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National PK12 Gateway and Clearinghouse to support State and City Open Virtual Education Spaces

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OVERVIEW:

Multiple states will be coming together next Fall to pilot, prototype and collaborate in the development and implementation of Open Virtual Education Spaces (OpenVES), to support teachers, students, and parents in implementing standards based eLearning infrastructure. In order to create and maintain a national standards database, and to provide common services in support of OpenVES efforts, a national non-profit PK12 Gateway Clearinghouse is a necessity. In this White Paper a high level set of requirements for a national gateway clearinghouse to support state efforts to implement their Virtual Education Spaces are presented. Such a gateway will implement the following six functions:

- 1) National and State Standards Database, Index, and Ontologies
- 2) National Non-profit edUDDI Registry
- 3) Content and Resource Indexing Tools and Search Repository
- 4) edCommerce support for premium content and resource purchases
- 5) Multi-Media Content Distribution, Caching and Streaming Capability
- 6) xLINKS Persistent URL Registry
- 7) Digital Rights Management Capability

RELATIONSHIP OF CONTENT TO THE VES eLEARNING PLATFORM:

One of the fundamental goals of the OpenVES Architecture is to provide a robust and universal eLearning Platform for k12 education. A key element of that goal is to enable the student and teacher workspace with access to a rich array of third party standards based content, resources, and assessments. We expect that educational publishers will be eager to provide that content. The PK12 Gateway Clearinghouse will make it easy to "plug in" publisher and third party content.

The challenge any vendor or designer faces in deploying content into the k12 student and teacher workspace is to accomplish all of the following goals simultaneously:

- Maximize Value Added
- Minimize Content Aggregation Entropy
- Minimize Cognitive Friction
- Minimize Discovery Cost
- Maximize the Economy of Beneficial Participation

So, what strategies can be employed by OpenVES to assure that content deployment remains as frictionless as possible, and meets the other goals stated above:

- Open syndication of content and resources
- Open standards based indexing tools for standards, content, and resources
- Open standards for Educational Content and Resource packaging
- Open Standards for Question and Test Interoperability
- Open standards based tools for State and National Standards Writers

VIEWS OF CONTENT IN VES

There are two important views of content provided here to help clarify what the role of the OpenVES Gateway is with regard to content:

- 1) The Teacher and Student Centric View of VES Content
- 2) The Publisher Centric View of VES Content

The Teacher and Student Centric View of VES Content

All of the world, especially the world of content, is organized into one single view for teachers, students, and parents: the state learning standards. Rather than learning multiple search strategies, acquiring multiple logins and passwords, coping with a multiplicity of irrelevant, duplicate, and often spurious results, the teacher gets all of the publisher and teacher developed content organized the way they need to use it.

Teachers get all of their web content organized the same way, all of the teacher prepared and shared content organized the same way, and all of the assessments, student work and teacher contributions from other states organized in the same way. Hours of searching, evaluation, validation, and alignment are done automatically and teachers are provided with comments from teachers who have actually used the content in their classes.

The "Content Enabled Desktop" means that all a teacher needs to be able to access their content is to identify or select a discipline, strand and district or state standard.

The Publisher Centric View of VES Content

What does a publisher need to know and do to publish their content into the VES eLearning Platform?

- 1) Register basic content publishing service descriptions and taxonomies with the OpenVES edUDDI Registry.
- 2) Identify assets, to be deployed, that fall into the following categories:
 - A. Pointed to by URL free branded access
 - B. Deployed as live RSS (XML) feeds
 - C. Deployed as XML content or resource packages
 - D. Custom Publishing resources
 - E. Subscription Services
 - F. Broadcast and Media Channels
 - G. Advertising
 - H. Deployed on a number of (usage and license) eCommerce models

- 3) Normalize assets to OpenVES XML Specifications
- 4) Catalog resources and content at OpenVES Clearinghouse
- 5) Maintain OpenVES Clearinghouse Catalog
- 6) Pay for usage reporting, competitive analysis, surveys and evaluation, and leads.

A number of different license models for usage, metering, and charging are contemplated. These will range from paid up statewide licenses, to individual district metered usage contracts.

OpenVES PK12 GATEWAY CLEARINGHOUSE MODEL:

The Model for this clearinghouse will be one, which is Internet based and is organized as a e2e and b2e service center. The Clearinghouse will organize national education standards, interface with Content Providers and Standards organizations, be a communications medium between states, and provide a discovery service for standards, curriculum and instructional resources.



