiproject.org/project/prods.html. Other projects and products related to the O.K.I. TM Project.

References

[1] http://www.okiproject.org/specs/

[2] http://www.okiproject.org/specs/

[3] http://www.okiproject.org/documents/

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

[5] http://www.adlnet.org

[6] http://www.ja-sig.org/

Blanca Jordan

Atos Origin, Spain

Learner Profiling Specifications

The generation and management of learner profiles (and, more generally, user profiles – i.e. including instructors/tutors, other content providers and any other user roles) is likely to be an integral part of any sophisticated Grid-based learning system. Profiles of users are necessary for several different aspects of the working of such a system:

- System administration, such as maintaining security and managing access rights;
- Course administration, such as assessment and progress monitoring;
- Personalisation – automatically providing learners with the learning content that is most appropriate for them individually.

The management of user profiles in a Grid system can be seen as just one aspect of metadata management on the Grid in general – just as the physical, computational and educational resources within the system all have metadata associated with them so do the users of the system. Just as there are structured metadata schemas for describing learning objects (such as the IEEE-LOM) that allow a system to know about the learning resources it manages, there are schemas for learner profiles that allow a system to know about its users.

Several schemas for learner profiles have been developed, but no de facto industry standard has yet emerged. As we will see in the following sections, these existing schemas tend to focus on facilitating the storage and transfer mainly of administrative information, with a lack of focus on data useful for providing personalisation. This means that, for the developers of systems taking full advantage of new learning Grid infrastructure to provide personalised learning experiences, none of the existing schemas may capture all of the information necessary on its own, and there may even be some necessary information about the learner that is not included in any existing schema.

The data needed will differ between learning systems and depend on the exact functionality provided by the particular application. This presents system designers with a dilemma: should they create a whole new schema from scratch, ignoring proposed standards and to a large extent "re-invent the wheel" just so they can include one or two additional elements that do not appear in existing specifications, or should they work with an existing standard specification but settle for a system with reduced functionality?

One possible solution to this dilemma will be suggested towards the end of this article, but first we will review some of the main runners (a representative, but not exhaustive collection) in the race to a standard learner profile.

vCard

The vCard schema [1], maintained by the Internet Mail Consortium, forms the basis several of the more detailed personal profile specifications. It covers the basics of personal (and business) information.

eduPerson

eduPerson is an object class developed by the Internet2 consortium as part of the EDUCAUSE project [2,3]. It provides an eduPerson LDAP object class that includes the most widely used attributes of people involved in higher education. The person class descriptions can be used in campus LDAP directories in order to facilitate communication and user information interchange between educational institutions. The eduPerson class consists of a set of data elements and attributes about individuals within a higher education institution, along with recommendations on the syntax and semantics of the data that may be assigned to those attributes.

The specification is very much geared towards administration and identity management across higher education institutions, and so contains little information that would be of use in providing personalisation. It is used primarily by US universities, but a customised version called UKeduPerson [4] has been developed by the London School of Economics (LSE), driven by the needs of UK institutions to share learning and teaching resources more freely and the needs of the Shibboleth project [5] for more sophisticated access to password-protected web resources.

PAPI-LEARNER

The IEEE Public and Private Information – Learner (PAPI-LEARNER) [6] is a proposed standard still in draft form, although not modified since 2002. It is a data interchange specification used for communication among cooperating systems. The PAPI standard specifies both the semantics and the syntax of a learner model that can be used to store the information associated with a teacher or learner, in a format appropriate for use by learning technology systems. It defines a set of elements for recording information concerning the learner, categorised into six classes, each of which has separate security and administration. Their initial letter identifies them:

- **N**ame – personal information primarily used for administration (e.g., name, address, social security number)
- **R**elations – learner's relationships with other users of the system (e.g., cohorts, classmates)
- **S**ecurity – security information (e.g., public and private keys, credentials)
- **M**y Configuration – preferences to improve human-computer interaction (e.g., useful and unusable I/O devices, learning styles, physical limitations)
- **G**rades – performance information (e.g., grades, reports, log books)
- **W**orks – portfolio information as an illustration of abilities and achievements (e.g., accomplishments, works)

The standard profile data can be extended with additional information to give "conforming" data, although it will not be "strictly conforming".

