Army Business Rules and Best Practices for Distributed Learning Development Guide

Version 3.0
28 July 2022

Release Summary

Version	Release Date	Changes in Release
3.0	01 August 2022	• Added Business Rule 1.1.6 Responsive Web Design • Added Business Rule 1.1.7 Availability of Fonts Use • Added Business Rule 1.1.8 3D Models Specifications • Added Business Rule 1.1.9 No Embedded Certificates of Completion within Courseware • Combined Business Rule 2.1.1 and 2.1.2 into Business Rule 2.1.1 Allowable File and Folder Name Characters • Removed Business Rule 2.1.12 Consistent Exit Behavior • Removed Business Rule 2.1.13 Adobe Flash • Updated Business Rule 2.2.1 Window Closure and Exit Button • Moved Appendix E Use of Fonts into Business Rule 1.1.7 • Replaced Appendix E with 3D Models Specifications • Updated Appendix D BHCC
2.0	01 November 2021	• Removed reference to Learning Content Object (LCO) • Updated Business Rule 2.2.1 Window Closure and Exit Button • Updated Business Rule 2.1.9 Open Standards Requirement • Updated Business Rule 4.2.1 SCORM Content Package Deliverables • Added Business Rule 1.1.5 Revised Section 508 and WCAG Compliance • Removed BRBP Checklist • Added Responsive Web Design • Added Instructional Strategy for Accommodating Special Scoring Requirement

Table of Contents

Introduction

The Army Business Rules and Best Practices for Distributed Learning (DL) Development Guide ("BRBP," or "guide") is a development and compliance resource for the creation of distributed learning products for Army DL Producing Activities (ADLPAs).

This guide contains business rules and supporting best practices for application in development of DL products for delivery on Army Learning and Content Management Capability (ALCMC) information systems.

The intended audience is DL courseware programmers and instructional systems designers.

The business rules (BRs), best practices (BPs), and supporting information within this guide provide DL developers with the baseline requirements for creating Army DL products that meet Army DL conformance requirements and provide certain functionality required by the Army.

Business rules and best practices are formatted to provide end-goals for developers that apply broadly to all types of Army DL products, avoiding narrow specificity where possible to give developers the freedom to create a variety of robust products to meet the needs of the Army.

Developers are responsible for determining how best to apply the language of the guide to Army DL products.

The Division of Courseware Standards and Specifications, The Army Distributed Learning Program (TADLP), Army University maintain this guide.

Required Knowledge

This guide contains technical concepts related to instructional systems and web programming. The following technical specification knowledge is required:

- The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instructional design model
- Shareable Content Object Reference Model 2004 3rd Edition (SCORM) Technical Reference
- JavaScript and Extensible Markup Language (XML) programming
- General usage of Learning Management Systems (LMS)
- Army SCORM Acceptance Criteria

IMPORTANT: The Army only accepts web-based DL products conformant to SCORM 2004 <u>3rd Edition</u>.

Content Notation

Each section contains business rules, best practices, general discussion, and illustrations such as code examples. Business rules, best practices, and code examples have icons next to them for identification, shown in Figures 1 through 3 below.

Business Rule (BR) Example:

BUSINESS RULE 1.1.1: DISCRETE INDEPENDENT CONTENT BLOCKS
Independent SCOs shall be discrete blocks of learning content that do not refer to other SCOs or placement in a hierarchy in any of the content.

Figure 1: An example business rule

Best Practice (BP) Example:

BEST PRACTICE: SET A PRIMARY OBJECTIVE FOR EACH SCO

Set a primary objective for each SCO, whether the SCO is scoring or not, to increase interoperability. It is better to define an objective in the manifest than to rely on the LMS to automatically apply a default objective that the content has no control over.

Figure 2: An example best practice

Code Example:

SETTING A SCORM NAVIGATION REQUEST WHEN EXITING A LESSON
```
if (getValue("cmi.completion_status") == "completed")
    setValue("adl.nav.request", "exit");
else
    setValue("adl.nav.request", "suspendAll");
```

Figure 3: An example code sample

Each business rule and best practice in this guide is accompanied by an explanation to provide context to their requirements. Business rules often contain similarly inspired best practices, though best practices may stand on their own.

Figure 4 demonstrates how an important note appears in the guide.

IMPORTANT: Keep track of all log files and results produced during testing; they are required deliverables when it comes time to submit a DL product to the Army.

Figure 4: Important note example

Section Layout

The following sections contain include business rules, best practices, and appendices. The business rules and supporting information are presented within a life-cycle-style set of DL development phases, discussed in The Army Learning Environment, to provide clear context of requirements and why they exist, in the following order:

- **The Army Learning Environment**: An overview of the Army learning environment in which DL products reside, its major components, and the broad goals developers should keep in mind.

- **Business Rules and Best Practices Table**: Quick reference list of all business rules and best practices.

- **Section 1: Design**: The business rules and best practices that apply to designing a DL product before commencing development and programming work.

- **Section 2: Development**: The business rules and best practices that apply during the construction of a DL product and the implementation of its content and functionality.

- **Section 3: Testing**: The business rules and best practices that apply to validating a functional DL product after development is finished.

- **Section 4: Delivery**: The business rules and best practices that apply to delivering a finished DL product to the Army and ensuring that everything the Army requires is present.

- **Appendices**: This section contains information on Responsive Web Design, SCORM Implementation of Specific Instructional Strategies, Instructional Strategies for Accommodating Special Scoring Requirements, Baseline Home Computer Configurations,3D Model Specifications, and Metadata.

The Army Learning Environment

"Army Learning Environment" describes the collections of technologies, platforms, and content that comprise Army DL. This section provides a brief overview of the relevant parts of the Army learning environment and a discussion of the expectations for developers creating a DL product.

SCORM 2004 3rd Edition Technical Specifications

Advanced Distributed Learning Initiative (ADL) provides three technical documents that make up the SCORM 2004 3rd Edition specification:

- SCORM Content Aggregation Model (CAM) specifies that content should be packaged in a ZIP file called a Package Interchange File (PIF).
  - The PIF must always contain an XML file named imsmanifest.xml.
  - The manifest file contains all the information the LMS needs to deliver the content. The manifest divides the course into one or more parts called Shareable Content Objects (SCOs).
  - The manifest contains an XML representation of the activity tree, information about how to launch each SCO, and metadata that describes the course and its parts.