Each state uses very different terminology to describe the elements and components of their standards based education reform model. Each state articulates its standards in differing levels of granularity. The state standards, with which teachers work, and their local district objectives and benchmarks, are also very different. By creation of a standard controlled vocabulary for the essential elements of standards based educational reform and accountability, and specific customized ontologies for each state, the clearinghouse will make it possible for teachers in one state to view, search, and use standards, curriculum, and instructional resources from other states, transparently, and in the context of their own state and local terminology.

PK12 GATEWAY CLEARINGHOUSE SERVICES:

A non-profit national standards-based PK12 Clearinghouse will assist states to implement their OpenVES projects. The services provided by this non-profit national standards-based PK12 Clearinghouse would include:

- Startup support for states planning implementation of OpenVES.
- Staff Development and Professional Development for OpenVES teams.
- Support for OASIS edXML Technical Committee activity.
- Coordination with publishers of International Education Standards
- Coordination with publishers of Educational content and Educational Software to create a Business to Education (B2E) marketplace gateway.
- Support for national Educational Standards cataloging tools for state OpenVES systems.

- National Internet discovery service for Standards, Curriculum, and Instructional Resources.
- Maintenance of national educational directory listings.
- Maintenance of national standards-based assessment bank of tests, test items, rubrics, checklists, and performance based authentic assessments.
- Maintenance of a national standards-based Resource database containing curriculum and instructional resources indexed from state OpenVES resource libraries and from third party educational content publishers.
- Maintenance of a national standards-based Resource database containing Learning Objects indexed from state OpenVES resource libraries and third party educational content publishers.
- Support and Maintenance of a national calendar of nonprofit standards-based education reform events, conferences, workshops, etc. This calendar will interface with state OpenVES calendars and will be capable of publishing events to them.
- Creation, Support and Maintenance of a national Calendar Gateway of events, programs, training, professional development activities, and media schedules, etc. This calendar will interface with state OpenVES calendars and will be capable of publishing events to them.
- Creation, Support and Maintenance of a national Media and Information channels containing programs, news, information, training, professional development activities, and media schedules, etc. This collection of Information channels will interface with state OpenVES Workspace channels and will be capable of publishing events to them.
- Will be capable of managing a wide range of Educator to Educator (E2E) services between school districts and their teachers, and educational publishers. The clearinghouse will be able to provide metered billing for access to on-line educational resources and content.

All of these services will be tightly integrated with the OpenVES Workspace Services Architecture. For example, when a state Curriculum Manager updates the state standards in OpenVES, and publishes them, these new standards will be automatically replicated in the Clearinghouse Standards database. For example, when a teacher publishes a standards-based lesson plan in Massachusetts, teachers using comparable Colorado standards would have access to it.

PK12 CLEARINGHOUSE COMPONENTS AND REQUIREMENTS:

In order to support the services described above, the national OpenVES PK12 gateway clearinghouse will require the following:

- 1. National Educational Standards Repository
- 2. State Education Standards Databases and State Standards Ontologies
- 3. Common Controlled Vocabulary and Thesaurus for Standards based Education Reform
- 4. Subject Taxonomies for all PK12 Subject Disciplines
- 5. Concept Maps (XTM Topic Maps) and Content Repositories for PK12 Content
- 6. xLINKS repository for Resource and Link Management
- 7. XML Indexing and Meta-tagging Tools for Educational Publishers and Content Producers
- 8. Interstate Education Communities Database and Directory
- 9. Standards based Test Item Repository
- 10. Standards based Rubric and Checklist Repository
- 11. Standards based Resource Database (Interstate OpenVES Assets)
- 12. Standards based Resource Database (Content Publisher)
- 13. National Standards Based Education Calendar Services
- 14. National Standards Based Education Information Channel Services

- 15. Rights Management systems for edCommerce services for Ed Resources and Content
- 16. Gateway Clearinghouse Bulletins
- 17. Online Education Evaluation and Research Services
- 18. Gateway Interfaces to State OpenVES sites
- 19. Gateway Interfaces to International Educational Standards organizations
- 20. Gateway Interfaces to for profit Educational Publishers and Content Providers
- 21. Gateway Interfaces to non-profit Educational Publishers and Content Providers

