A Grid Based IMS Learning Design Player

the ELeGi Case Study

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What is ELeGi

- **European Learning Grid Infrastructure** is an FP6 Integrated Project whose objectives are:
  - To create new potential for ubiquitous and collaborative human learning, merging experiential, personalized and contextualized approaches
  - To define and implement an advanced service-oriented Grid based software architecture for learning
  - To validate and evaluate the software architecture and the didactical approaches through the use of Pilots and Demonstrators
What is IMS Learning Design

- It is a **specification** which describes **learning scenarios** that can be presented online and **shared** between systems and learners.
- Through Learning Design it is possible to:
  - Describe and implement learning activities based on different pedagogies
  - Coordinate multiple learners and roles within a multi-learner model
  - Coordinate the use of learning content with collaborative services
  - Support multiple delivery models
  - Transfer learning designs between systems
  - Reuse learning designs and materials
  - Perform tracking, reporting, and performance analysis

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**Method**

**Components**

- **Play**
  - Act 1
  - Act 2
  - Act 3
  - Act 4
  - Act 5

- **Role**
  - Role-part 1
  - Role-part 2
  - Role-part 3
  - Role-part ...

- **Activity**

- **Environment**
  - Learning objects
  - Learning services
The ELeGI’s Learning Model

- It describes the main entities involved in the learning process
- It allows the automatic building and delivery of adaptive Units of Learning expressed in IMS Learning Design

The Knowledge Model

- Represents the knowledge about the learning domain and connected learning resources
- Represents learning acquired competencies and preferences
- Defines the optimal modalities of knowledge building

The Knowledge Model

- First Level
  - Ontology
- Second Level
  - Metadata
- Third Level
  - Learning Resource

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A Sample Ontology

The Learner Model

- **Cognitive State**
  - What does the learner know?
    - Stores the knowledge of every learner about domain concepts
    - It is updated after each test activity

- **Preferences**
  - How does the learner prefer to learn?
    - Stores learner preferences about several pedagogical parameters like:
      - media, didactic approach, interactivity level, semantic density, difficulty, etc.
    - It is updated after each test activity
Unit of Learning Building

The Didactic Model

- We can use Learning Design but ...
  - it implements 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
    - plays cannot take into account learner needs and preferences and adapt accordingly the learning activities
  - it can’t exploit advantages of the Grid for learning
    - the early binding of resources thwarts the opportunity for dynamic selection of distributed learning objects and services that best fits learning needs
The Didactic Model

- The solution is to build abstract pedagogies without specifying concrete environments for each activity in the play.

Updating the Knowledge Model

- Requires (R)
- Suggested Order (SO)
- Belongs To (BT)

Limits
- BT
- R

Derivatives
- D
- I

Analysis
- BT
- R

Series
- D
- SO

Integrals
- I

= Inductive/Experiential

= Deductive
An Example Scenario

1. The Unit of Learning requests a Learning Service

2. The Player finds on the GRID a suitable Learning Service

3. The selected Service sends back a Portlet Handle

4. The Portlet is aggregated in the whole Unit of Learning interface and sent back to the Learner
Service Discovery and Binding

- Each Learning Service
  - must be a WSRF compliant GRID service
  - must extend a class provided by the supplied API
  - must use WSRP Portlet to expose service interface
- An XML service description is included into the Unit of Learning in place of the real service
- It may exploit two service discovery methods:
  - **Static address specification**
    - A service address is used to instantiate it
  - **Dynamic address specification**
    - An SLA containing the information needed to retrieve a service is used
Service Discovery and Binding

Service URL address. If not specified the dynamic address specification method is used.

Used by GRID middleware to search for suitable service.
Service Discovery and Binding

Dynamic Binding

<?xml version="1.0"?>
<service ...
<SLA>
[…]
</SLA>
<params>
<param name="DOMAIN" value="Limiti_ELeGi_ING%%1" />
<param name="CONCEPTS" value="Limit_Point, …" />
</params>
</service>
The Result

Conclusion

- We presented an approach able to:
  - automatically build a Unit of Learning based on three models (knowledge, learner and didactic)
  - design domain-independent pedagogies with IMS-LD
  - enable the automatic discovery and late binding of learning resources and services

- The approach and the related software were developed in the context of ELeGI project

- More info on www.elegi.org