IMS-LIP

The IMS Learner Information Package [7], originally developed by the IMS Global Learning Consortium to enable interoperability of IMS-compliant servers, is probably the current front-runner in the race to become a standard for learner profiling. It has gradually seen more widespread acceptance and use in diverse educational systems, and in 2004 it was chosen as the basis for the CEN/ISSS "Guidelines for the production of learner information standards and specifications" [8], effectively making it the basis of a European standard for the transfer of learner information.

As announced in the January edition of this newsletter the version 1.0.1 specification has recently been released, with only minor typographical changes and clarifications of version 1.0.

The main sections of the profile include: identification data, accessibility requirements, learner goals, qualifications, current activities, competencies and interests.

Profiling for Personalisation

Of the schemas presented here, IMS-LIP and PAPI are the two most suited to being of use in the provision of personalised learning experiences tailored towards the individual learner. This is because these schemas include elements for the recording of learner histories, current activities and learning goals. However, it is still unlikely that any of the learner profiling schemas will include absolutely all of the information required by any particular learning system. One reason for this is that the schemas provide only a syntactic structure for storing such information: a space is provided for a free-text block to describe the learner history, goals, and so on, but there is not really scope for the use of structured vocabularies or ontologies. This limits the machine-processability of such learner profiles.

It is possible to leverage the syntactic structure provided by these learner profile schemas whilst exploiting the power of Semantic Web technologies by populating the profile elements not with free text but with data encoded in languages such as RDF and OWL. This approach enables semantically enhanced systems to provide advanced personalisation services, but our original dilemma remains: what to do when the necessary profile elements do not all appear in a single profile schema, or not in any schema at all?

One solution is to encode the whole of the learner profile (not just the free-text sections) using RDF. This provides the additional advantage of being able to pick whatever elements are necessary from multiple schemas while remaining interoperable with other (RDF-aware) systems [9,10]: rather than needing to invent a completely new data model when new profile elements are required, the demographic and other common data catered for in existing schemes (such as IMS-LIP and PAPI) can be represented using the relevant elements from the existing schemes, and this can easily be enriched with extra elements where necessary. This is the approach that we adopted in the SeLeNe project [11] and expect to adopt in the new L4All project [12].

References

[1] Internet Mail Consortium, *http://www.imc.org/*.

[2] Educause, eduPerson Object Class, *http://www.educause.edu/eduperson/*.

[3] UCAID (2003). EduPerson Object Class Specification. *http://www.nmi-edit.org/eduPerson/internet2-mace-dir-eduperson-200312.pdf*.

[4] UKeduPerson, *http://www.angel.ac.uk/UKeduPerson/Reference*.

[5] Shibboleth Project *http://shibboleth.internet2.edu/*.

[6] IEEE LTSC (2002). PAPI Learner, Draft 8 Specification. *http://edutool.com/papi/*.

[7] IMS Global Learning Consortium (2005). IMS Learner Information Packaging Information Model Specification, Final Specification Version 1.0.1. *http://www.imsglobal.org/profiles/index.html*.

[8] CEN (2004). Guidelines for the production of learner information standards and specifications, March 2004. *http://participant-info.jtc1sc36.org/doc/SC36_WG3_N0120.pdf*.

[9] Dolog, P. and Nejdl, W. (2003). Challenges and benefits of the Semantic Web for user modelling. In Proceedings of AH2003: Workshop on Adaptive Hypermedia and Adaptive Web-Based Systems, Hungary, USA and UK, 2003.

[10] Keenoy, K., Levene, M. and Peterson, D. (2003). Personalisation and Trails in Self e-Learning Networks. SeLeNe Deliverable D4.2, London, 2003. *http://www.dcs.bbk.ac.uk/selene/reports/Del4.2-2.1.pdf*.

[11] SeLeNe, *http://www.dcs.bbk.ac.uk/selene*.