- SCORM Run-Time Environment (RTE) specification states that the LMS should launch content in a web browser, either in a new window or in a frameset.
  - The LMS may only launch one SCO at a time. Once the content is launched, it uses a well-defined algorithm to locate an ECMAScript (JavaScript) API that is provided by the LMS.
  - This API has functions that facilitate the exchange of data with the LMS. The SCORM RTE data model provides a standard set of data model elements that can be written to and read from the LMS.
  - Some example data model elements include the status of the SCO (completed, passed, failed, etc.), the score the learner achieved, a bookmark to track the learner's location in the course, and the total amount of time the learner spent in the SCO.

- SCORM Sequencing and Navigation (SN) specification allows the content author to govern how the learner is allowed to navigate between SCOs, and how data progress is rolled up to the course level.
  - Sequencing rules are represented by XML within the course's manifest. Sequencing operates on a tracking model that closely parallels the data model elements reported by SCOs during run-time.

ADL's SCORM 2004 3rd Edition Overview and Impact Summary offers a high-level overview of the key differences between SCORM 2004 2nd Edition and SCORM 2004 3rd Edition. It also provides a high-level overview of the SCORM 2004 3rd Edition documentation suite, the SCORM 2004 3rd Edition Conformance Test Suite and SCORM 2004 3rd Edition Sample Run-Time Environment.

The SCORM 2004 3rd Edition technical specifications, content examples, as well as other SCORM related resources, are located on the ADL website.

DL Delivery Platforms

The ALCMC is comprised of the delivery platforms for DL content systems that deliver content to learners and record performance.

The ALCMC's two major delivery platforms for DL are the Army Learning Management System (ALMS) and the Enterprise Lifelong Learning Center (ELLC). Any other DL delivery platforms are beyond the scope of this guide.

The ALMS is based on the Saba® enterprise learning platform, and the ELLC is based on the Blackboard® learning platform. Both platforms fully support SCORM 2004 3rd Edition content and have separate content testing environments (CTEs) for testing content.

Key Concepts

- DL creation process: The general process of Design, Development, Testing, and Delivery used by this document to categorize the business rules and best practices. The DL creation process is not normative like the ADDIE model process, but this guide uses it as a convenient and clear method to describe the overall process of making DL products.
- Content package: A content package is a file that contains content and accompanying metadata. It is a general concept that has been incorporated into standard formats such as the IMS Content Packaging specification used in SCORM.
- Interoperability: The concept of interoperability appears frequently in this guide and refers to the ability of content packages to be transferred between systems and function consistently. Interoperability also implies that content packages are fully self-contained, which is a key principle in specifications like SCORM.
- Learning experience: The learning experience simply refers to the learner's ability to experience learning content without confusion or difficulty. This concept is similar to "ease of use" or "user experience."

Product Delivery Process

The following lists above provide an overview of what goes into creating and delivering DL products within the Army learning environment.

DL developers are expected to complete the following prior to product submission:

- ☐ Follow the approved Instructional Multimedia Design Plan (IMDP)
- ☐ Implement instructional design requirements
- ☐ Implement functional requirements such as general content behavior and SCORM usage
- ☐ Validate full conformance to Army requirements using Army testing tools
- ☐ Conduct validation testing on the delivery platform's testing environment
- ☐ Ensure the final deliverable package includes all necessary items and documentation

The Army will perform the following after receipt of final deliverable package:

- Conduct a certification process on all submitted content in accordance with the Army Acceptance Criteria using tools such as Army Conformance Test Suite logs and Content Communication Trace Log Parser, available on the CAR for download.
- Perform functional testing on the delivery platform to validate functional behavior and identify any issues that hinder the learning experience.
- Deploy content to learners on the delivery platform once DL product is deemed acceptable.

Note: This document refers to this step as "platform delivery," which is different from delivery of a final product to the Government.

About the Army SCORM Acceptance Criteria

TADLP provides a set of criteria for DL developers to follow when creating DL products to ensure all requirements for acceptance by the Army are met. The acceptance criteria should be used in tandem with the business rules in this guide.

The purpose of the Army Acceptance Criteria is to specify quality control (QC) and quality assurance (QA) procedures that Army DL Producing Activity developers (hereafter referred to as the developer) shall use to verify that courseware is compliant with the SCORM 2004 3rd Edition specification.

Compliance includes meeting playability requirements and properly executing the Army activity's instructional strategy prior to submission to the Government for certification.

These criteria apply to courseware delivered to the Government in support of TADLP, as well as "in-house" TADLP courseware developed by the Government. The Army SCORM Acceptance Criteria is found on the CAR.

Business Rules and Best Practices Table

This section contains lists of all the business rules and best practices, and where each is located. Use this section for quick reference.

List of Business Rules

This section contains a list of all the business rules in the guide, organized by section.

Section 1 Design
Business Rule 1.1.1: Discrete Independent Content Independent SCOs shall be discrete blocks of learning content that do not refer to placement in a hierarchy or to other SCOs anywhere in the content.
Business Rule 1.1.2: Consistent Content Titles All SCOs shall contain the same topic title in content packaging resources and in the instructional content presented to the learner.
Business Rule 1.1.3: Internal Learning Content Instructional content that directly contributes to satisfying mastery requirements for an SCO shall be located within its content package and shall not reference to an external URL.
Business Rule 1.1.4: Metadata Requirement for All Learning Content Metadata is required for all content packages and their SCOs or launchable assets.
Business Rule 1.1.5: Revised 508 Standards Compliance All Army DL products shall be compliant with the Revised 508 Standards and Web Content Accessibility Guidelines 2.0.
Business Rule 1.1.6: Responsive Web Design All Army DL products shall apply Responsive Web Design.
Business Rule 1.1.7: Availability of Fonts Used All Army DL products shall be designed with fonts available on the target platforms.
Business Rule 1.1.8: 3D Model Specifications All 3D models developed for Army DL Products shall meet the requirements of the Army 3D Model Specifications.

Business Rule 1.1.9: No Embedded Certificates of Completion within Courseware

Certificates Of Completion shall NOT be embedded within courseware intended for deployment on the ALMS.

Business Rule 1.2.1: Single-SCO Content Packages

SCORM 2004 3rd Edition content packages shall be limited to a single SCO for the purposes of modularity and interoperability.

Business Rule 1.2.2: SCORM Metadata Files

Metadata for an object shall be contained with its own valid XML file that conforms to the IEEE LOM model schema and is referenced within the content packaging model. Metadata files must be included in the content package.