OpenVES PK12 GATEWAY CLEARINGHOUSE ACTION PLANS

In the coming months OpenVES plans to take the following steps to build, test and implement Gateway Clearinghouse fuctionality:

April 2001 – VES Massachusetts Launched first non-commercial UDDI Gateway
September 2002 - OpenVES edUDDI Implementation available for public use
Fall 2002 - Educational Publisher Beta Testing - Beta Test publishers being sought.
Winter 2002 - Integration and Beta Testing with Non-Profit Education Organizations

VEG Standards Commitments

In building indexes and repositories the OpenVES Gateway Clearinghouse will support:

- IEEE 1484 Learning Technology Systems Architecture (LTSA)
- IMS Content Packaging
- IMS Question and Test Interoperability Standard with OpenVES Extesions
- UDDI, SOAP, WSDL, XML Web Services
- Z39.50 Search and Retrieval
- SIF Zone Integration Server (ZIS)
- HTTP, WebDAV, and other standards as applicable.

IMS Content Packaging Specification

The IMS Content Packaging Specification provides the functionality to describe and package learning materials, such as an individual course or a collection of courses, into interoperable, distributable packages. Content Packaging addresses the description, structure, and location of online learning materials and the definition of some particular content types.

The Content Packaging Specification is aimed primarily at content producers, learning management system vendors, computing platform vendors, and learning service providers. Learning materials described and packaged using the IMS Content Packaging XML format should be interoperable with any tool that supports the Specification. Content creators can develop and distribute material knowing that it can be delivered on any compliant system, thereby protecting their investment in rich content development.

IMS Question & Test Interoperability Specification

The IMS Question & Test Interoperability Specification provides proposed standard XML language for describing questions and tests. The specification has been produced to allow the interoperability of content within assessment systems. This will be useful for publishers, certification authorities, teachers, trainers, publishers and creators of assessments, and the

software vendors whose tools they use. Authoring tools, and publishers, may publish XML and this data can be imported into other authoring tools and delivery systems.

IMS Reusable Competencies Definition Information Model

The IMS Reusable Competencies Definition Information Model defines an information model for describing, referencing and exchanging definitions of competencies, primarily in the context of online and distributed learning. In this specification, the word competency is used in a very general sense that includes skills, knowledge, tasks, and learning outcomes. This specification gives a way to formally represent the key characteristics of a competency independent of its use in any particular context. It enables interoperability among learning systems that deal with competency information by providing a means for them to refer to common definitions with common meanings.

IMS Learning Object MetaData Model - LOM

This document describes the names, definitions, organization, and constraints of the IMS metadata elements. This work is composed of two parts, a working document from an IEEE standards committee, of which IMS member organizations have been key contributors, and a number of modifications that have been approved by the IMS Technical Board.

IMS Enterprise Information Model

The scope of information included in this version of the specification is intended to support interoperability between Learning Management systems (LMS) and the following classes of Enterprise Systems:

- Human Resource Systems
- Student Administration Systems
- Training Administration Systems
- Library Management Systems

KEY OpenVES CLEARINGHOUSE TECHNOLOGIES:



This is a hypothetical example of the utilization of the OpenVES Gateway Clearinghouse.

OpenVES GATEWAY CLEARINGHOUSE FINANCIAL OPPORTUNITIES:

Although each state OpenVES could build intelligent search tools for resources, and maintain an array of interfaces to standards groups, publishers, and other states, and negotiate their own business deals, it will be far more efficient to create these interfaces once in the OpenVES Gateway Clearinghouse. In this scenario, the Clearinghouse becomes the nexus for feeding pay-by-use content to state OpenVES systems. In that role it will negotiate arrangements with content providers and establish digital rights management and charge mechanisms for use by OpenVES Workspace Services in the various states.

This particular E2E and B2E solution would create a new and homogeneous market for the education publishers. It would open up a standards based market for educational software publishers and creators of k-12 learning objects. It would create new opportunities for access to educational resources and holdings of non-profit education repositories. It would ultimately create a digital education market space, with managed distribution, recordkeeping, and chargeback for the publishers, content providers, and for the states, and their school districts.

This OpenVES Gateway Clearinghouse model is the same as the General Motors B2B model for the automobile industry that is expected to process trillions of dollars of payments. It employs the same technologies as are being used by the UDDI B2B gateways. We expect that the Gateway Clearinghouse will be the principal sustaining source of revenue for state OpenVES projects.



