New Way Of Accessing and Reusing E-Learning Between Countries

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ABSTRACT

Norwegian Defense Education Command (NoDEC) and Canadian Defense Academy (CDA) are in a joint effort using/testing Federated Digital Repository System (FDRS) to store and access e-learning courses in a Sharable Content Object Reference Model (SCORM) Learning Management System (LMS) environment. This paper presents the results of using the FDRS to store primarily learning objects without duplicating or manipulating any of the files. It highlights how the system is used to revolutionize the publication of courses through the use of Uniform Resource Locators (URL) to the content instead of uploading large SCORM content packages to an LMS. The paper describes how the FDRS allows federated searches across several instances of content management systems or repositories. By enabling an Open Knowledge Initiative (OKI) capability in the FDRS, Norwegian Defense (NoD) and Canadian Defense (CaD) gain instant access to the content from each other's systems, ready to be reused right away. The FDRS also allows publication of a package from a single course to several types of LMS at the same time. This will enable the same course instance to run on multiple LMS. This paper will also recommend solutions to the cross domain issues of using different systems in a learning content management environment.

ABOUT THE AUTHORS

LtCdr Geir Isaksen is a former submariner working at the Norwegian Defense Education Command (NoDEC) located in Oslo. He is currently working as an ADL advisor at the Norwegian Defense (NoD) ADL Centre. LtCdr Isaksen has worked at the Norwegian Navy Submarine School as a head instructor in the ULA-class submarine simulator in Bergen for 2 years. In resent years he completed further education within adult pedagogy, crew resource management, project management and learning styles. He has been responsible for the development of the NoD ADL regulations and several major e-learning projects like the development of the courses in law of armed conflict and several R/D projects. Geir Isaksen is the current chairman of NATO Training Group Working Group for IT/ED ADL subgroup and a part of the newly established Norwegian ADL partnership lab in Oslo.

Peter Lamothe is a principal technical consultant at the Italian company Giunti Labs, based out of Ottawa, Canada. Since 2006 he's been specializing in content repositories and federation of content. He has a broad experience of running R&D activities related to E-Learning. From 2003 to 2006 Mr Lamothe was manager of the Canadian ADL Partnership Lab in Ottawa, were he supervised R&D activities on ADL related initiatives like SCORM and Content Object Repository Discovery and Registration Architecture (CORDRA), where he represented Canada on the respective working groups. He is also experienced in managing environments with open-source and proprietary LMS, Learning CMS, repositories, content packaging tools, and authoring applications. Peter is experienced with standards and specifications, such as IMS, IEEE, and OKI where he is a member of the OKI Technical Working Group.

Bill Railer brings a mix bag of over 7 years of experience in solutions development for corporate finance and equity trading as well as several years of teaching information technology at the University level. He has spent the last 6 years at the Canadian Defense academy where he has successfully implemented a national e-learning delivery and development capability known as DNDLearn. In his current role as Director of Learning Concepts and Experimentation and the Canadian ADL Partnership lab, Bill Railer promotes the development and adoption of new learning concepts, methodologies and solutions. He is also responsible for the implementation of global e-learning standards within the Department of National Defense (DND).

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INTRODUCTION

For some years now, armed forces within NATO and Partnership for Peace (PfP), thanks to standards, regulations and specifications, have been able to take e-learning courses on their Learning Management Systems (LMS), track the course completions and store course results locally (Isaksen, 2006). The normal way of doing this has been to install large Sharable Content Object Reference Model (SCORM) course packages directly in the LMS. These packages are composed of all files and content necessary to run the learning experience (Dodds, P. & Thropp, S, 2006a).