Business Rule 1.2.3: Army Metadata Fields

All SCORM 2004 3rd Edition metadata files shall be formatted to include the following fields to meet Army requirements:

General Identifier Fields

Catalog; Entry

General Fields

Title; Language; Description; Keywords; Type of Metadata

Life Cycle Fields

Version; Status of Package Submittal; Proponent's Role; Proponent's Name, Address and Email; Date of Submittal

Metadata Fields

Catalog Identifier; Entry Identifier; Schema; Language

Technical Fields

Format

Rights Fields

Cost; Copyright and Other Restrictions

Classification Fields

MOS and Skill Level; SQI; ASI; Task Numbers and Task Descriptions; Learning Objectives; 508 Compliant; Security Level (Foreign Disclosure)

Section 2 Development

Business Rule 2.1.1: Allowable File and Folder Name Characters

Files and folders in Army learning content packages shall contain only the following allowable characters from the RFC 3986 unreserved character set:

- _ . A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7 8 9

Business Rule 2.1.2: Allowable Folder Name Characters

This Business Rule has been combined with Business Rule 2.1.1

Business Rule 2.1.3: External URL Encoding

External resource names that contain characters not in the allowable lists (see Business Rule 2.1.1) shall be referenced in Army learning content using a percent-encoded URL.

Business Rule 2.1.4: File Extension Separation

A single period character (".") shall be used to separate a file's name from its extension.

Business Rule 2.1.5: Maximum File Path Length

File paths in Army learning content packages shall not exceed 256 characters in length.

Business Rule 2.1.6: Browser Data Storage

Learning content shall not store data using the web browser's built-in methods such as cookies or Web Storage.

Business Rule 2.1.7: Server-Side Technology

Learning content shall not make use of any server-side technologies such as scripting or database implementations.

Business Rule 2.1.8: Error-Free Code
All code in learning content shall not produce any file or script errors when executed in the web browser.

Business Rule 2.1.9: Open Standards Requirements

All source code created and delivered for IMI shall be designed and programmed using "open standards" as presented in the Open Source Initiative website.

Business Rule 2.1.10: Bookmarking Requirement

Non-assessment SCOs shall contain functionality to bookmark the learner's progress whenever the learner exits the content.

Business Rule 2.1.11: Assessment Data Obfuscation
Credit-producing assessment learning content shall obfuscate question-and-answer data so that the data is not in a plaintext format easily recognizable by the learner.

Business Rule 2.2.1: Window Closure and Exit Button

Unless required by the LMS, SCORM 2004 3rd Edition learning content shall not forcefully close the LMS SCORM player nor instruct the learner to close the LMS SCORM player using the browser close button.

Each content page shall include a blatantly prominent, unobscured "EXIT" button in a consistent location as the standard method for learners to exit the course and close the content window. The "EXIT" button shall be designed include the actual word spelling for uniformity across all Army DL products.

Business Rule 2.2.2: SCORM Manifest and Schemas

SCORM 2004 3rd Edition content packages shall contain a manifest file (imsmanifest.xml) and all SCORM 2004 3rd Edition base and extension schemas in the root level of the package. Additionally, all local schema files shall be referenced in the schemaLocation attributes.

Business Rule 2.2.3: SCORM Content Package Files

All files that make up the content for a SCORM 2004 3rd Edition SCO shall be contained within its content package and referenced in the imsmanifest.xml file.

Business Rule 2.2.4: SCORM Objectives Global to System

The adlseq:objectivesGlobalToSystem attribute of the organization element shall be set to "false" in all Army SCORM 2004 3rd Edition content packages.

Business Rule 2.2.5: Assessment Objective Satisfaction

SCORM 2004 3rd Edition assessment SCOs shall include the imsss:primaryObjective element in the manifest and set the satisfiedByMeasure attribute of the element to "true."

Business Rule 2.2.6: Assessment Mastery Score Declaration

SCORM 2004 3rd Edition assessment SCOs shall include an imsss:primaryObjective element in the manifest and declare a mastery score using the imsss:minNormalizedMeasure element.

Business Rule 2.2.7: SCORM Data Model

All SCORM 2004 3rd Edition SCOs shall track learner performance using only the SCORM 2004 3rd Edition data model; assessment SCOs shall use the Interactions data model element to record all learner performance.

Business Rule 2.2.8: SCORM Required API Calls for Assessments

Credit-producing assessment SCORM 2004 3rd Edition SCOs shall at a minimum use the SCORM API as follows:

Method Calls	**Data Model Elements**
Call at least once:	Set a valid value at least once:
▪ Initialize	▪ cmi.exit
▪ GetLastError	▪ cmi.completion_status
▪ Commit	▪ cmi.score.scaled
▪ Terminate	▪ cmi.session_time
	▪ cmi.interactions.n.correct.response.n.pattern
	▪ cmi.interactions.n.learner_response
	▪ cmi.interactions.n.latency
	▪ cmi.interactions.n.timestamp
	▪ cmi.interactions.n.type
	▪ cmi.interactions.n.result

Business Rule 2.2.9: SCORM Required API Calls for Non-Assessments

Credit-producing, non-assessment SCORM 2004 3rd Edition SCOs shall at a minimum use the SCORM API as follows:

Method Calls	**Data Model Elements**
Call at least once:	Set valid value at least once:
▪ Initialize	▪ cmi.exit
▪ Commit	▪ cmi.success_status
▪ Terminate	▪ cmi.completion_status
	▪ cmi.location or cmi.suspend_data
	▪ cmi.session_time

Business Rule 2.2.10: SCORM Navigation Request

All SCORM 2004 3rd Edition SCOs shall set an appropriate navigation request using the adl.nav.request data model element during run-time.

Section 3 Testing

Business Rule 3.1.1: Target Platform Testing

All SCOs shall be tested on the target delivery platform testing environment with content configuration settings identical to the live version of the platform.

Business Rule 3.1.2: Computer Configuration

All content packages shall be tested using a computer with a configuration (i.e., hardware, operating system, web browser) that matches the minimum requirements of the Baseline Home Computer Configuration (BHCC).

Business Rule 3.1.3: Conformance Testing Tools

All content packages shall be validated with conformance testing tools and methods required by the Army for the specific IMI type.

Business Rule 3.2.1: SCORM Strict Mode

All SCOs shall be tested on the target delivery platform testing environment using strict conformance settings when available. Any configuration options that relax conformance shall not be active.

Business Rule 3.2.2: Army Conformance Testing

All SCORM 2004 3rd Edition content packages and SCOs shall pass all tests performed using the Army SCORM 2004 3rd Edition Conformance Test Suite (ACTS).

Business Rule 4.1.1: Content Package Format

All learning content shall be contained in an approved content package format that the ALCMC delivery platform natively supports.

Business Rule 4.1.2: Content Package Deliverables

All finalized content packages that are consumable by the learner on an ALCMC delivery platform or computer shall be delivered electronically to the Government.

Business Rule 4.1.3: Source Material Deliverables

All final contract deliverables – such as content packages, development source files, answer keys, and test logs – shall be delivered to the Government and include any supporting software or tools.