OpenVES GATEWAY CLEARINGHOUSE TECHNOLOGY AND edUDDI

The Universal Description, Discovery and Integration (UDDI) standard (registry) is an important industry initiative. The Standard creates a platform-independent, open framework for describing services, discovering businesses, and integrating business services using the Internet. UDDI is the first cross-industry effort driven by platform and software providers, marketplace operators and e-business leaders. These technology and business pioneers are acting as the initial catalysts to quickly develop the UDDI standard. We are implementing this technology in support of the Education and Non-Profit Sector.

The UDDI standard takes advantage of WorldWide Web Consortium (W3C) and Internet Engineering Task Force (IETF) standards such as Extensible Markup Languare (XML), and HTTP and Domain Name System (DNS) protocols. Additionally, cross platform programming features are addressed by adopting early versions of the proposed Simple Object Access Protocol (SOAP) messaging specifications. The UDDI standard is the building block that will enable educational publishers, content providers, and businesses to quickly, easily and dynamically find and transact with state VES systems, school districts, teachers, students, and parents using their preferred applications.

Education benefits from the OpenVES Implementation of edUDDI

Educational organizations of all sizes can benefit from edUDDI, because the standard comprehensively addresses problems that limit the growth and synergies of B2E commerce, E2E commerce, and the deployment of non-profit educational Web services.

The UDDI standard is not industry-specific. Any industry, worldwide, offering products and services can benefit from this open initiative. It is not only applicable to business use, either.

Before the UDDI project, there was no industry-wide, accepted approach for businesses and educational organizations to reach statewide education initiatives like VES, school districts or individual educators, students, or parents with information about their products and Web services. Nor was there a method of how to integrate into each other's systems and processes.

- Problems the UDDI specification can help to solve:
 - Making it possible for educational organizations, and users, to quickly discover the right education organization or business from millions currently online
 - Defining how to enable freecommerce or ecommerce to be conducted once the preferred educational organization or business is discovered
- Immediate benefits of the UDDI project for education organizations and businesses include:
 - Reaching new education customers
 - Expanding offerings
 - Extending market reach
 - Increasing access to current education customers
 - Solving education customer-driven need to remove barriers to allow for rapid participation in the global Internet economy
 - Describing their services and business processes programmatically in a single, open, and secure environment

• Using a set of protocols that enable educational organizations and businesses to invoke services over the Internet to provide additional value to their preferred customers.

Registering for VEG UDDI

You will be able to register at the OpenVES PK12 Gateway Clearinghouse at edUDDI.org this summer. Organizations wishing to prototype this service should contact <u>OpenVES</u>.

Registering enables an educational organization or company to publicly list basic information about their organization or company and their content or offerings. There will also be the option to list a catalog of products, services and guidelines for engagement. Registered educational organizations and companies will then be accessible in searches by potential buyers and marketplaces. As registrants, integration will be significantly easier and more dynamic for companies, school districts, and educational organizations transacting for profit and non-profit business with each other.

UDDI leadership

The long list of organizations participating in the UDDI project represents many industries and core competencies. As such, UDDI is not owned or led by any one company. Rather, it is currently being guided by a group of committed industry leaders. These leaders are spearheading the initial creation and design efforts. As the standard becomes more widely accepted, the list of Community members is expected to grow exponentially.

The future of edUDDI and the OpenVES PK12 Education Gateway

It is the intention of the OpenVES Education Gateway Clearinghouse to link its non-profit education edUDDI Clearinghouse to the commercial for-profit UDDI clearinghouses run by Arriba, IBM, and Microsoft.

Z39.50 and the OPenVES Gateway Clearinghouse

"Z39.50" refers to the International Standard, ISO 23950: "Information Retrieval (Z39.50): Application Service Definition and Protocol Specification", and to ANSI/NISO Z39.50. The Library of Congress is the Maintenance Agency and Registration Authority for both standards. The standard specifies a client/server-based protocol for searching and retrieving information from remote databases.





Federated pk12 eLearning Gateway - Repository Architecture

Federated pk12 eLearning Gateway – Repository Architecture

OpenVES will be working with non-profit PK12 Content Repository owners and organizations to pilot and prototype federated gateway protocols for the worldwide sharing and exchange of pk12 education content.

The European ETB project has pioneered an international model of cooperation for pk12 educational content. We hope to learn from them and those in Canada and Australia working on this issue.