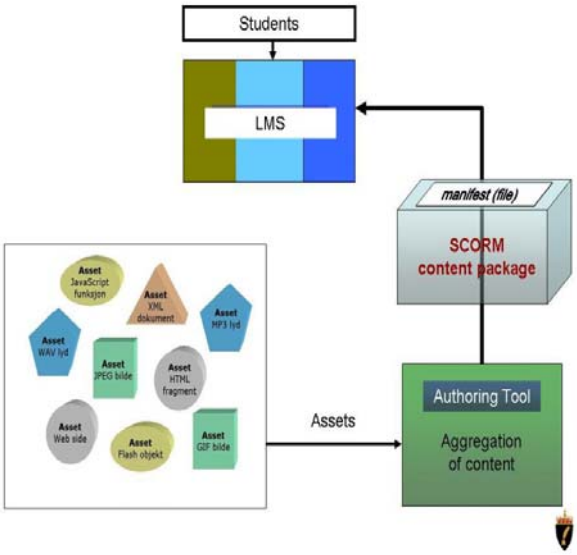

Figure 1.Course implementation into a NoD LMS

This method makes maintaining, retrieving and reusing the content very difficult and time-consuming. Especially in a test phase with a course development vendor, the repeated upload of large course packages is time and resource consuming. Most large organizations and armed forces have a growing need to store content in a way that makes it searchable, retrievable and reusable for internal units and international partners.

There are a number of challenges and questions that an organization must address when purchasing, developing, maintaining and reusing learning content. Some of them will be addressed in this paper.

CHALLENGES IN DEVELOPMENT, MAINTENANCE and REUSE OF CONTENT

Separation of content in course packages

Most current e-learning SCORM conformant courses are composed of files that contain multiple types of media. One common way of doing course development is to use Flash® files that contain images and/or animations together with text and sound. Different types of media formats built into one file type makes maintaining and editing the course content time consuming and costly.

Figure 2. Screenshot from NoD Course with all files types built into Flash®

To make it easier to maintain and change course content, both NoDEC and CDA want to move forward with the separation of content (asset types). Text should come in xml, speech and effect sound in Mp3, images in jpg/gif and graphics/animation in flash.

This will make it much easier to change or update course content and reduce maintenance costs. The issue of changing language in a course will now be easier and cheaper.

In a Federated Digital Repository System (FDRS) files can be checked out and edited before they are checked in again. When separation of content is implemented, the capability to edit the course content in-house is established. If the course text is xml based, common software like Microsoft Notepad® can be used to edit the file. By editing the text (xml) and replacing speech files (mp3), a whole course can be translated into a different language directly from the repository.

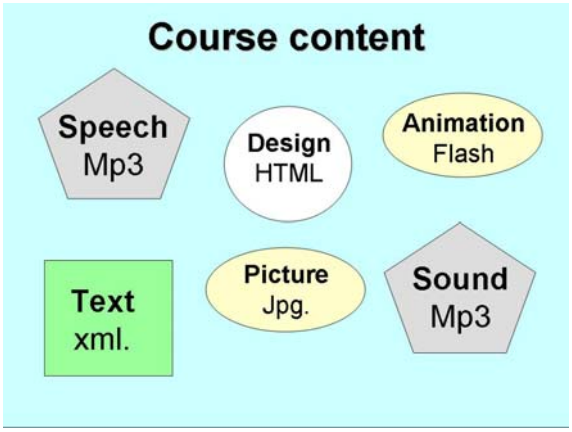

Figure 3. Separation of course content

Structure of content files

During this project we discovered that SCORM does not come with mandatory "rules" of how to structure the content (course files) and how to name folders (Dodds, P. & Thropp, S, 2006b) Today different vendors and developers structure their courses in many different ways (as shown in figure 4).

The reason this was identified as a problem is because when you want to retrieve and reuse on a Sharable Content Object (SCO) level, you first of all need to have a common system for indentifying a SCO in different content repositories. Secondly, when a SCO that fulfills your training needs is identified, you want to be sure that all necessary files are located before you retrieve the SCO. There is no standard way of structuring a course or naming folders identified by this project.

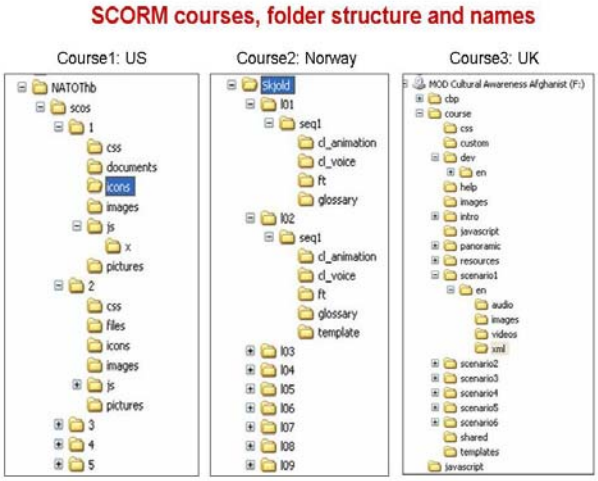

Figure 4. Examples of different course file structures

Labeling of content

In order to make courses, SCO`s and assets retrievable, they need to be marked (tagged) with the right type of searchable information. The Learning Object Metadata (LOM) in SCORM is one example of information (Metadata) that can be associated (tagged) to a learning object or asset (file) to make them searchable.