Business Rule 4.2.1: SCORM Content Package Deliverables

Each SCO for use by learners shall be contained in a package interchange file (PIF) per the SCORM 2004 3rd Edition specification that the ALCMC delivery platform natively supports. Each SCORM content package shall be delivered as a single zip file. Do not nest SCORM content packages within other SCORM content packages.

Business Rule 4.2.2: SCORM Validation Deliverables

All SCOs delivered to the Army shall be accompanied by proof of passing as prescribed in the Army Acceptance Criteria.

List of Best Practices

This section contains a list of all the best practices.

Best Practice: Assign Organization and SCO Titles in the Manifest
Give the organization and each SCO correct titles in the manifest for a SCORM package. Avoid using default values such as "A001" which may confuse the learner.
Best Practice: Use the VPAT to Document and Report Revised 508 Standards Compliance
DL developers may use a Voluntary Product Accessibility Template (VPAT) to document and report that a DL product meets Revised 508 Standards and WCAG 2.0.
Best Practice: Fallback Fonts   Use fallback font stacks to avoid distortion of text and/or layout when specified fonts are not available or not working. This is especially important when custom fonts are embedded in the courseware.
Best Practice: Bookmarking Prompt
SCOs that contain bookmarking functionality should provide the learner with the option at re-entry to resume their progress at the location bookmarked during the previous learning session.
Best Practice: Develop for Low-Bandwidth Learner Environments
Develop content so that it provides an adequate learning experience even in low-bandwidth environments.
Best Practice: Set a Primary Objective for Each SCO
Set a primary objective for each SCO, whether the SCO is scoring or not, to increase interoperability. It is better to define an objective in the manifest than to rely on the LMS to automatically apply a default objective that the content has no control over.

1 Design

This section covers the requirements for the first phase of the DL creation process: Design. In this phase, it is assumed that no development or programming work has begun, and that developers are making design decisions that pertain to content structure and creating metadata to describe the content. The business rules in this section are themselves normative. Explanations of business rules, best practices, and examples are informative in nature.

1.1 All Learning Content

The information in this section pertains to the design phase requirements for all IMI types.

Content Structure

The information in this section pertains to the structure of learning content regardless of IMI type.

BUSINESS RULE 1.1.1: DISCRETE INDEPENDENT CONTENT

Independent SCOs shall be discrete blocks of learning content that do not refer to placement in a hierarchy or to other SCOs anywhere in the content.

Purpose

Business Rule 1.1.1 ensures that an independent content object is truly independent of other content objects and does not rely on or refer to SCOs outside of itself. An independent SCO is meant for reuse in multiple locations within the Army learning environment and must not be bound to other SCOs or specific contexts.

Risk

Failure to follow Business Rule 1.1.1 causes an independent SCO to violate its purpose as an interoperable content object and become dependent on use with the SCO(s) or context(s) it references.

Verification

Verify that the given SCO does not reference any other SCOs by name, number, or hierarchy placement anywhere in the content package titles, manifest, metadata, or content that is viewed as part of the learner experience.

Business Rule 1.1.1 may be ignored in cases where the SCO is explicitly designed as an introduction to a course.

BUSINESS RULE 1.1.2: CONSISTENT CONTENT TITLES

All SCOs shall contain the same topic title in content packaging resources and in the instructional content presented to the learner.

Purpose

Business Rule 1.1.2 ensures that there is no risk of the learner being confused about their location within learning content. The rule pertains primarily to content packaging standards and how delivery platforms such as an LMS display the titles of items. For example, an organization of packaged content is allowed to have its own title that may differ from the title shown in content itself. Titling must be consistent throughout instructional content.

Risk

Failure to follow Business Rule 1.1.2 creates the risk of learners becoming confused and having their learning experience hindered.

Verification

Verify that the title in the instructional content matches the title exactly as it is formatted in the content package resources. If the title appears in multiple places within the packaging resources, ensure that each occurrence of the title matches every other occurrence. Test whether Business Rule 1.1.2 has been satisfied by verifying that the title as it appears in the LMS Table of Contents matches the title as it is displayed from within the content on the target delivery platform.

BUSINESS RULE 1.1.3: INTERNAL LEARNING CONTENT

Instructional content that directly contributes to satisfying mastery requirements for an SCO shall be located within its content package and shall not reference to an external URL.

Purpose

Business Rule 1.1.3 ensures learning content (i.e., text and media) that is critical to a learning objective is readily accessible from within a content package, as opposed to an outside location that may change uncontrollably. The rule enforces the portability and availability of learning content.

The Army may allow exceptions for non-critical material, usually for large items such as Field Manuals and Soldier Training Publications. However, all files that reside outside of the content package must be stored in an Army repository or within an Army LMS where they are protected from removal, replacement, or updates.

Risk

Failure to follow Business Rule 1.1.3 creates the risk of critical learning content that is not within a content package (i.e., an external URL) changing or becoming unavailable uncontrollably. Learning content that is incomplete due to partial unavailability or changes cannot fulfill its educational purpose for the learner.

Verification

Except where otherwise explicitly permitted by the Army, verify that all learning content is packaged locally within the content package and referenced with the use of relative URLs. Test whether Business Rule 1.1.3 has been satisfied by running the SCO locally in an offline context and ensuring that no broken links are encountered. The Army SCORM 2004 3rd Edition Conformance Test Suite (ACTS) may be used for this purpose when obtaining logs for SCORM 2004 3rd Edition SCOs.

Metadata

The information in this section pertains to the creation of metadata for learning content regardless of IMI type.

BUSINESS RULE 1.1.4: METADATA REQUIREMENT FOR ALL LEARNING CONTENT

Metadata is required for all content packages and their SCOs or launchable assets.

Purpose

Business Rule 1.1.4 ensures that all DL content has the metadata required for use within the ALCMC for content management purposes. Different IMI types will specify standards for their metadata.

Risk

Failure to follow Business Rule 1.1.4 causes a DL product to be incomplete, which means the Army will not accept the product when it is delivered.

Verification

Verify that each content package contains valid metadata files that are well-formed and valid according to the given IMI type's metadata specifications.

BUSINESS RULE 1.1.5: REVISED 508 STANDARDS COMPLIANCE

All Army DL products shall be compliant with the Revised 508 Standards and Web Content Accessibility Guidelines 2.0.

Purpose

The Revised 508 Standards address access to information and communication technology (ICT) under Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794d), and Section 255 of the Communications Act. Compliance with these standards is mandatory for Federal agencies. The Revised 508 Standards, which are part of the Federal Acquisition Regulation, ensure access for people with physical, sensory, or cognitive disabilities.

