

# Creating Reusable Content with SCORM 2004 and the ADL Registry

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# Objectives

- **Understand basic ADL and SCORM terminology**
- **Use the ADL Registry to search for existing content**
- **Understand how existing content can be redeployed, rearranged, repurposed, and rewritten**

# Agenda

- **Introduction**
- **Terminology**
- **Process**
- **Case study**
- **Future of SCORM**
- **Resources and references**

# Introduction

# ADL Initiative Overview

- **Formed in 1997 to standardize and modernize training and education delivery and management**
- **Oversight provided by DoD Office of the Under Secretary of Defense for Personnel and Readiness**
- **Vision**
  - **Provide access to the highest-quality learning and performance aiding that can be tailored to individual needs and delivered cost-effectively, at the right time and in the right place**
- **Successes**
  - **SCORM**
  - **ADL Registry**

# SCORM 2004

- **Sharable Content Object Reference Model**

- Integrates a set of related technical standards, specifications, and guidelines designed to achieve SCORM's high-level requirements for content and systems
- Enables you to redeploy, rearrange, repurpose, and rewrite your content
- Allows e-learning to be delivered to your learners via any SCORM-certified LMS using the same version of SCORM

# ADL's Functional Requirements

- **Accessibility**
  - The ability to locate and access instructional components from multiple locations and deliver them to other locations
- **Reusability**
  - The ability to use instructional components in multiple applications, courses and contexts
- **Interoperability**
  - The ability to take instructional components developed in one system and use them in another system
- **Durability**
  - The ability to withstand technology changes over time without costly redesign, reconfiguration or recoding

# SCORM

*the de facto* standard for e-learning

- **K-12 Education**

- Cyber Home Learning System (Korea)
- Becta (UK)
- European Schoolnet Aspect Project (EU)

- **Corporate Training and Education**

- Automotive Industry (Chrysler)
- Pharmaceutical Industry (Wyeth, Pfizer, Abbott Labs)
- Mortgage Industry (Mortgage Bankers Association, Wells Fargo Home Mortgage)

- **Government/Defense**

- US Federal Pharmacy Technician Training
- Canada Department of National Defence

- **Others**

- Australia Vocational Education and Technology Sector

# ADL Registry

- ADL Registry – a central search point for metadata to find DoD content related to learning
  - The digital equivalent of a library card catalog
  - Contains all of the cards (**registered entries**) that contain a standard set of information (**metadata**) about all of the books (**training resources**) in the library (**repository**)
- <http://adlregistry.adlnet.gov/>

# ADL Registry Metadata Entry

Title and Description

Keywords

Version and Status

Author/Contributor  
Details

Copyright and  
Other Restrictions

Type of Content

Metadata & Repository  
Identification

## View Metadata

[download XML file](#)

### Content Information

Title: HAZMAT Familiarization and Safety Transportation  
Description: This course is designed to meet employee training requirements for personnel working with hazardous material. It meets the required familiarization and safety training as described in 49 CFR, Section 172.704. This course does not meet the training requirements for a HAZMAT certifying officials as identified in Department of Defense (DoD) courses described in DOD 4500.9-R, Chapter 204, D.1.b).  
Keywords: Material Safety Data Sheets (MSDS)  
Hazardous Materials  
Hazardous Materials Transportation  
Hazard classes  
Emergency Response Guide (ERG)  
waste substance  
marine pollutant  
compressed gases  
explosives  
flammable  
Version Number: 20080000.00  
Content Status: under development  
Collection: DOD

### Contributor Information

Contributor Name: Nina Pasini Deibler  
Contributor Role: author  
Contributor Date: 2008-04-28T12:08:56

### Restriction Information

Copyright Restriction: yes  
Security Level: unclassified  
Distribution Restriction: LR

### Technical Information

Content Type: asset  
Object Contents:  
(MIME/Types) text/html  
Metadata Schema: LOMv1.0  
ADL-Rv1.0  
Conformance: SCORM 2004

### Identifiers

Registry ID: 4444/registry  
Repository ID: [100.51/10017daclms](#)  
Content Object ID: [4444.22/a27620b362fcb2bae91e9380442fe985](#)  
Metadata Instance ID: 4444/MDa27620b362fcb2bae91e9380442fe9851209401899082

# DoD Policy – DoDI 1322.26

- **Related to SCORM content**
  - **Embedded training and DL shall be the first option to meet DoD training requirements**
  - **All acquired or developed systems and content packages shall conform to SCORM (current version)**

# DoD Policy – DoDI 1322.26

- **Related to the ADL Registry (ADL-R)**
  - **All acquired or developed SCORM content packages shall**
    - **Include metadata**
    - **Be registered in the ADL-R**
    - **Be maintained in DoD Components' repositories that are searchable and accessible**
  - **More than just content packages should be registered!**

