



Integrating On-line Judge into effective e-learning

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Universidad de Valladolid



Education and Culture DG
Lifelong Learning Programme

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How it all started: Valladolid Online Judge

JUDGE HISTORY

- Started in 1995
- More than 2,900 problems
- Almost 9,000,000 submissions
- Almost 1,000,000 during the last year alone
- More than 100,000 users
- More than 280 online contests

FIRST VERSION

- Designed for a local contest
- Very strict
- Problems to scale
- Security model based on restricted functions

SECOND VERSION

- Development started in 2005
- Into production in 2007
- More versatile
- More modular
- Better technology
- Better security model based on system restrictions
- But with lots of margin for improvement in education area

Overview of the EduJUDGE project

FRAMEWORK

- The EduJudge project was funded with the support of the **Lifelong Learning Programme** of the **European Union** .
- It was part of the Transversal Programme – Key Activity 3: *Development of ICT-based content and services.*



Education and Culture DG

Lifelong Learning Programme

PARTNERSHIP

- **CEDETEL** (Coordinator) - Spain
- **University of Valladolid** - Spain
- **University of Porto** – Portugal
- **KTH Royal Institute of Technology** – Sweden
- **Institute of Mathematics and Informatics** - Lithuania



Universidad de Valladolid



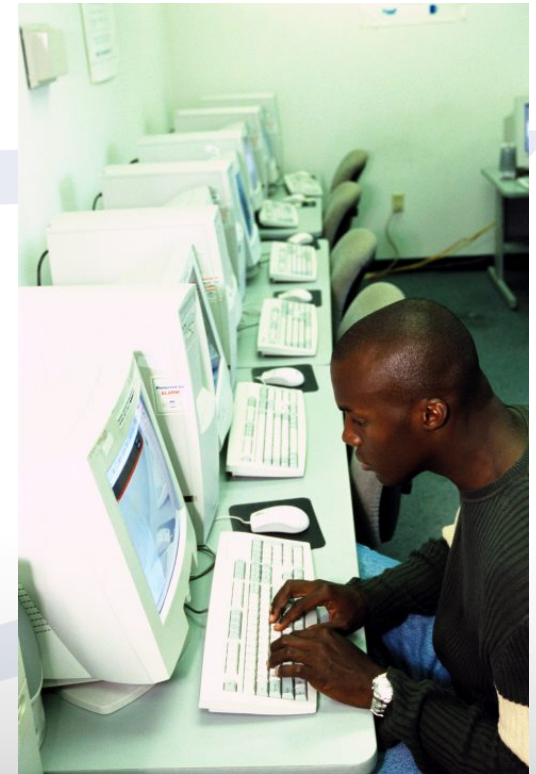
AIMS AND OBJECTIVES

- **MAIN OBJECTIVE:** to integrate **UVa Online Judge** into an **effective educational environment** , in order to satisfy the users' demand of a greater pedagogic character and, in this way, to ease the use of Online Judge in the official courses offered in the areas of **mathematics and programming** .



AIMS AND OBJECTIVES

- **To improve the accessibility and use of algorithm problems** defining metadata and creating a **remote problem repository** . In this way, problems will be more accessible for the community of teachers and reuse of resources will be promoted.
- **To give Online Judge a greater pedagogic character** designing an intelligent system and classifying problems into different levels of difficulty.
- **To develop a distributed system for remote evaluation** so that the application field of EduJudge can be extended.
- **To integrate Online Judge into QUESTOURnament** and other communication and teaching mechanisms available in the **Moodle platform** .



AIMS AND OBJECTIVES

- **To decentralize the management of courses and students** through the installation of Moodle and QUESTOURnament locally at every institution that uses the Online Judge, with a multilingual User Interface (translated, at least, into English and the mother language of each partners' country).
- To organize **pilot experiences** addressed to satisfy the demands of users and to contribute to the development of a quality learning model.
- **To create a community of teachers and students** at European level to share Knowledge and experiences.

TARGET GROUPS

- University sector and post degree, for several technical and science degrees.
- Secondary school, for computing field.