Risk

If the rule is not followed, the DL Courseware will not be 508 compliant in accordance with Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794d). Not meeting Revised 508 Standards may preclude people with disabilities from accessing some or all the available content at least as well as people without disabilities.

Verification

It is recommended that distributed learning product developers use the Voluntary Product Accessibility Template (VPAT™) for documenting and reporting 508 compliances of the DL product.

BEST PRACTICE: USE THE VPAT TO DOCUMENT AND REPORT REVISED 508 STANDARDS COMPLIANCE
DL developers may use a Voluntary Product Accessibility Template (VPAT) to document and report that a DL product meets Revised 508 Standards and WCAG 2.0.

A VPAT is a self-reporting document for DL developers to detail each aspect of the Revised 508 Standards requirements and demonstrate how Distributed Learning products are compliant with Revised 508 Standards.

The current VPAT recommended by U.S. General Services Administration (GSA) may be found on the ITI Council website under "policy" and then "accessibility."

The above referenced VPAT document includes a brief description of the essential Revised 508 Standards and WCAG 2.0 requirements and Best Practices for Information and Communications Technology (ICT), for DL product developers. The accompanying Accessibility Conformance Report consists of tables that may be used to document and report each area of compliance with hyperlinks to sections in Revised 508 Standards and WCAG 2.0 requirements and available guidance.

For more references and information on 508 compliances, see the additional official resources below:

- U.S. Access Board website
- WCAG website
- GSA 508 website
- Revised 508 Standards website

Responsive Web Design

BUSINESS RULE 1.1.6: RESPONSIVE WEB DESIGN

All Army DL products shall apply Responsive Web Design.

Purpose

Responsive Web Design (RWD) is an approach to web design that makes web pages display effectively on different devices and screen sizes. RWD responds to the needs of the users and the devices they use to access DL products by adapting web pages to varying screen sizes.

Risk

If the rule is not followed, the DL Courseware may not display properly on some devices and screen sizes.

Application and Verification

Refer to Appendix A for detailed information on applying and verifying Responsive Web Design.

Use of Fonts

BUSINESS RULE 1.1.7: AVAILABILITY OF FONTS USED

All Army DL products shall be designed with fonts available on the target platforms.

Purpose

Proper display of text, characters, symbols, bullets, and icons is an important aspect of quality DL courseware. DL content developers must ensure that fonts used in courseware are readily available on the target platforms the DL courseware is designed for.

Risk

If the rule is not followed, text, numbers, bullets, symbols, or icons in certain fonts may not display properly, making the courseware unusable.

Verification

Ensure that all text, symbols, and characters are displayed as designed on target delivery platforms. If a custom font is necessary, the font file must be included in the courseware package.

Application

All Army DL products should use web-safe fonts and must define fallback fonts in the course content. When not using web-safe fonts, custom fonts must be included in the content package.

Web-Safe Fonts

DL Developers should maximize the use of web-safe fonts. Web-safe fonts are readable and look the same for all browsers and devices, pre-installed on most devices (e.g., computers, mobile phones, and tablets). Below is a list of popular web-safe fonts:

- Arial (sans-serif)
- Courier New (monospace)
- Garamond (serif)
- Georgia (serif)
- Helvetica (sans-serif)
- Times New Roman (serif)
- Verdana (sans-serif)

Fallback Font Stack and Font Family

A fallback font stack is the CSS code that instructs a browser on which fonts to display, and what to do should the first-choice font be unavailable or not working. A font family is a grouping of fonts defined by commonly shared design styles. For example, the Times family includes different font sizes, styles (like roman and italic), and weight (like regular and bold).

Examples of fallback font stacks composed of fonts in the same family:

- `Arial, Helvetica, sans-serif`
- `"Arial Black", Gadget, sans-serif`
- `"Bookman Old Style", serif`
- `"Comic Sans MS", cursive, sans-serif`
- `Courier, monospace`
- `"Courier New", Courier, monospace`
- `Garamond, serif`
- `Georgia, serif`
- `Impact, Charcoal, sans-serif`
- `"Palatino Linotype", "Book Antiqua", Palatino, serif`
- `"Times New Roman", Times, serif`
- `Verdana, Geneva, sans-serif`

BEST PRACTICE: FALLBACK FONTS

Use fallback font stacks to avoid distortion of text and/or layout when specified fonts are not available or not working. This is especially important when custom fonts are embedded in the courseware.

Below is an example of implementing the fallback mechanism for unavailable or missing fonts:

FALLBACK MECHANISM FOR UNAVAILABLE OR MISSING FONTS

```
p {
    font-family: "Comic Sans MS", cursive, sans-serif;
}
```

Embedding Custom Fonts

In cases where certain custom fonts rather than web-safe fonts are chosen and embedded in courseware for special effects to enhance instructional presentation, the custom fonts may be added by using the @font-face CSS rule. The pertinent font files shall be included in the content package as mentioned in accordance with Business Rule 2.2.3. There are several web-font formats available with varying browser support. Custom fonts may potentially be blocked by software installed on certain DL delivery platforms. Therefore, the use and display of custom fonts embedded in the courseware must be fully tested on all target platforms for DL delivery during the design phase.

Below is an example of embedding custom fonts:

EMBEDDING CUSTOM FONTS

```
@font-face {
  font-family: 'FontName';
  src: url('webfont.eot'); /* IE9+ Compat Modes */
  src: url('webfont.woff2') format('woff2'), /* Super modern browsers */
       url('webfont.woff') format('woff'), /* Modern browsers */
       url('webfont.ttf') format('truetype'), /* Safari, Android, iOS */
       url('webfont.svg#FontName') format('svg'); /* Legacy iOS */
}
```

WARNING: Custom fonts may potentially be blocked by software installed on certain DL delivery platforms. DISA STIG Rule SV-78131r1_rule stipulates that the system shall be configured to block untrusted fonts from loading. Rule SV-59369r1_rule describes a policy setting that allows the user to manage whether pages of the zone may download HTML fonts. For this reason, always specify fallback fonts as explained in the "Fallback Font Stack and Font Family" section.

Use of Unicode

Unicode is the universal character encoding maintained by the Unicode Consortium. This encoding standard provides the basis for processing, storage, and interchange of text data in any language in all modern software and information technology protocols. Unicode provides a unique number for every character, no matter what the platform, program, or language is. These characters include symbols, icons and emojis that may be incorporated into the user interface.

However, different computer systems may display the Unicode characters differently, and some Unicode characters may not be available in certain computer systems. Therefore, if the developer decides to incorporate Unicode characters in the courseware, a thorough test must be conducted on all target delivery platforms to verify that the characters render and display properly as designed.