# DoD Policy – DoDI 1322.26

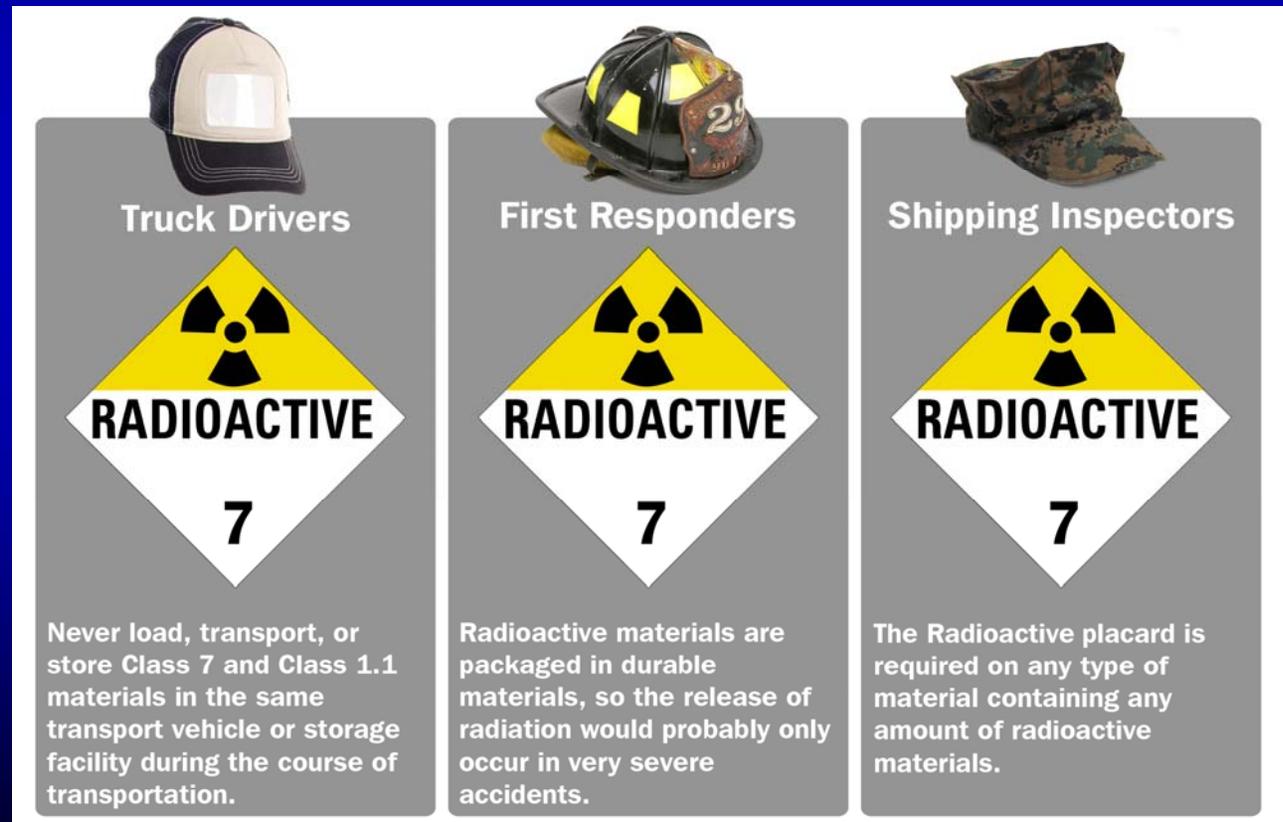
- **Related to the Front-End Analysis**
  - The ADL-R shall be searched prior to beginning any new DL content development or acquisition activity to identify available content suitable for reuse
  - The Defense Automated Visual Information System/Defense Instructional Technology Information System (DAVIS/DITIS) (<http://defenseimagery.mil>) shall also be searched for learning content in other media

Search other relevant resources for reusable materials and SCORM-compliant learning objects, too (e.g. [www.merlot.org](http://www.merlot.org))

# Terminology

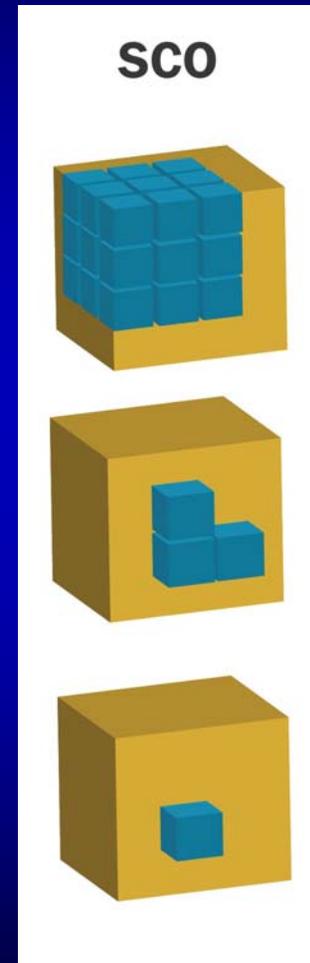
# Asset

- Electronic representations of media such as text, images, sound or any other piece of data a web client can deliver
- The most basic form of content
- Can be reused in many different contexts and applications



# Sharable Content Object (SCO)

- Comprised of one or more assets that becomes an independent, defined piece of instructional material
- The smallest logical unit of information you can deliver to your learners via an LMS
  - In technical terms, a SCO is defined as the only piece of information that uses the SCORM Application Programming Interface (API) for communication with an LMS.