[12] L4All, *http://www.lkl.ac.uk/research/l4all.html*.

Kevin Keenoy and George Papamarkos

London Knowledge Lab,
Birkbeck, University of London, UK

News

By Angelo Gaeta

IMS General Web Services Public Draft Specification

2005 March 1st

The General Web Service Base Profiles provide a basic structure for the definition of Web Services. They consist of a set of non-proprietary Web Services specifications, along with clarifications and amendments to those specifications that promote interoperability. The General Web Services Base Profiles address the most common problems experienced when implementing Web Services specifications. The General Web Services Base Profiles define the selection of mechanisms within referenced specifications that are well understood, widely implemented, and useful.

The General Web Services Base Profiles promote interoperability across web specifications implementations on different software and vendor platforms. The Base Profiles focus on a core set of Web Services specifications and the most common problems experienced implementing the identified Web Services specifications. It is not a goal of the General Web Services Base Profiles to create a plug-and-play architecture for Web Services or to guarantee complete interoperability. The General Web Services Base Profiles address interoperability in the application layer, in particular, the description of behaviors exposed via web services.

The General Web Service Base Profile is derived from the Web Services Interoperability Base Profile v1.1. The IMS recommendations for the General Web Service Base Profile (Core) are to adopt:

- XML Schema V1.0 - all data models in IMS specifications will be defined in terms of XML Schema (XSD);
- HTTPv1.1 - the Hypertext Transfer Protocol (HTTP) is the mandated protocol binding for the SOAP messages;
- SOAP V1.1 - SOAP is the mandated messaging protocol;
- WSDL V1.1 - an instance of the service is defined using Web Services Description Language (WSDL) v1.1.

The specification is available at http://www.imsglobal.org/gws/gwsv1p0pd/imsgws_profilesv1p0pd.html.

Gridbus Project Releases GridSim Toolkit 3.2

2005 April 1st

The Gridbus Project at the University of Melbourne, Australia, has released the next-version of Grid simulation software, the GridSim Toolkit 3.2 toolkit.

The new version of GridSim has been substantially improved. Improvements include:

- Multiple regional GridInformationService (GIS) entities connected in a network topology. With this functionality, a resource registers to its regional GIS entity. In addition, a regional GIS entity can communicate/query to other GIS entities about their local resources. In summary, this functionality allows a Virtual Organization (VO) scenario.
- A functionality to select/filter an event from the incoming entity's queue based on some constraints.
- Bug fixes in sending and receiving acknowledgement in GridSim and AdvanceReservation class.

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

The early version of our GridSim toolkit has been used/dowloaded by several academic and commercial organizations around the world including: California Institute of Technology, Argonne National Lab, University of Illinois, Manchester University, CERN, Carleton University, University of Ljubljana, National University of Singapore, Indian Institute of Technology, Tsinghua University, Sun Microsystems, IBM, Unisys, HP, British Telecom and EMC Corp.

The GridSim software has been used for modeling and simulating many interesting systems. For example, Unisys's usage in data center modeling and University of Ljubljana's extension of GridSim to support DataGrid. Our own usages include simulating economic Grid scheduler in a competitive economy model, economic based cluster scheduler and cooperative Grid federation.

To download the GridSim software, please visit the Gridbus Project Web site at www.gridbus.org/gridsim/.

MIT O.K.I. and IMS/GLC Collaborate to Evolve Open Service Interface Definitions

2005 April 12th

the IMS Global Learning Consortium (IMS/GLC) and MIT's Open Knowledge Initiative (O.K.I.) launched a collaborative change process for the next release of the Open Service Interface Definitions (OSIDs). This process will result in the third major release of the OSID specifications scheduled for later this year

The OSIDs define application programming interface specifications for service-oriented systems that are being adopted by a number of commercial and open source eLearning software products. Several IMS/GLC members, including SUN, Microsoft, Giunti Labs, University of Michigan, MIT, and Cisco Systems, have asked whether the O.K.I's Open Service Interface Definitions (OSIDs) can be made available as part of the IMS/GLC suite of eLearning interoperability specifications.