Metadata can be added from the asset level to the whole course itself. The challenge is to decide how much information to connect (tag) to every level, what taxonomy to use, and to make sure that everybody within an organization or federation (NoDEC, CDA NATO, PfP) uses the same taxonomy and quantity of metadata information.

The LOM defines 9 categories with up 75 different types of information that can be associated to an asset, SCO or course (Dodds, P. & Thropp, S, 2006a). For most organizations, this is too much and not all of them are recommended as mandatory in the SCORM. For this project we used only 3 mandatory Metadata fields (title, description and keywords).

Again, there are many different ways of actually adding metadata. You can put it all in the manifest file of the SCORM course package or you can use links from the manifest to the xml file that contain metadata. You also want to make sure that the tagged information can be read in the same way by different tools and different LMS.

When you import and dissemble a course package into the FDRS, there is functionality to add metadata in accordance with to preset metadata schemas.

```
metadata>
  <schema>ADL SCORM</schema>
  <schemaversion>1.2</schemaversion>
- <lom xmlns="http://www.imsglobal.org/xsd/imsmd_rootv1p2p1">
- <general>
- <title>
  <langstring>2 - Weapon system Presentation:</langstring>
  </title>
- <catalogentry>
  <catalog>wbtmanager_catalog_placeholder</catalog>
- <entry>
  <langstring>{SYM-DCN-SKJOLD-C01-L2-EN-20070228}</langstring>
  </entry>
  </catalogentry>
- <description>
  <langstring>- Overview of the CMS, Skjold and the Skojld's project - Weapon
System, the main functions of the CMS and each Weapon
subsystem</langstring>
  </description>
- <keyword>
  <langstring>{SYM-DCN-SKJOLD-C01-L2-EN-20070228}</langstring>
```

```
<metadata>
<schema>ADL SCORM</schema>
<schemaversion>1.2</schemaversion>
<adlcp:location>metadata/SA1.xml</adlcp:location>
</metadata>
```

Figure 5. Examples of MetaData in a SCORM® manifest file

Duplication of content

New e-learning courses implemented into NoD today are uploaded onto the 8 different content servers in order to reach all students. This requires time-consuming and costly procedures to update and maintain all our courses. It is also a challenge to make sure that all 8 content servers have the right version of all the courses and content at any given time. This task is done manually today, with no solid record of when an update is done and by whom.

One good example that illustrates the benefits of having one repository that stores your course content is the use of technical documentation as a content source in a technical training. Technical training is in most cases based on the technical documentation (techdata) that comes with the equipment.

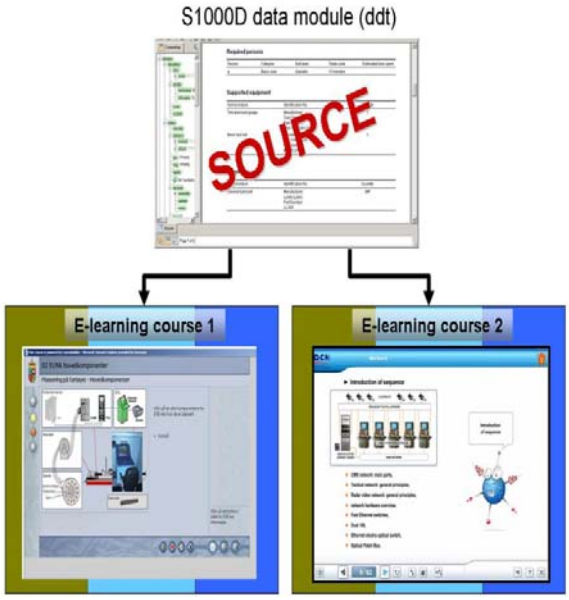

Figure 6. Techdata as the source for learning content

Regardless of how many different courses that use a specific content file, it should come from one source. The huge benefit is: when the technical documentation changes, the course automatically changes as well.

The feature of checking out files, editing them and then checking them in again is functionality a content management system must have to be able to facilitate this capability.