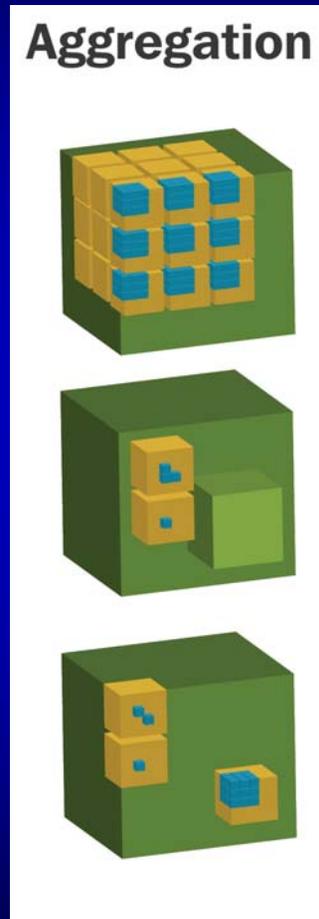
# Content Package

- A standardized, interoperable way to upload content to a SCORM-compliant LMS
- A SCORM content package contains two principal parts:
  - The **XML manifest file** that lists
    - All of the resources or assets you want to include in the package
    - The content structure diagram you created (called the organization)
    - The sequencing rules
    - All of the metadata for the SCOs, aggregations, and the package itself
  - All of the physical SCO and asset files for the content package



# Aggregation

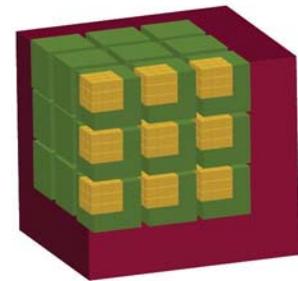
- **Collection of related content**
  - A parent and its children in a tree structure
  - Also known as a cluster
- **Used to group related content for sequencing so that it can be delivered to learners in the manner you prescribe**
- **Contain SCOs and other aggregations**
  - Aggregations of aggregations are possible



# Organization

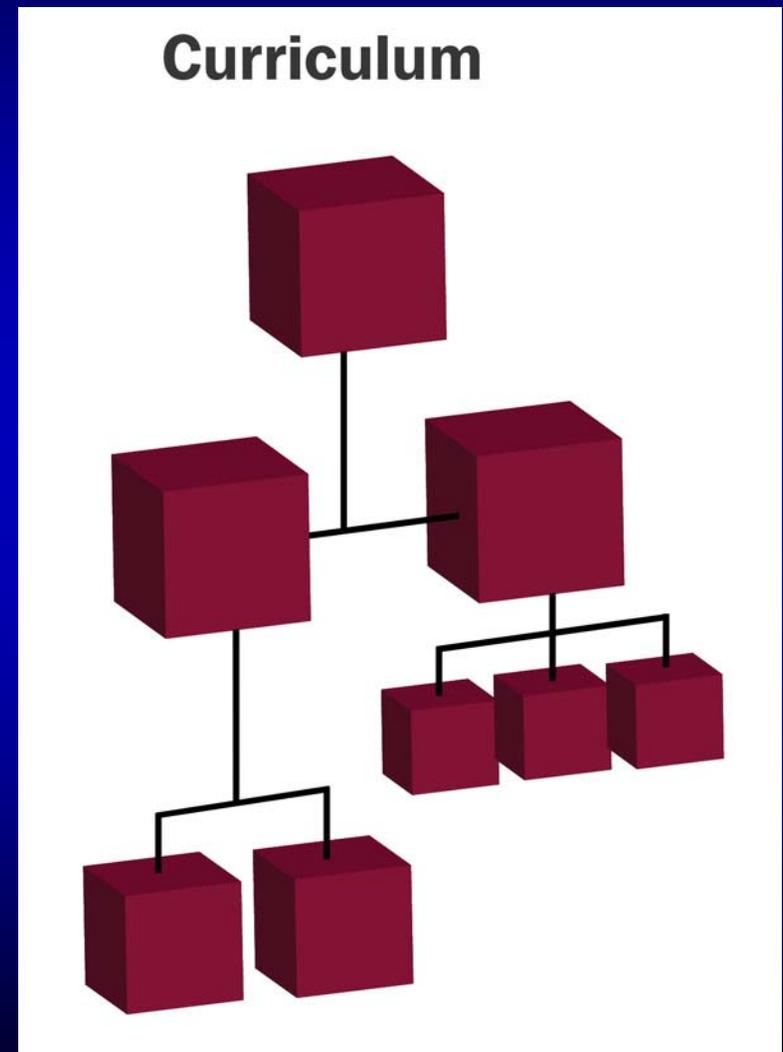
- The part of a content package where SCOs are ordered into a tree structure and sequencing behaviors are assigned to them
  - Also known as a root aggregation
- Outlines the entire structure you created for the content that will be delivered as a single content package

## Organization



# Curriculum

- **Outside the scope of SCORM**
- **SCORM-compliant content can be part of a curriculum that is managed by your LMS**
- **Typically includes courses, lessons, and assessments using a variety of delivery media and instructional strategies**



# Data Model Elements

- **Enable tracking and storing of data about learner performance in, and interaction with, instructional content **interoperably****
  - Every LMS must support all data model elements
  - Use of data model elements in content is optional
- **Allow you to use or collect information including**
  - Learner's name for use in the content
  - Last location in the content the learner viewed
  - Learner's language, presentation or other preferences
  - Score and/or pass/fail status
  - Completion status for a SCO
  - Total time spent in a SCO and/or time in a single session of a SCO
  - Responses to assessment items
  - Interactions within a SCO

# Sequencing and Navigation

- **Sequencing**

- Ability to prescribe the manner in which learners receive individual pieces of content from the LMS
- Allows you to design more granular content
- Can be used to add context to when you have context-neutral SCOs

- **Navigation**

- Process that allows learners and designers to determine what content to deliver
  - Learner directed – learner decides what to do next using LMS provided navigation elements
  - Content directed – content (designer) will provide navigation elements inside content