3D Model Specifications

BUSINESS RULE 1.1.8: 3D MODEL SPECIFICATIONS

ALL 3D models developed for Army DL Products shall meet the requirements of the Army 3D Model Specifications.

Purpose

The purpose of specifications for 3D models is to ensure all models meet certain quality standards so they may be used, revised, and reused as intended. 3D models must adhere to the specifications outlined in Appendix E.

Risk

If the rule is not followed, the 3D model will not meet the specifications for 3D models and runs the risk of inferior model quality and functionality resulting in rejection by the Army.

Verification

Refer to Appendix E Army 3D Model Specifications for detailed information on 3D model specifications.

Certificates of Completion

BUSINESS RULE 1.1.9: NO EMBEDDED CERTIFICATES OF COMPLETION WITHIN COURSEWARE

Certificates of Completion shall NOT be embedded within courseware intended for deployment on the ALMS.

Purpose

The ALMS automatically generates a DA87 compliant Certificate of Completion when the learner successfully completes a topic or course. It is not only redundant but also potentially harmful to embed certificates in the courseware.

Risk

Embedding and displaying a Certificate of Completion within the courseware may cause the learner to exit the topic or course improperly. As a result, learning-outcome information such as completion status and scores may not be recorded correctly in the ALMS. When learners complete the course and arrive at the certificate, they often believe they have officially completed the course and exit out or close the window before the course signals to the LMS that the learner has completed the course. This causes the ALMS to suspend the course and record it as not complete. This often results in calls to the Army Training Help Desk (ATHD) to have a learner's completion status corrected.

Application

Instructions for obtaining ALMS generated course or topic Certificate of Completion are found in the ALMS Help by searching for the term "certificate," then searching for either Learner Print Course Certificate or Learner Print Topic Certificate. Include Instructions for Obtaining ALMS Generated Certificate of Completion in the Letter of Instruction for proponent organizations that emphasize the need for the student to obtain a Certificate of Completion. Training developers may incorporate guidance into the Letter of Instruction for students to obtain a Certificate of Completion.

1.2 SCORM Content

The information in this section pertains to the design phase requirements for SCORM 2004 3rd Edition DL products. The guide considers the design phase for SCORM 2004 3rd Edition to cover manifest creation and configuration, and the creation of accompanying metadata.

Content Structure

The information in this section pertains to the structure of SCORM content.

BUSINESS RULE 1.2.1: SINGLE-SCO CONTENT PACKAGES

SCORM 2004 3rd Edition content packages shall be limited to a single SCO for the purposes of modularity and interoperability.

Purpose

Business Rule 1.2.1 ensures that SCOs maximize interoperability and portability by keeping content packages as small as possible.

Risk

Failure to follow Business Rule 1.2.1 may cause large and difficult-to-manage content packages.

Individual modules in a multi-SCO package lose portability, and the difficulty in diagnosing and repairing issues is increased in content packages with many components, especially where SCORM sequencing logic is concerned.

Verification

Verify that the manifest file contains a single `organization` element with a single `item` element. Figure 5 provides an example of how to define a single SCO package in a manifest file.

REFERENCE TO AN EXTERNAL METADATA FILE FROM WITHIN THE PACKAGE MANIFEST

```
<organizations default="CCC">
 <organization identifier="CCC" adlseq:objectivesGlobalToSystem="false">
  <title>Captains Career Course</title>
  <item identifier="CCCM01" identifierref="CCCM01_resources">
 <title>Captains Career Course Module 01</title>
  </item>
 </organization>
</organizations>
```

Figure 5: Code sample for a single SCO package defined in a manifest

Metadata

The information in this section pertains to the creation of metadata for Army SCORM 2004 3rd Edition DL products.

BUSINESS RULE 1.2.2: SCORM METADATA FILES

Metadata for an object shall be contained with its own valid XML file that conforms to the IEEE LOM model schema and is referenced within the content packaging model. Metadata files shall be included in the content package.

Purpose

Business Rule 1.2.2 ensures that metadata files are both discrete from the content they support and valid to the Institute of Electrical and Electronics Engineers (IEEE) standard for learning object metadata (LOM) to support interoperability.

Risk

Failure to follow Business Rule 1.2.2 causes metadata to be invalid according to formatting requirements. The result is a DL product that is incomplete, which means the Army will not accept the product when it is delivered.

Verification

Verify that each content package contains discrete metadata files that conform to the IEEE LOM schema, and that each file is properly referenced within the content package manifest file. Figure 6 shows an example of a reference to a separate metadata file within a SCORM 2004 3rd Edition SCO manifest file. The `adlcp:location` element contains the reference to the `metadata_course.xml` file.

REFERENCE TO A METADATA FILE FROM WITHIN THE PACKAGE MANIFEST

```
<metadata>
  <schema>ADL SCORM</schema>
  <schemaversion>2004 3rd Edition</schemaversion>
  <adlcp:location>metadata_course.xml</adlcp:location>
</metadata>
<organizations default="CCC">
```

Figure 6: Code sample for a reference to an external metadata file from within the package manifest

BUSINESS RULE 1.2.3: ARMY METADATA FIELDS

All SCORM 2004 3rd Edition metadata files shall be formatted to include the following fields to meet Army requirements:

General Identifier Fields

> Catalog; Entry

General Fields

> Title; Language; Description; Keywords; Type of Metadata

Life Cycle Fields

> Version; Status of Package Submittal; Proponent's Role; Proponent's Name, Address and Email; Date of Submittal

Metadata Fields

> Catalog Identifier; Entry Identifier; Schema; Language

Technical Fields

> Format

Rights Fields

> Cost; Copyright and Other Restrictions

Classification Fields

> MOS and Skill Level; SQI; ASI; Task Numbers and Task Descriptions; Learning Objectives; 508 Compliant; Security Level (Foreign Disclosure)

Purpose

Business Rule 1.2.3 ensures that metadata files contain all the information the Army needs to support learning content tracking and interoperability.

IMPORTANT: Refer to the Appendix F: Metadata section for details on implementing required Army metadata fields, such as default field value requirements.

Risk

Failure to follow Business Rule 1.2.3 causes metadata to be invalid according to formatting requirements. The result is a DL product that is incomplete, which means the Army will not accept the product when it is delivered.

Verification

Verify that all metadata files contained within the content package adhere to the guidelines presented in the Appendix F: Metadata, and that all elements are present within each metadata file. The Army SCORM 2004 3rd Edition Conformance Test Suite

(ACTS) checks the presence and valid values of Army required metadata in SCORM packages.

General Best Practices

This section contains best practices for the general design of SCORM content that have broad applications and are not linked to specific business rules.