CONTENT MANAGEMENT SYSTEM PROJECT

Both the NoDEC and the CDA have for some time explored the market for content storing software that could be a defense system for storing, retrieving and reusing content. Both parties have tested HIVE® as a content management system for some time.

The HIVE® Federated Digital Repository System (FDRS) application implements all types of content without changing anything in the file itself (Harvest Road, 2007b), and gives it a unique identifier in the system. SCORM® courses can be stored on course, SCO or asset level. All content in the FDRS can be tagged with metadata after defined schemas on all levels (SCO, Asset, and course).

During the project we found that when a course is implemented into HIVE®, it allows us to publish only the small manifest file to the LMS instead of the whole course package.

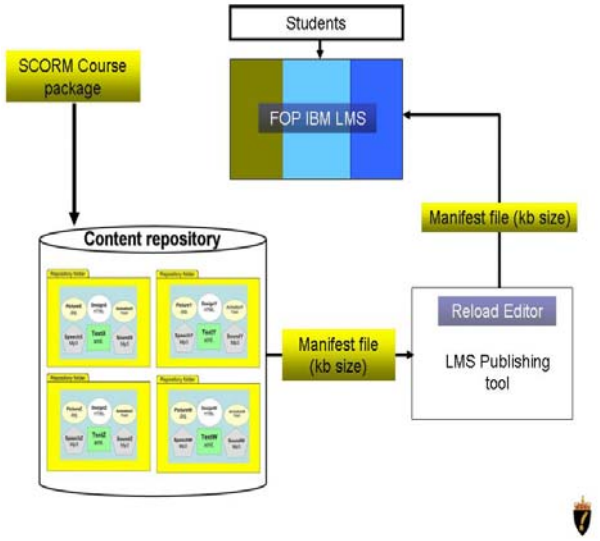

Figure 7. New course published to a LMS through a content repository

This saves a lot on time and cost during the implementation of new courses onto the LMS. When a published course is run by a student, the LMS accesses the content directly from the FDRS.

This capability also makes it much faster and easier to test a course during the development phase. You don't need to upload a new package for every change you make. If a change in a course file is required, you only need to make the change in the identified file directly in the FDRS, and the change will be visible in the LMS at the same time (Isaksen, 2008).

All types of content (files) can be checked out from FDRS, edited and checked in again (Harvets Road, 2007a). The edited file will instantly change in the e-learning course. That's maintenance of the source with an instant update of the learning.

MULTINATIONAL SHARING OF CONTENT

Technical background Open Knowledge Initiative (OKI) and Open Service Interface Definitions (OSID)

The O.K.I develops and promotes specifications that describe how the components of a software environment communicate with each other and with other enterprise systems. O.K.I. specifications enable sustainable interoperability and integration by defining standards for Service Oriented Architecture (SOA). Through this work O.K.I. seeks to open new market opportunities across a wide range of software application domains.

To this end, O.K.I. has developed and published the OSIDs, whose design has been informed by a broad architectural view. The OSIDs define important components of a SOA as they provide general software contracts between service consumers and service providers. This enables applications to be constructed independently of any particular service environment, and eases integration.

The OSIDs enable choice of end-user tools by providing plug-in interoperability. OSIDs are software contracts only and therefore are compatible with most other technologies and specifications, such a SOAP (SOAP is a protocol for exchanging XML-based messages over computer networks, normally using HTTP/HTTPS), Web Services Description Language (WSDL). They can be used with existing technology, open source or vended solutions. OSIDs are a local language service definition and bindings of them are provided in Java, PHP, and soon Objective C and C# (Kahn, J, 2005a).

The OSIDs themselves are very generic and they use *Types* as a way of allowing implementation-specific behavior. Developing a community consensus on Types is a crucial part of obtaining interoperability with OKI. The most popular OSID, Repository, has been so successful at interoperability because most of the implementations share at least one common Search Type.