# SCORM Product Status

- **SCORM 2004 Compliance**

- A product is tested to ensure it performs in the ADL SCORM Test Suite
- Applies to a specific version only
  - SCORM 2004 1<sup>st</sup> Edition
  - SCORM 2004 2<sup>nd</sup> Edition
  - SCORM 2004 3<sup>rd</sup> Edition
  - SCORM 2004 4<sup>th</sup> Edition (coming soon)

- **SCORM 2004 Certification**

- A qualified, neutral third party conducts a formal evaluation using the ADL SCORM Test Suite and a rigorous, accurate, reliable, validated methodology
- Applies to a specific version only
  - SCORM 2004 1<sup>st</sup> Edition
  - SCORM 2004 2<sup>nd</sup> Edition
  - SCORM 2004 3<sup>rd</sup> Edition
  - SCORM 2004 4<sup>th</sup> Edition (coming soon)

# SCORM and Your Process

# Unique Workflow Issues Analysis

- **Search ADL Registry and DAVIS/DITIS to identify existing content or media that can be reused**
- **Document search criteria and results via screen captures from the ADL Registry and DAVIS/DITIS**

- 
- **If existing content identified**
    - **State how you will gain access to the content**
    - **Describe how it will be integrated with your project**

- **If existing content not identified**
  - **Justify your need to create new content**

# ADL Registry Home Page



The screenshot shows the ADL Registry Home Page. On the left is a navigation sidebar with the ADL Registry logo (a stylized 'A' and 'L' with a globe) and three main sections: 'Search' (registry for content), 'Contribute' (your content to the registry), and 'Getting Started' (with the ADL Registry). Below these are three links: 'Register Repository/Contributors', 'Technical Reference', and 'About ADL Registry'. The main content area features a 'Home' breadcrumb, a search and share description for the U.S. Department of Defense (DoD), and a paragraph explaining the ADL Registry's sponsorship and purpose. A search bar with the placeholder 'Search Content...' and a yellow 'search' button is positioned below the text. The background of the main content area includes a faint world map.

**ADL Registry**

Home

**Search**  
registry for content

**Contribute**  
your content to the registry

**Getting Started**  
with the ADL Registry

- ▶ [Register Repository/Contributors](#)
- ▶ [Technical Reference](#)
- ▶ [About ADL Registry](#)

Search and share learning with others across the U.S. Department of Defense (DoD).

The ADL Registry is sponsored and operated by the U.S. DoD Advanced Distributed Learning (ADL) Initiative. It provides a means for registering, searching, and discovering content objects using a common set of metadata.

Search Content... **» search**

<http://adlregistry.adlnet.gov/>

# Documenting Search Results

Search criteria

Description of item

Number of result pages

Results for: 1  
" (hazmat AND transport) "

**Naval Motor Vehicle and Railcar Inspection and Exam**

[get content](#) [view metadata](#)

This course covers the requirements, techniques and procedures for the inspection of motor vehicles and railcars (on- and off-station) that are transporting ammunition and explosives. The course includes instruction on compatibility, placarding requirements, and blocking and bracing for ISO inter-modal containers, railcars and motor vehicles. It covers Department of Defense (DOD) and Navy transport equipment inspection procedures using DD Form 626, Motor Vehicle Inspection (Transporting Hazardous Material), and NAVSEA Form 8023/3. The course also addresses Navy transportation safety requirements and the security of sensitive ordnance. This course is required by NAVSEA OP 5, Volume 1, and NAVSEA SW020-AF-HBK-010 for newly assigned inspection personnel. Students should complete Ammo-67, HazMat Familiarization and Safety in Transportation, before attempting this course.

**Naval Motor Vehicle and Railcar Inspection and Exam**

[get content](#) [view metadata](#)

This course covers the requirements, techniques and procedures for the inspection of motor vehicles and railcars (on- and off-station) that are transporting ammunition and explosives. The course includes instruction on compatibility, placarding requirements, and blocking and bracing for ISO inter-modal containers, railcars and motor vehicles. It covers Department of Defense (DOD) and Navy transport equipment inspection procedures using DD Form 626, Motor Vehicle Inspection (Transporting Hazardous Material), and NAVSEA Form 8023/3. The course also addresses Navy transportation safety requirements and the security of sensitive ordnance. This course is required by NAVSEA OP 5, Volume 1, and NAVSEA SW020-AF-HBK-010 for newly assigned inspection personnel. Students should complete Ammo-67, HazMat Familiarization and Safety in Transportation, before attempting this course.

**HAZMAT Familiarization and Safety Transportation**

[get content](#) [view metadata](#)