BEST PRACTICE: ASSIGN ORGANIZATION AND SCO TITLES IN THE MANIFEST

Give the organization and each SCO correct titles in the manifest for a SCORM package. Avoid using default values such as "A001" which may confuse the learner.

This best practice relates directly to Business Rule 1.1.2 for ensuring consistency in titles. A SCORM content package manifest has a title element for the organization element, and a title for each SCO within as well – the LMS will display all titles in a table of contents. Developers often overlook assigning organization titles in the manifest, especially when using authoring tools that assign default values, which may cause confusion to the learner. Figure 7 provides an example of setting consistent organization and SCO titles in a manifest.

MATCHING ORGANIZATION AND SCO TITLES IN A CONTENT PACKAGE MANIFEST

```
<organizations default="CCC">
 <organization identifier="CCC" adlseq:objectivesGlobalToSystem="false">
  <title>Captains Career Course</title>
  <item identifier="CCCM01" identifierref="CCCM01_resources">
      <title>Captains Career Course Module 01</title>
  </item>
 </organization>
</organizations>
```

Figure 7: Code sample for matching organization and SCO titles in a content package manifest

2 Development

This section of the guide covers the requirements that pertain to the second phase of the DL creation process: Development. In this phase, it is assumed that the design decisions have been made and it is time to begin programming work. The business rules in this section are themselves normative. Explanations of business rules, best practices, and examples are informative in nature.

2.1   All Learning Content

The information in this section pertains to the development of learning content for all IMI types.

General Programming

The information in this section pertains to general programming principles that are critical to all Army DL products regardless of IMI type.

BUSINESS RULE 2.1.1: ALLOWABLE FILE AND FOLDER NAME CHARACTERS

Files and folders in Army learning content packages shall contain only the following allowable characters from the RFC 3986 unreserved character set:

- _ . A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7 8 9

Purpose

Business Rule 2.1.1 ensures that a standard file and folder naming convention exists to enforce Army DL content interoperability, and that file and folder names do not contain any characters (such as special characters) that could cause problems related to the syntax for file paths on delivery platforms.

Risk

Failure to follow Business Rule 2.1.1 creates a risk of content failing to operate correctly on its delivery platform due to unsupported syntax in file or folder names.

Verification

Verify that each file and folder name you create and/or that is created by your DL authoring tool of choice contains only characters from the list presented in Business Rule 2.1.1.

BUSINESS RULE 2.1.2: ALLOWABLE FOLDER NAME CHARACTERS
This Business Rule has been combined with Business Rule 2.1.1

BUSINESS RULE 2.1.3: EXTERNAL URL ENCODING

External resource names that contain characters not in the allowable lists (see Business Rule 2.1.1) shall be referenced in Army learning content using a percent-encoded URL.

Purpose

Business Rule 2.1.3 ensures that a standard convention exists for accessing external resources from learning content and minimizes the risk of problems on delivery platforms regarding the syntax for file paths.

Risk

Failure to follow Business Rule 2.1.3 creates a risk of content failing to operate correctly regarding the external resources it references due to unsupported syntax in path names.

Verification

Verify that any external URLs contained within the content package are properly percent-encoded where necessary so that the DL product operates properly. Ensure that any external links behave as expected during target platform testing and use percent encoding wherever the need arises to ensure proper function.

BUSINESS RULE 2.1.4: FILE EXTENSION SEPARATION

A single period character (".") shall be used to separate a file's name from its extension.

Purpose

Business Rule 2.1.4 ensures that a standard file naming convention exists for interoperability of Army DL content and minimizes the risk of problems on delivery platforms regarding the syntax for file paths.

Risk

Failure to follow Business Rule 2.1.4 creates a risk of content failing to operate correctly on its delivery platform due to incorrect syntax in file names.

Verification

Verify that each file created and/or that is created by the DL authoring tool of choice only contains a single period character between the file name and its extension. Ensure file extensions can be viewed on the operating system to verify this.

BUSINESS RULE 2.1.5 MAXIMUM FILE PATH LENGTH

File paths in Army learning content packages shall not exceed 256 characters in length.

Purpose

Business Rule 2.1.5 ensures that a standard file naming convention exists for interoperability of Army DL content and minimizes the risk of problems on delivery platforms regarding the allowable length of file paths.

Risk

Failure to follow Business Rule 2.1.5 creates a risk of content failing to operate correctly on its delivery platform because of file paths that exceed the length limit. A file path that exceeds the allowable length limit may result in the delivery platform not storing or serving the file.

Verification

Verify that each file and folder you create uses concise names that are no longer than needed to convey relevant information. For example, you might consider using a shorthand identifier for a lesson name instead of the full name when creating files and folders within the content package (e.g., a folder named "CCCM01" instead of "Captains_Career_Course_Module_01").

BUSINESS RULE 2.1.6 BROWSER DATA STORAGE

Learning content shall not store data using the web browser's built-in methods such as cookies or Web Storage.

Purpose

Business Rule 2.1.6 exists because many learners in the Army learning environment use machines that have heightened security configurations that often include disabling built-in web browser data storage mechanisms such as cookies or Web Storage. Developers should make use of data storage capabilities in an approved technology like SCORM, depending on the IMI type for the content.

Risk

Failure to follow Business Rule 2.1.6 creates a risk of content failing to operate correctly due to unsupported functionality, causing a detriment to the learner's experience.

Verification

Verify that the implementation of your SCO does not include the use of any local storage technologies. Ensure that Business Rule 2.1.6 has been satisfied by testing the SCO in a browser with caching, cookies, and other local storage options disabled and confirming proper operation.

BUSINESS RULE 2.1.7: SERVER-SIDE TECHNOLOGY

Learning content shall not make use of any server-side technologies such as scripting or database implementations.

Purpose

Business Rule 2.1.7 ensures that learning content does not make use of server-side technologies not endorsed for use on ALCMC delivery platforms for security reasons. Server-side technologies include use of languages such as Hypertext Preprocessor (PHP), relational database implementations, or servlets.

Risk

Failure to follow Business Rule 2.1.7 means the Army will not accept a DL product due to security concerns.

Verification

Verify that the implementation of your SCO does not include the use of any server-side technologies by methods such as code analysis and design document review.

BUSINESS RULE 2.1.8: ERROR-FREE CODE

All code in learning content shall not produce any file or script errors when executed in the web browser.

Purpose

Business Rule 2.1.8 ensures that learning content has been created correctly and will not cause errors in the learner's web browser when it is run.

Risk

Failure to follow Business Rule 2.1.8 causes a DL product to be incomplete, which means the Army will not accept the product when it is delivered. Additionally, code errors may cause DL products to function improperly or not at all, which may prevent the learner from experiencing content as intended.