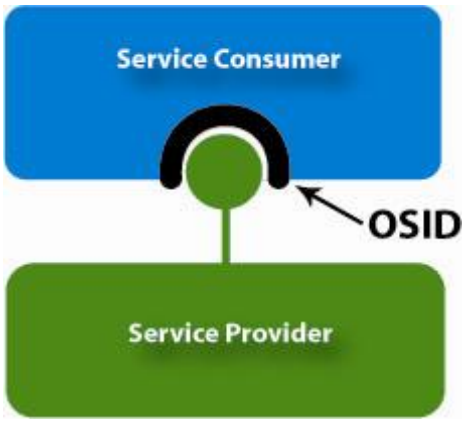

Figure 8. Open Service Interface Definitions from OKI

Technical solution

The challenge in this project was to implement an OSID based Single Sign On (SSO) across the NoDEC and CDA repository applications. This project used a client-side content publishing, search and discovery, and management application, allow for each participant to disaggregate content in their own repository (be it html, flash, SCORM, Word, Excel, PowerPoint) (Harvest Road, 2007b) and then expose it to the participants, based on predefined set of permissions, access level and parameters.

Additionally, the client application enables each participant to search, discover, and reuse within their own course offering, the other's content course, SCO, asset, or chunk.

Metadata is used to describe each group's content. This can be any industry recognized application profile such as IMS, Dublin Core, and a proprietary schema from each group. It can also be a combination of existing standards based and proprietary. For this integration project, both CDA and NoDEC are using the same schema definition.

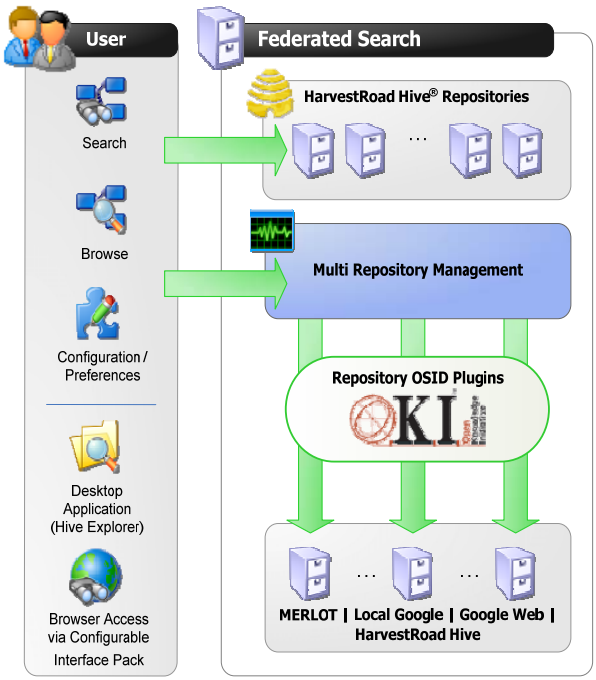

Figure 9. Federated Search system principal schema

The provider (each client repository) and consumer (client) OSID definition files are developed and deployed to each connecting client(s) application. The OSID definition file contains various information types like: provider application, connection information, metadata schema information, and user credentials.

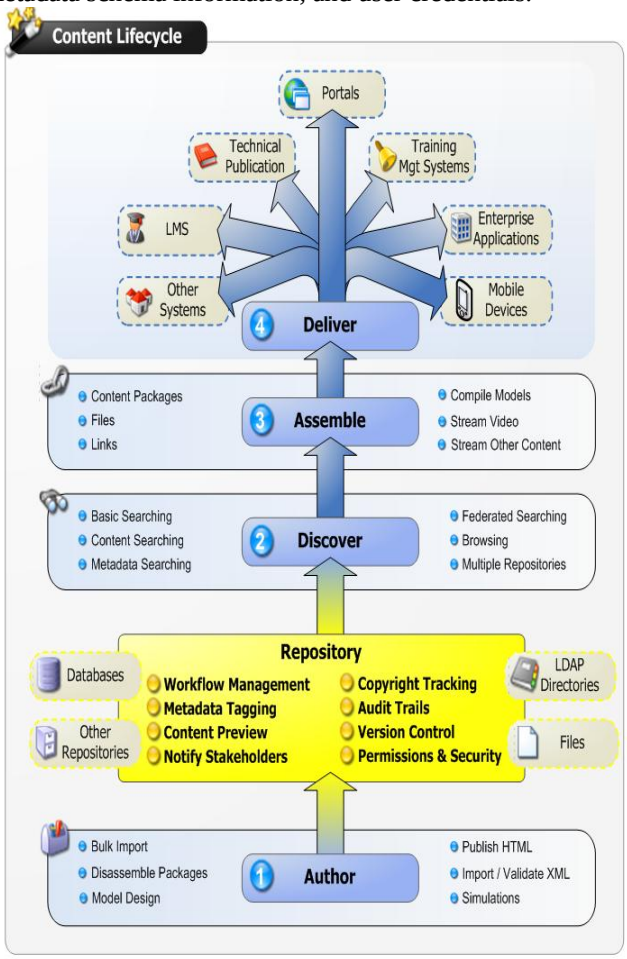

Figure 10. Content lifecycle

NoD - CDA - Test case

By enabling these capabilities, NoD and CDA are now able to search the "open" parts of each others content repositories and access courses that cover topics like the laws of armed conflict (Norway) and ISAF pre deployment course released from Allied Command Transformation (ACT).