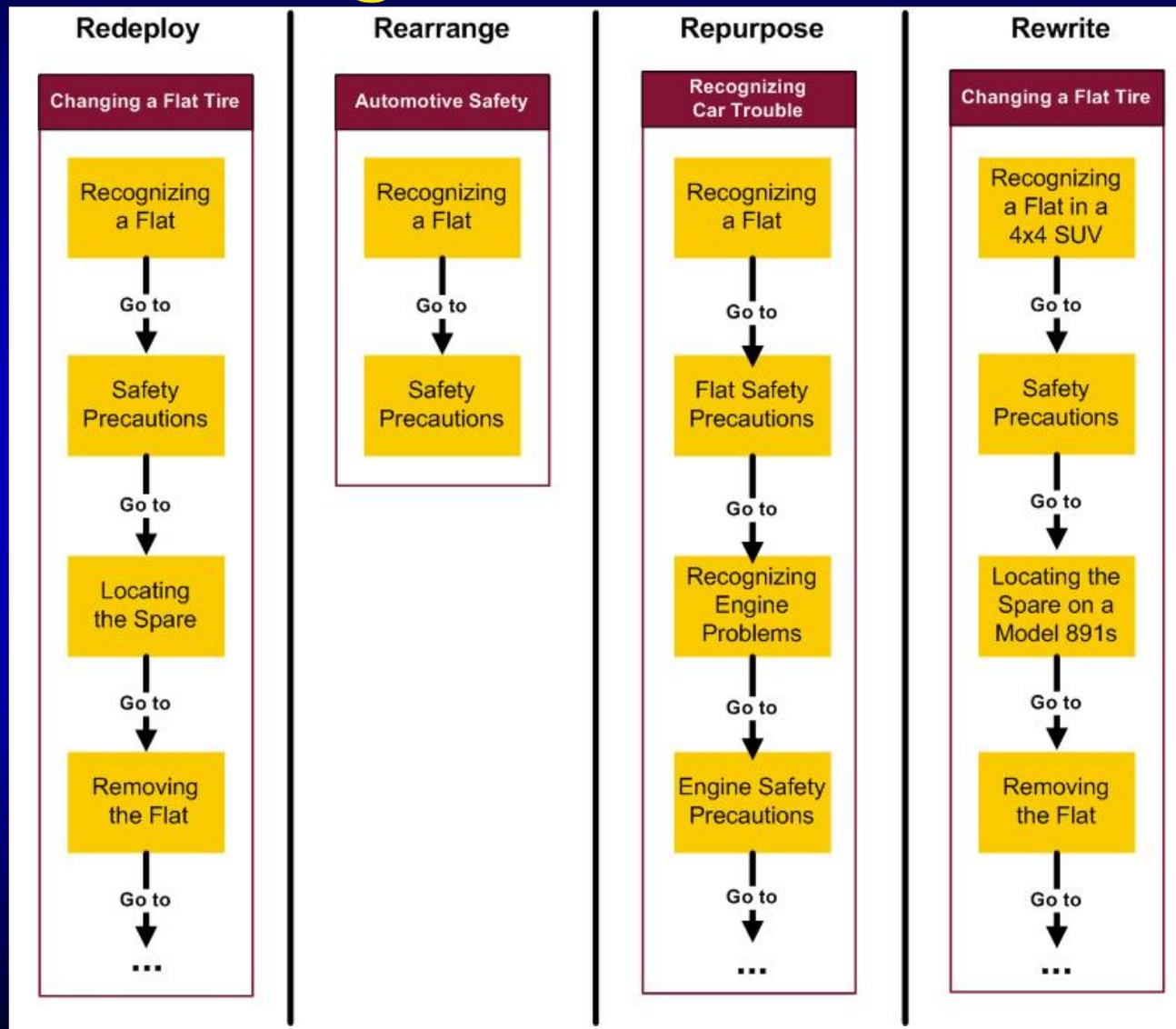
This course is designed to meet employee training requirements for personnel working with hazardous material. It meets the required familiarization and safety training as described in 49 CFR, Section 172.704. This course does not meet the training requirements for a HAZMAT certifying officials as identified in Department of Defense (DOD) courses described in DOD 4500.9-R, Chapter 204, D.1.b).

1

# Categories of Reuse

- **Redeploy**
  - Running the same content, without modification, in multiple LMSs
- **Rearrange**
  - Re-ordering the same content for new uses or new contexts
- **Repurpose**
  - Using the same piece of content in new contexts or in different ways
- **Rewrite**
  - Taking relevant materials and changing the examples, imagery, or writing style, or removing irrelevant information

# Categories of Reuse



# Analysis Considerations

- **Have you searched the ADL Registry to identify existing content that can be redeployed, rearranged, repurposed, or rewritten?**
- **Does the target LMS comply with the latest version of SCORM?**
- **What data do you need to track about learner performance in and interaction with the instruction?**
- **How will the content be used?**
- **Can you immediately identify secondary audiences for your content to increase its reusability?**
- **How will you record, assign, and document metadata for your content?**

# Unique Workflow Issues Design

- **Maximize the potential that your content can be redeployed, rearranged, repurposed, or rewritten**
  - Design smaller, context neutral SCOs
  - Use sequencing to add context-specific SCOs
- **Define data collection and tracking requirements**
- **Create content structure/flow chart and rules for sequencing**
- **Determine what information is required for formal reporting**