The collaboration between the O. K. I. and IMS/GLC marks the transition of the OSID maintenance and dissemination process, a necessary first step in considering adoption of the specifications by the Consortium.

As part of this effort, O.K.I. and IMS/GLC will be distributing the draft XML models for OSIDs (XOSID) via the IMS member and public websites. The Java language bindings of the OSIDs will also be distributed via the IMS website. PHP bindings also exist, and work is progressing on C# and Objective C bindings which will be distributed when available.

IMS/GLC has created a public forum to support the maintenance process for the OSIDs, located at http://www.imsglobal.org (look in the Quick Links section for "Specification Problem and Suggestion Reporting"). A document describing the process can be found on the IMS/GLC site and also at the O.K.I. project site, http://www.okiproject.org.

IBM, Microsoft, Others to Submit WS-RM to OASIS

2005 April 19th

BEA Systems Inc., IBM Corp., Microsoft Corp. and TIBCO Software Inc. announced they will submit the latest version of the Web Services ReliableMessaging (WS-RM) specification, comprising both protocol and policy assertions, to the Organization for the Advancement of Structured Information Standards (OASIS) for further refinement and finalization as a Web services standard. Incorporating broad industry feedback, the co-authors proposed a technical committee and charter to enable further review and industry collaboration on the proposed standard.

Reliable message-based communication can be a vital element to enterprise-critical applications. Reliable messaging includes the ability to ensure that a message exchange has been completed correctly with no messages lost or duplicated. For example, within an order processing system, it is critical for the application to know that all items have been received and none have been duplicated.

If a client using this application temporarily loses network connectivity during the course of order submission, reliable messaging ensures that the order is received once and only once. In some applications, it can also be important to know the correct sequencing of messages. The WS-RM protocol, together with the other Web services specifications such as those related to security, policy, transactions and coordination, can help provide a more secure, robust and scalable approach to reliable messaging.

The Reload Learning Design Player 1.0 is now available

2005 April 15th

The Learning Design Player is developed at the University of Bolton by Paul Sharples and Phillip Beauvoir. It is based on and uses the Coppercore Learning Design Engine as developed by the Open University of the Netherlands.

The features of this release are:

- Wraps the Coppercore (version 2.2.2) runtime engine within an easy to use management interface,
- Automatically launches and deploys Coppercore under a JBoss server,
- Interface allows for easy import/removal of Learning Designs into the Coppercore engine without the use of command line tools,
- Automatically reads a Learning Design and populates Coppercore with a default run and active user for every role found within the manifest,
- Easy launch - double click a role within the management interface and it launches in the Native Browser ,
- Cross-platform written in Java - (build only currently available for PC Windows).

It is available at:
http://www.reload.ac.uk/ldplayer.html.

The Reload Learning Design Editor version 1.0.2 is now available

2005 April 15th

The Learning Design Editor has been developed at the University of Bolton by Phillip Beauvoir and Paul Sharples. It currently supports Level A. Levels B and C will be supported later in 2005.

Main features of this release are:

- Intuituve User Interface for editing IMS Learning Designs,
- Built on Eclipse for fast native user interface,
- Embedded native Browser to view content,
- Project manager view to organise your Learning Designs,
- Resource manager view to organise your favourite files and web links,
- No need to import Resources, just point at a file in the content folder,
- More than one Learning Design can share the same Project folder and file content,
- Wizards to import and export as IMS Learning Design Zip Package,
- Level B support (in the 2nd version) and level C support (in the 3rd version).

It is available at:
http://www.reload.ac.uk/ldeditor.html.

Hampshire uses e-learning for pupils who can't get to school

2005, April 26th

Hampshire County Council has made Hampshire one of the first counties in the UK to offer a new type of e-learning class for pupils who are unable to attend lessons at school. Place2Learn, developed by Hampshire County Council's Education Other Than At School (EOTAS) Service, has been launched.

The service, funded by a £50,000 government grant, will use `up to the minute' computer software to offer a real-time online `classroom' for pupils who are unable to attend their school. These include youngsters who are medically unwell, emotionally vulnerable or permanently excluded from school.