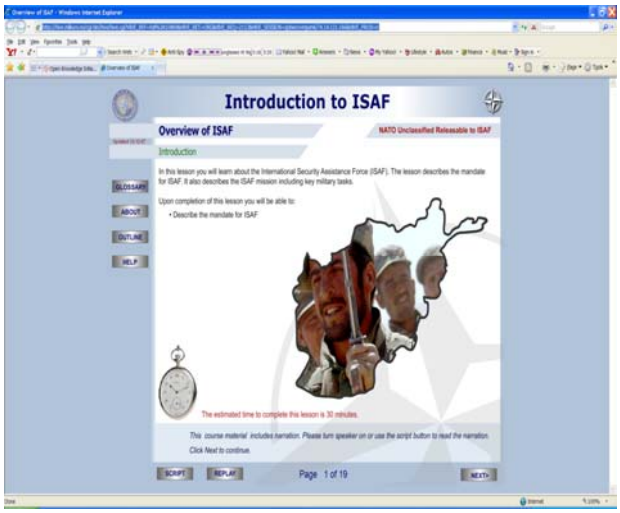

Figure 11. ISAF pre deployment course from ACT

Benefits found in this project

A federation of national content repositories connected together that enables partnership nations to access each others content is a very powerful capability for NATO and other partner nations. The benefits of a solution described in this paper are:

1. Each participant maintains ownership and control of their respective content, providing access others to search, discover, preview, and reuse.
2. Introducing additional repositories into the framework is relatively simple.
3. Implementing an OKI solution is non-intrusive to the provider systems.
4. NATO can give all member nations and partner's access to NATO courses from a single place without duplicating the courses.
5. The system allows you to preview all types of content
6. With the implementation of content separation you are able to edit content in the system. Even change language yourself.
7. It makes the test phase, when implementing a new course to an LMS quicker and cheaper.

Indentified challenges

1. Nations and organizations must "release" there content to be reused by other nations
2. A common set of rules for developing courses, when it comes to file structure and look and feel should be established.
3. NATO nations should move towards a common Metadata schema and taxonomy

Summary

This project has shown that there is a technical solution available to facilitate multinational content sharing. By using instances of an FDRS (HIVE®) with an enabled OSID capability from OKI, NoDEC and CDA have the capability to access each others open content. This type of solution can be the model for a future NATO/PfP system for federation of content

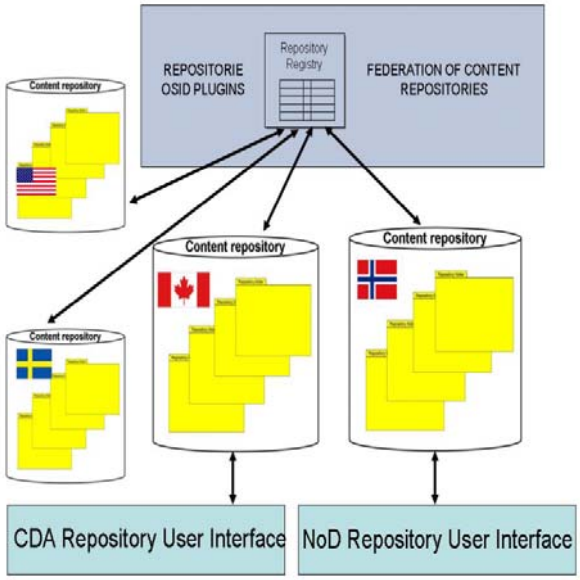

Figure 12. Federation of NATO/PfP repositories

NoD and CDA will, together with Giunti labs and NATO partners, continue to explore and test more solutions to optimize the capability to develop, store, maintain, retrieve and reuse content across nations and organizations.

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