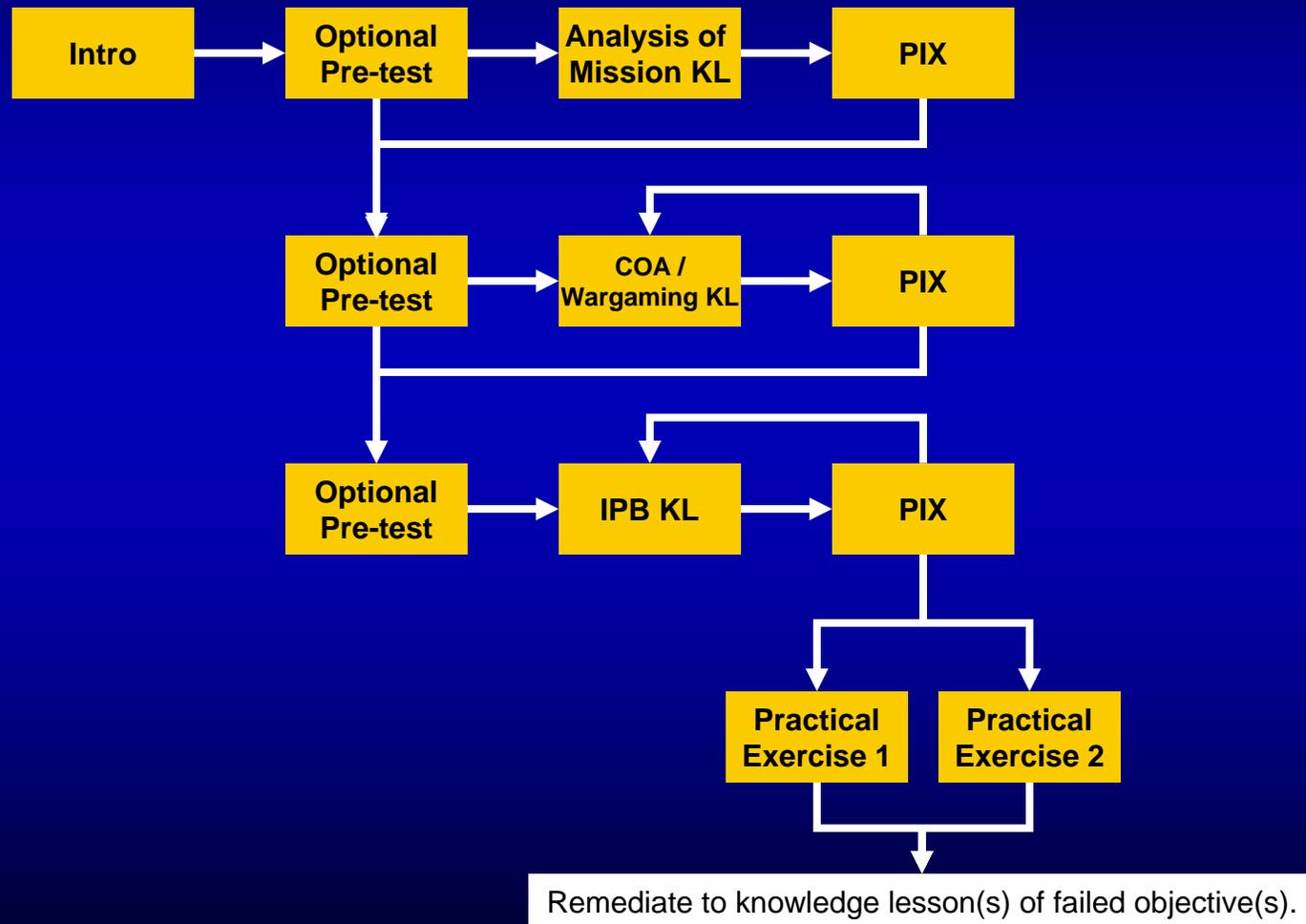
# Determining SCO Size

## - It Depends

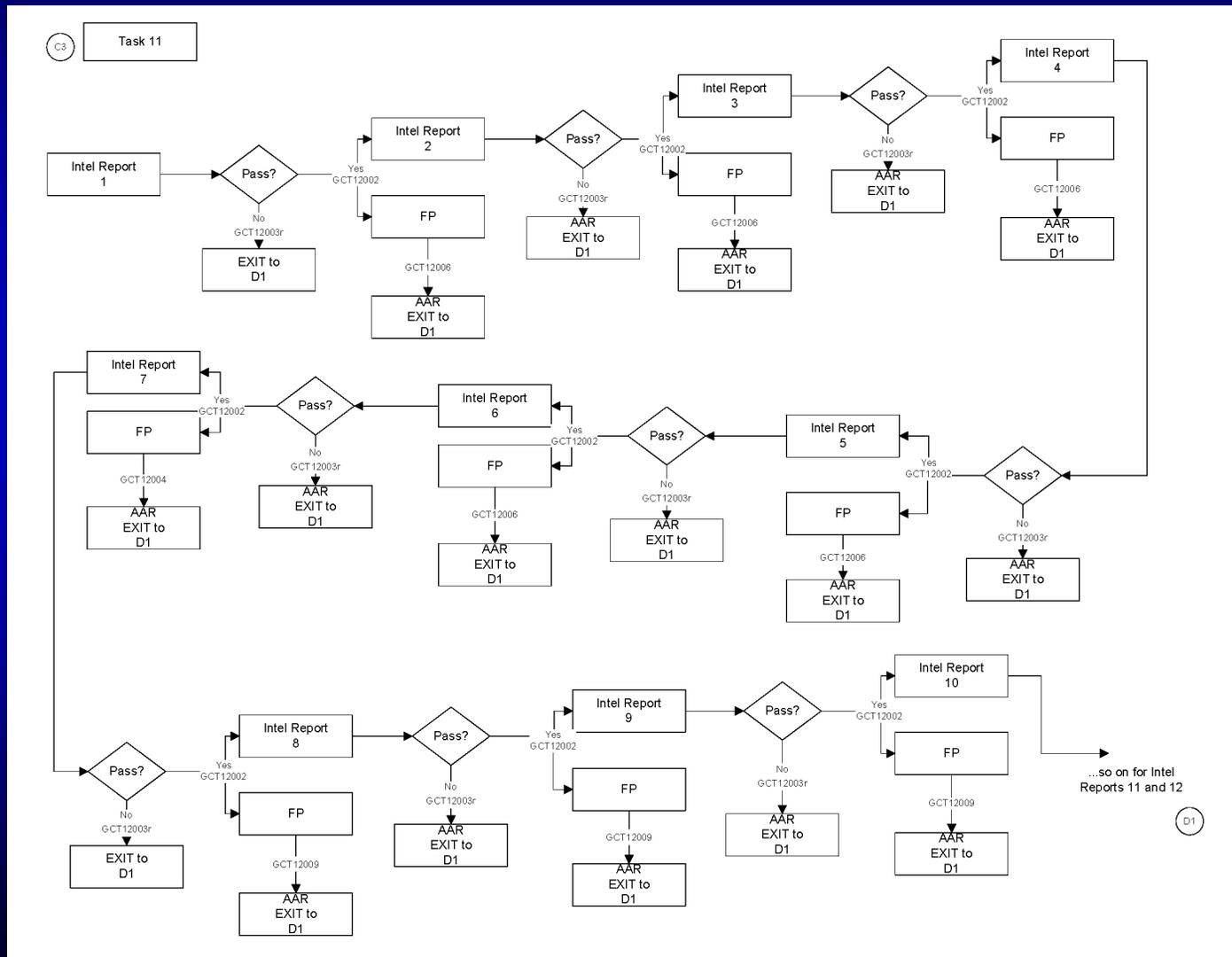
- **Compliance Training Example**
  - Your learners need general instruction about handling hazardous materials
  - You must show that learners completed the instruction
  - Complete means learners viewed the content
  - One larger SCO is acceptable
- **Certification Training Example**
  - You need to know that a shipping inspector learned to “properly ship radioactive materials for transit on a vessel” as part of a larger hazardous materials transportation course
  - Learners must complete a series of similar learning objectives and pass a comprehensive assessment to receive certification
  - Numerous smaller SCOs may be required for tracking