WORK PACKAGES

**MNGT 1
COORDINATION**

CEDETEL

ALL

**PREP 1
REPOSITORY
OF
PROBLEMS**

**U. PORTO
ALL**

**PREP 2
EXTENSION
ONLINE JUDGE**

**UVA
KTH, UP**

**PREP 3
INTEGRATION
ELEARNING
PLATFORM**

**UVA
ALL**

**QPLN 1
PILOT
EXPERIENCES**

**IMI
ALL**

**QPLN 2
QUALITY &
EVALUATION**

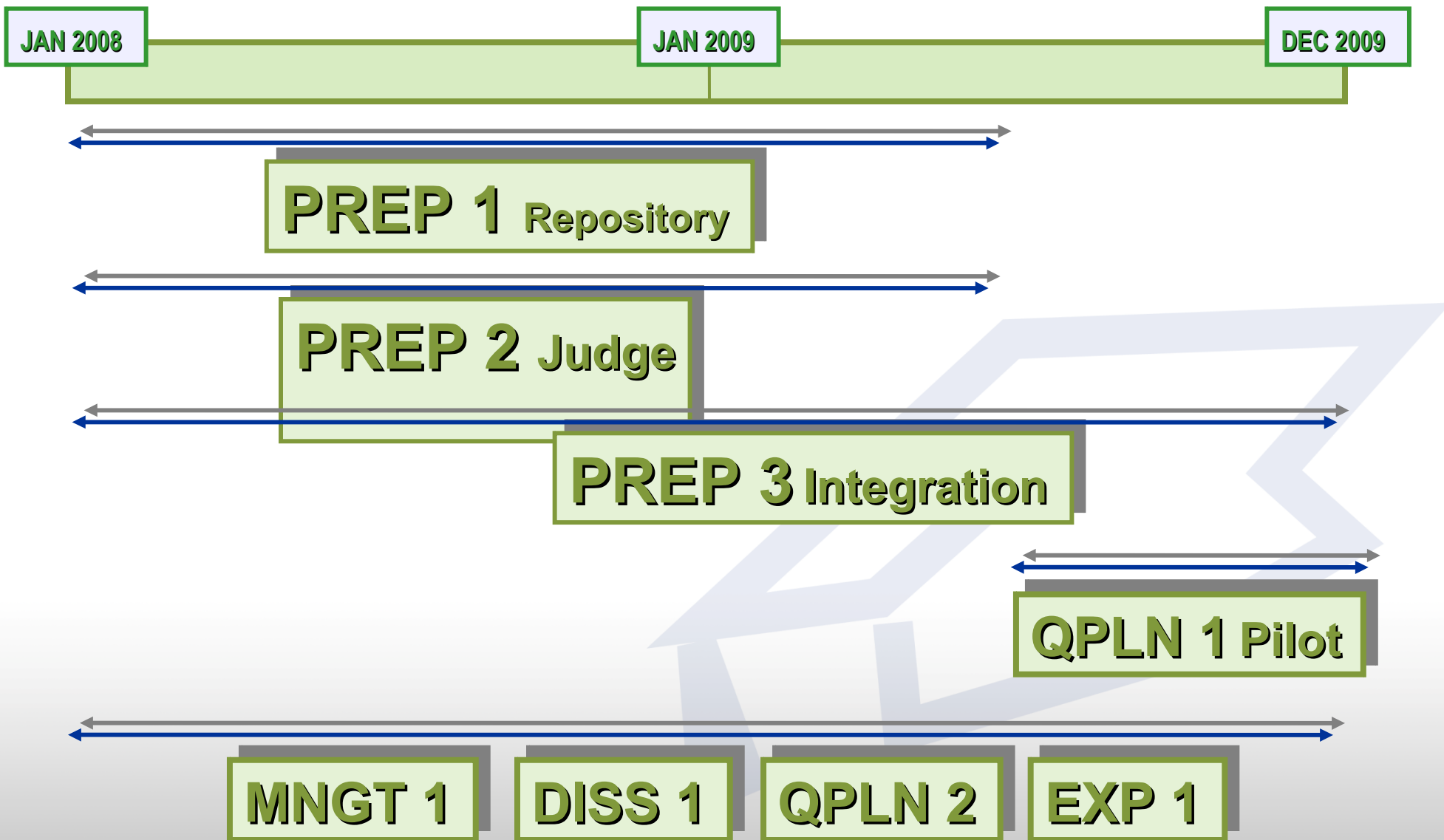
**CEDETEL
ALL**

**DISS 1
DISSEMINATION**

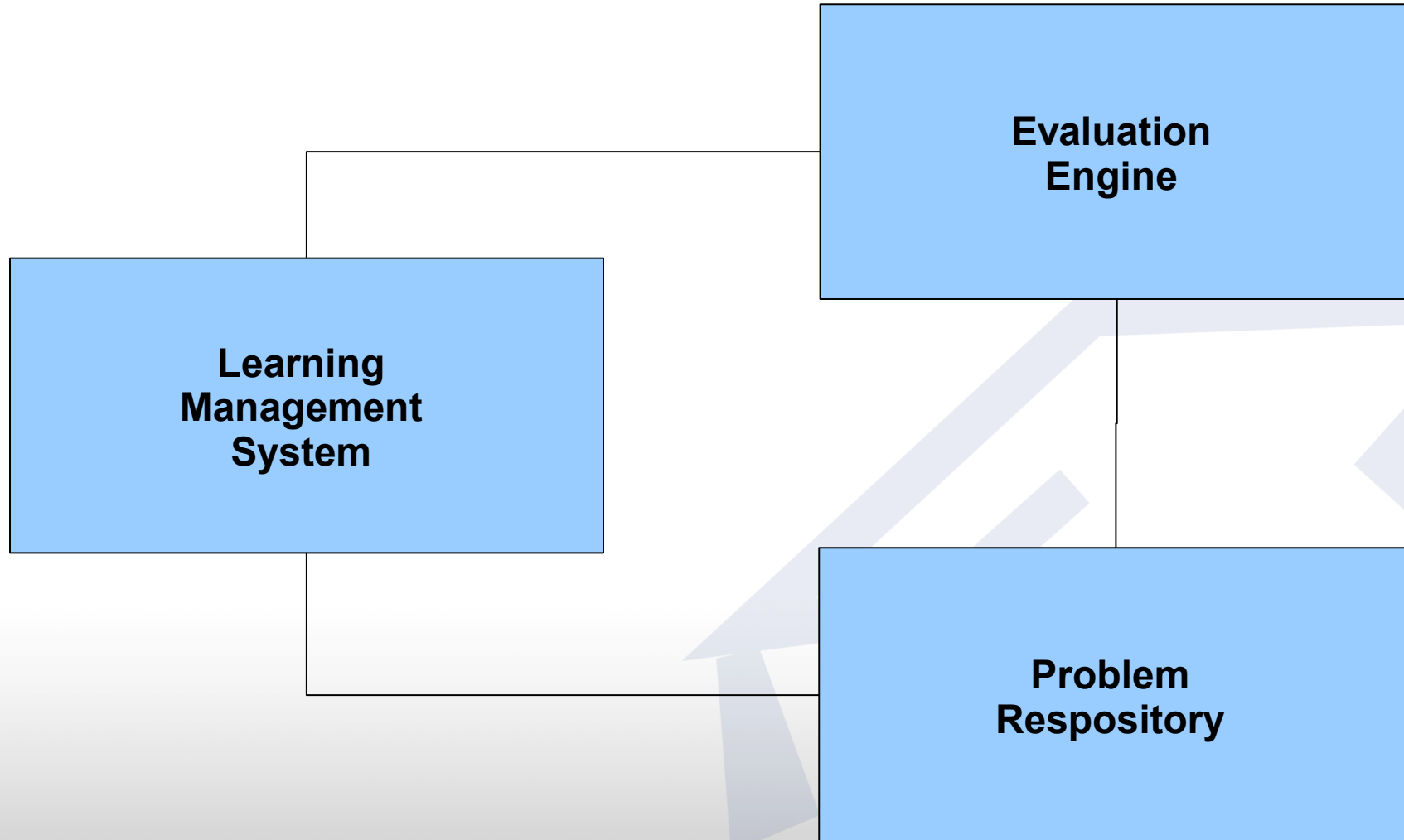
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ALL**

**EXP 1
EXPLOITATION**

**UVA
ALL**



SYSTEM ARCHITECTURE



SYSTEM ARCHITECTURE

- Based on SOAP Web Services
- Modular
- Decentralized
- Distributed
- Asynchronous
- Scalable
- Feedback
- Statistics



THE LEARNING OBJECT CONCEPT

- It is more than just a problem description
- It contains the means for:
 - Classifying the problem
 - Presenting the problem description
 - Evaluating a submission
 - Automatically generating Test Cases
 - Determining the difficulty of the problem

TYPES OF PROBLEMS

- ICPC-style problems
- IOI-style problems
- Interactive problems:
 - User vs. User
 - User vs. Computer
- Problems requiring different programming skills:
 - Linking to a library
 - ...
- Anything that can be automatically judged

PROGRAMMING LANGUAGES

- ICPC languages:
 - ANSI C
 - C++
 - JAVA
 - ...
- New generation languages:
 - Python
 - C#
 - ...

LEARNING MANAGEMENT SYSTEM

- Learning environment management
 - Courses
 - Classrooms
 - ...
- User management
- Per user statistics collection
- Per problem statistics reporting

PROBLEM REPOSITORY

- Storage and classification of LOs
- SQL database
- SOAP Webservices
- Processing of LOs
- Per LO statistics collection



EVALUATION ENGINE

- Plugin based
- Ability to judge different types of problems
- Stateless
- Distributed
- Reports statistics to the Problem Repository
- Multiple languages
- Automatic test case generation

Video

Thank you for your attention

Questions?