The County Council is one of only 20 Local Education Authorities to date to offer pupils this particular type of live e-learning facility and by the end of the summer term, there will be at least 12 classes running every week, each with around five pupils. Each class will provide 50 minutes of live teaching and set assignments for pupils to complete in their own time.

Pupils are given a password allowing them access to the live classroom, where they can then interact with a tutor via the internet. Core subjects of maths, English and science are taught using tools such as PowerPoint, whiteboards, audio and video links, and throughout the lesson pupils can see and hear their tutor and ask questions.

In addition to the "live" classroom, Place2Learn will also offer a "non-live" learning environment for pupils to log on and complete lessons in their own time. Place2Learn tutors will interact with pupils via email and their own personal web pages. This "VLE" facility (Virtual Learning Environment) has been produced in partnership with the Wildern School in Hedge End and will go live in June.

Commenting, VLE Coordinator Paula Valledy said, "This is an exciting development for education in Hampshire, reflecting many of the aspirations of the Children Act, using 21st century technology to give pupils, who cannot attend school for a range of reasons, additional support in their core subjects.

"The tailored packages and the interactive element of Place2Learn should go some way to prepare pupils for their return to school both academically and socially"

It is available at:
http://www.publictechnology.net/

UK JISC Distributed e-Learning Programme kicks-off

2005 April 1st

In the UK a number of projects are beginning as part of a research programme on distributed e-learning, funded by the Joint Information Systems Committee. Several aspects of distributed e-learning are addressed, including:

- Infrastructure development – defining a web services architecture for e-learning
- Developing architectures and standards for repositories of e-learning and other resources
- E-learning tools – discovering where there are gaps in tools that currently exist
- Cultural issues and subject differences
- Exploring the cultural and legal issues around the sharing of e-learning content

Full details of the programme can be found at *http://www.jisc.ac.uk/index.cfm?name=programme_edistributed*.

More specifically, the London Knowledge Lab is leading the L4All project, which will create a system that records and shares learning pathways and trails via a pilot web portal. This will support collaborative learning and provide foundations for supplying personalised lifelong learning.

See *http://www.lkl.ac.uk/research/l4all.html* for further details.

When	What	Where
26-29 April 2005	**5th Annual Access Grid Retreat** The Access Grid Retreats provide an interactive forum for the Access Grid community to share recent experiences and research findings, to present ideas for future AG technical directions and to train and educate AG newcomers. http://www.mcs.anl.gov/fl/flevents/ag/agr05/	**California, USA**
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**
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**

When	What	Where
May 9-12, 2005	**SIGAW: Semantic Infrastructure for Grid Computing Applications Workshop** This workshop is designed to take a snapshot of promising research on semantic systems in the context of Grid computing and track emerging do-able solutions for developing a semantic infrastructure. Languages, tools and technologies are already available, in particular those borrowed from the Semantic Web community, the Digital Library community, and the Semantic Grid. However, much remains to be done. For instance, a semantic infrastructure leveraging common denominators between grid applications and architectures is needed. Additionally, semantic systems must easily adapt to tailor customized solutions for individual applications. Some lightweight versions must be available to facilitate customization and integration in existing environments (for instance problem-solving environments). Other systems need to scale to the volumes and diversity of the data. As successful prototypes move towards deployment provisions for maintenance will have to be made. The workshop is seeking papers presenting innovative research, design, and lessons learned with an emphasis on scientific applications. http://www.csm.ornl.gov/~7lp/workshop/SIGAW.html	**Cardiff, UK**
10-12 May 2005	**Next Generation Internet - Demonstrations at Telecom cITy** Eurolabs is a European IST project that integrates new networking technologies, applications and services. It organises advanced demonstrations at Telecom cITy, the Belgian ICT fair, including Grid computing and IPv6-compatible applications. Demonstrations will include: BEgrid (see a real Grid in operation), home networking devices (control your house from anywhere) and multimedia streaming to an iPAQ http://www.ist-eurolabs.org/Documents/labstcity.pdf	**Brussels, Belgium**
18-20 May 2005	**Computer Supported Inquiry Learning** A workshop for a Kaleidoscope special interest group which aims to bring together expertise in self-directed inquiry learning and the design of inquiry learning environments. http://kaleidoscope.gw.utwente.nl/WS-IL/	**Genoa, Italy**
19-20 May 2005	**eLearning Conference – Towards a Learning Society** In support of the revitalisation of the Lisbon agenda to become the world's most competitive and dynamic knowledge-based economy by 2010, the European Commission is organising a conference on eLearning which will take place in Brussels on 19-20 May 2005. The conference will bring together a cross section of the various stakeholders involved in eLearning in Europe, and will provide the perfect forum for sharing experiences, exchanging good practices and taking stock of the added value of using ICT in education and training. http://www.elearningconference.org/index.htm	**Brussel, Belgium**
30 May 2005	**Information Day on Grid Technologies** Information event for anyone interested in submitting a proposal in the forthcoming FP6 IST Call 5 relating to Advanced Grid Technologies, Systems and Services. Advance registration required. http://www.cordis.lu/ist/grids/infoday_grid_tech.htm	**Brussels, Belgium**