# Sequencing Design

## Simple Content Structure Diagram



# Sequencing Design Complex Flow Chart (Partial)



# Design Considerations

- How will you optimize the potential for content to be redeployed, rearranged, repurposed, and rewritten?
- Will SCOs cover a single learning objective or multiple learning objectives?
- Will SCOs include an assessment, or will the assessment be a separate SCO?
- How will SCOs be divided, structured, chunked, and sequenced?
- What media types will be incorporated?

# Design Considerations (con't)

- What other organizational policies and practices must you comply with (e.g., Section 508)?
- When, where, and how will you collect data (e.g., per SCO, content package, curriculum)?
- What navigation options will be provided in the SCO versus the standard navigation options provided by a typical LMS?
- What colors and layouts will work best in the target LMS and in other LMSs?
- Will templates and cascading style sheets facilitate rearranging, repurposing, and rewriting the content?

# Unique Workflow Issues Development

- Use the content structure diagram to program the sequencing rules in a functioning prototype with generic content

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- **Content Developer**

- Continue content development while programmer focuses on sequencing rules

- **Programmer**

- Test sequencing rules with generic content until rules function as designer intended

# Example of Functional Prototype (Skeleton) with Generic Content

The screenshot displays a software interface with a dark blue header. The header contains the text "Skeleton Content" on the left and "POWERED BY RUSTICI SOFTWARE" on the right. Below the header is a navigation bar with the following options: "HIDE MENU", "VIEW DEBUG", "<- PREVIOUS", "NEXT ->", "CLOSE ITEM", and "RETURN TO LMS".

On the left side, there is a vertical menu with five items, each with a small icon and a checkbox:

- Skeleton Content
- Tutorial
- Pretest
- Lesson
- Pretest

The main content area on the right is white and contains the following text and buttons:

Module 1 Pretest

Course in progress, do not close...

PASS

FAIL

# Unique Workflow Issues Implementation

- **Test in ADL SCORM Test Suite**
  - **Deploy content on target LMS and test in “learner mode”**
- 
- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• <b>If target LMS unavailable</b><ul style="list-style-type: none"><li>– Deploy on ADL Sample RunTime Environment to view in “learner mode”</li></ul></li></ul> | <ul style="list-style-type: none"><li>• <b>If multiple target LMSs</b><ul style="list-style-type: none"><li>– Test in as many LMSs as possible</li><li>– Deploy on ADL Sample RunTime Environment to view in “learner mode”</li><li>– Use ADL Learning Technology Center LMS implementations</li></ul></li></ul> |
|--|--|

# Unique Workflow Issues Evaluation

- **No unique workflow issues**

# Unique Workflow Issues

## ADL Registry Metadata

- **Provide the mandatory metadata required by the ADL Registry**
- **Add additional metadata elements from IEEE Learning Object Metadata standard to more fully describe your content objects, if desired**
  - **ADL Registry indexes all metadata so that others can find, redeploy, rearrange, repurpose, or rewrite your content**

# Reuse Categories Case Study

# Case Study Overview

- **Organization:** Defense Ammunition Center (DAC)
- **Course:** Ammo-67, HAZMAT Familiarization in Transportation
- **Target Audience:** **US Army** shippers, loaders, drivers, etc. requiring hazardous materials familiarization specified in 49 CFR
- **Learning Objectives**
  - Select the proper publication for the specified mode of transportation
  - Identify the types of hazardous materials and their markings
  - Identify the classes and divisions for hazardous materials and their markings
  - Identify the documentation requirements for the identification of hazardous materials in transit
  - Identify the types of information found in a Material Safety Data Sheet (MSDS)
  - Identify the types of information found in the Emergency Response Guide (ERG)

# Case Study

## Reusable Items in ADL-R

Topic	Type	Shipping Inspector	Operator	First Responder	Lab Worker	In ADL-R
Ammo-67	Course	X	X			Y
Publications	SCO	X	X			Y
Types of HAZMAT	SCO	X	X	X		Y
UN HAZMAT Classes and Divisions	SCO	X	X	X	X	Y
Shipping Documentation for HAZMAT	SCO	X	X			Y
MSDS	SCO	X	X	X	X	Y
ERG	SCO	X	X	X		Y

# Case Study

## Redeploy

- **Course:** Ammo-67, HAZMAT Familiarization in Transportation
- **Target Audience:** **US Navy** shippers, loaders, drivers, etc. requiring hazardous materials familiarization specified in 49 CFR
- **Learning Objectives**
  - Select the proper publication for the specified mode of transportation
  - Identify the types of hazardous materials and their markings
  - Identify the classes and divisions for hazardous materials and their markings
  - Identify the documentation requirements for the identification of hazardous materials in transit.
  - Identify the types of information found in a Material Safety Data Sheet (MSDS)
  - Identify the types of information found in the Emergency Response Guide (ERG)
- **Modifications**
  - None

# Case Study Rearrange

- **New Course:** Hazardous Materials in the Lab
- **Target Audience:** Lab assistants, students using laboratory environments
- **Learning Objectives**
  - Identify the United Nations classes and divisions for hazardous materials and their markings
  - Identify the types of information found in a Material Safety Data Sheet (MSDS)
- **Modifications**
  - New context and audience
  - Subset of original Ammo-67 learning objectives
  - No change to actual SCOs

# Case Study

## Repurpose

- **New Course:** Workplace HAZMAT Compliance Training (OSHA mandated)
- **Target Audience:** All employees in an office building with a laboratory
- **Learning Objectives**
  - Identify the types of information found in a Material Safety Data Sheet (MSDS)
  - **Identify the location of MSDS in our facility**
- **Modifications**
  - New context and audience
  - One repurposed objective from original Ammo-67 learning objectives
  - One new objective for new context and audience

# Case Study Rewrite

- **New Course:** HAZMAT Awareness for First Responders
- **Target Audience:** Police, Paramedics/EMTs, Fire Fighters
- **Learning Objectives:**
  - Identify the four most common classes of hazardous materials and their markings
  - Identify the response strategies for common HAZMAT incidents
- **Modifications**
  - New context and audience
  - Adapted content (simplified to most common classes)
  - Added response strategies for first responders

# ADL Registry

## Items to Contribute

- **Content packages that others could redeploy, rearrange, repurpose, or rewrite**
  - Courses
  - Aggregations
  - SCOs
- **Collections of learning objectives**
  - Courses
  - Modules
  - Units
  - Other...

# ADL Registry Items to Contribute

- **Any content that is **useful** to others**
  - **Applicable to or required by multiple services or others in DoD**
    - **Combating Trafficking in Persons**
    - **Combat Care for Blast Injuries**
    - **Tactical: Patrolling, Defensive Operations**
  - **Non-government specific**
    - **Accounting**
    - **Medical**
    - **Leadership**
    - **Regulatory (compliance)**
  - **Governed by Federal, rather than just DoD policy**
    - **Transportation of Hazardous Materials**
    - **Federal Acquisition Regulations**
    - **Air Traffic Control**

# ADL Registry

## Items to Contribute

- **Any content that is **useful** to others**
  - **Not weapon-system specific**
    - **Principles of Navigation (flight or naval training)**
    - **HWMMV Maintenance**
  - **Other guidance (in PDF files)**
    - **Style Guides**
    - **Glossaries**
    - **Reference Manuals**

# Review

- ✓ **ADL and SCORM Introduction**
- ✓ **SCORM Terminology**
- ✓ **SCORM and Your Process**
- ✓ **Reuse Case Study**
  - ✓ **Search**
  - ✓ **Redeploy**
  - ✓ **Rearrange**
  - ✓ **Repurpose**
  - ✓ **Rewrite**
  - ✓ **Register**

# Future of SCORM

# SCORM 2004 4<sup>th</sup> Edition

- **Timeline**

- **Sample Run Time Environment and Test Suite final release expected ~early to mid 2009**

- **Enhancements/Corrections**

- **Correct minor bugs**
- **Improve interoperability across LMSs**
- **Test more stringently and add new test cases**

- **Impact on Community**

- **Requires re-certification of LMS vendors (no charge for currently certified SCORM 2004 3<sup>rd</sup> Edition LMSs for 90 – 120 days after certification is available)**
- **Certification available in mid 2009**

# Resources and References

# Resources for ADL Users

- **ADL Initiative**

<http://www.adlnet.gov/>

- **ADL Registry**

<http://adlregistry.adlnet.gov/>

- **Joint ADL Co-Lab Support Resources**

<http://www.jointadlcolab.org/support/>

- **ADL Glossary**

– <http://www.jointadlcolab.org/help/terms/index.aspx>

- **DAVIS/DITIS**

– <http://defenseimagery.mil/index.html>

# References

- ***ADL Guide to Creating Reusable Content with SCORM 2004***
  - [www.adlnet.gov](http://www.adlnet.gov)
- ***The ADL Registry and CORDRA, Volume 2: ADL Registry Overview and User Guide***
  - <http://adlregistry.adlnet.gov/>
- ***DOD Instruction 1322.26, Development, Management, and Delivery of Distributed Learning, June 2006***
  - <http://www.dtic.mil/whs/directives/corres/html/132226.htm>

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