When	What	Where
21-24 June 2005	**EUNIS 2005 - Leadership and Strategy in a Cyber-Infrastructure World** Research is at the heart of The University of Manchester. Many of the major advances of the 20th Century began here, including the work by Rutherford leading to the splitting of the atom and the development of the world's first modern computer. Our commitment to research excellence is clearly demonstrated by our investment in facilities which make such world-leading research possible. The University boasts the world famous Jodrell Bank Observatory, the soon to be completed £30m Manchester Interdisciplinary Biocentre and the recently opened £40m Integrative Centre for Molecular Cell Biology. The organising committee for EUNIS 2005 has been formed from staff of Manchester Computing, which is responsible for the IT infrastructure supporting the University campus. Our aim is to remain as Europe's premier academic IT service by continuously improving services, standards, and access for all our users. Manchester Computing incorporates services funded by the Research Councils, JISC, UKERNA and industry, delivering them in support of research, teaching and learning. We are proud to deliver a portfolio of services into every UK Higher Education organisation, most Further Education organisations and increasingly schools. **http://www.mc.manchester.ac.uk/eunis2005/**	**Manchester, UK**
5-8 July	**The 5th IEEE International Conference on Advanced Learning Technologies** **http://www.ask.iti.gr/icalt/2005/**	**Kaohsiung, Taiwan**
25-30 September 2005	**International Conference on GRID Networks and Services** Internet, Grid (next-Internet) and coming architectural solutions represent logical steps, towards sharing resources and coordinated services in a secure, dynamic and flexible manner among individuals, institutions and other entities. With respect to Internet, Grid brings new solutions for computing and networking. Although some of the technologies that fueled Grids began in the open source community including clustering technologies and P2P file sharing, a new management paradigm shift is dictated by partially and intermittent available services in such largely distributed and fully shared environments. The evolution of using and managing partial and intermittent services will have an influence on how autonomic computing and anticiparallelism paradigms will be used, as well as on managing paradigms offered by policy-enabled and reflexive middleware concepts. While some mechanisms and technologies exist, many other Grid-tailored ones must be invented and/or proved. IBM, Sun, Intel, HP and Microsoft, among others, have been funding research and development around GRID technologies, autonomic computing and anticiparalelism. Equipment vendors (Cisco Systems, Inc., etc.) and OSS producers (Lucent Technologies, Telcordia, etc.) initiated supporting solutions to keep the pace with these early achievements focusing on GRID networking and GRID management challenges. ICGNS 2005 initiates a series of conferences with some distinctive characteristics, starting with considering GRID services, GRID middleware, GRID networking, and decisional GRIDS views as complements towards large scale GRID implementation. Logistically, it is intended to exchange on research, advanced, and practical industrial implementations, cross layers. http://www.iaria.org/conferences/ICGNS/ICGNS2005/GeneralInformation/GeneralInformation.html	**Sillicon Valey, USA**