Verification

Verify that your SCO runs without producing any file or script errors through standard debugging and quality assurance processes. Verify whether Business Rule 2.1.8 has been satisfied by enabling your browser's error-reporting functions when testing your SCO.

BUSINESS RULE 2.1.9: OPEN STANDARDS REQUIREMENTS

All source code created and delivered for IMI shall be designed and programmed using "open standards" as presented in the Open Source Initiative website.

Purpose

IMI products often need maintenance after deployment due to changes in the requirements, running environment, etc. To accommodate technically qualified government developers to easily understand the code and make modifications, the source code must follow open standards requirements and not rely on hidden or proprietary knowledge.

Risk

Failure to follow Business Rule 2.1.9 means the source code may not be accessible by government developers for editing and enhancements and may cause the courseware to be rejected by the Army during the acceptance and testing process.

Verification

Verify that the source materials adhere to the following:

- **Availability:** The complete set of content source files must be delivered to the government under royalty-free terms with no distribution restrictions.
- **Patents:** All patents involving any source objects, scripts, tagging or code in this learning content must be licensed under royalty-free terms for unrestricted use, or be covered by a promise of non-assertion when practiced by open-source software
- **No Intentional Secrets:** Any detail necessary for interoperable implementation shall not be withheld.
- **No Agreements:** There shall not be any requirement for execution of a license agreement, non-disclosure agreement, grant, click-through, or any other form of paperwork to deploy any code in the learning content.

Required Functional Behavior

The information in this section pertains to the functional behavior requirements for learning content regardless of IMI type.

BUSINESS RULE 2.1.10: BOOKMARKING REQUIREMENT

Non-assessment SCOs shall contain functionality to bookmark the learner's progress whenever the learner exits the content.

Purpose

Business Rule 2.1.10 ensures that the learner may experience content at their own pace with the ability to exit and return without loss of progress. Bookmarking is a necessity for long learning objects and sequences of learning objects where full completion may require multiple visits to the content by the learner.

IMPORTANT: Credit-producing assessment content is always exempt from the bookmarking requirement.

Application

BEST PRACTICE: BOOKMARKING PROMPT

SCOs that contain bookmarking functionality should provide the learner with the option at reentry to resume their progress from the location bookmarked during the previous learning session.

Risk

Failure to follow Business Rule 2.1.10 causes a DL product to be incomplete due to a missing critical item of functionality, which means the Army will not accept the product when it is delivered.

Verification

Verify that your SCO supports bookmarking. Test this by running the SCO on the target delivery platform testing environment, exiting after making some progress, then reentering and verifying that your bookmarking functionality works as intended.

 You shall ignore Business Rule 2.1.10 in cases of credit-producing assessment content.

BUSINESS RULE 2.1.11: ASSESSMENT DATA OBFUSCATION

Credit-producing assessment learning content shall obfuscate question-and-answer data so that the data is not in a plaintext format easily recognizable by the learner.

Purpose

Business Rule 2.1.11 exists to mitigate the risk of the learner cheating by looking at assessment data contained in files using well-known methods such as the web browser's developer tools. While it is impossible to prevent all cheating, ensuring that assessment data is not plainly visible to the most common methods of cheating in DL provides reasonable protection of the data.

Risk

Failure to follow Business Rule 2.1.11 increases the risk of learners cheating by looking at the assessment data and reducing the effectiveness of the DL product.

Verification

Verify that question and answer data is not present in an easily readable format; ideally, this data would not be in plaintext. If the framework you are using requires plaintext question and answer data, then you should minify the data.

General Best Practice

This section contains best practices for the general development of all learning content that have broad applications and are not linked to specific business rules.

BEST PRACTICE: DEVELOP FOR LOW-BANDWIDTH LEARNER ENVIRONMENTS

Develop content so that it provides an adequate learning experience even in low-bandwidth environments.

Not all learners will have high-bandwidth connections due to reasons such as geographic location or hardware limitations. Developers should optimize all files used in DL content to ensure that they have the smallest possible file sizes while maintaining adequate fidelity and employ strategies such as content chunking that avoid requiring the learner to load large sets of files all at once.

2.2   SCORM Content

The information in this section pertains to the development of SCORM content. Remember that the business rules in the previous section apply to this IMI type as well.

General Programming

The information in this section pertains to the requirements for general functionality of SCORM content.

BUSINESS RULE 2.2.1: WINDOW CLOSURE AND EXIT BUTTON

Unless required by the LMS, SCORM 2004 3rd Edition learning content shall not forcefully close the LMS SCORM player nor instruct the learner to close the LMS SCORM player using the browser close button.

Each content page shall include a blatantly prominent, unobscured "EXIT" button in a consistent location as the standard method for learners to exit the course and close the content window. The "EXIT" button shall be designed include the actual word spelling for uniformity across all Army DL products.

Purpose

Business Rule 2.2.1 exists to prevent SCORM content from interrupting the active connection between itself and the LMS. The LMS loads SCORM content in its own player window, and if the window closes for any reason other than the automatic LMS actions that occur after attempt termination, both the storage and evaluation of data from the content may be negatively affected. ALMS may suspend an attempt on SCORM content when the SCORM player window is closed forcefully, causing the learner to not receive credit for completing a SCO.

The "EXIT" button triggers the SCO's proper exit procedure to save the learning progress data and terminate the SCORM session. By requiring the learner to click the "EXIT" button instead of the browser close button, the SCO is given ample time to send learning progress data to the LMS without the risk of losing data during page dismissal.

Risk

Failure to follow Business Rule 2.2.1 creates the risk of either the courseware or the learner closing the LMS SCORM player window forcefully and interrupting the sequence of behavior the LMS needs to perform while the window is active. This may cause issues with tracking and completion credit resulting from learning progress data loss.

Verification

Verify all the implementation details outlined in this section are met when developing the SCO, then ensure during testing that exiting the content does not force the LMS player window to close. If using an authoring tool during development, the content package files may require manually editing to ensure proper window closure if no appropriate configuration options available in the tool.

Content must include an "EXIT" button on all pages. The courseware is required to instruct the learner, by way of a mandatory tutorial, letter of instruction message, or other noticeable and mandatory medium, to use only the "EXIT" button inside of the courseware to close the content window rather than the "x" button of the browser.

Application

By implementing the following four practices in courseware development, the risk of the learner forcibly closing the content window and risking the loss of learner data is reduced:

1. Separate LMS SCORM Player Window and Content Presentation Window:

Launch learning content in its own window separate from the LMS SCORM player window to minimize the unintended forceful LMS SCORM player window closure.

The LMS SCORM player window is a frameset that contains pages responsible for LMS tracking and other functionality. Issues caused by closing the LMS player window forcefully may be avoided by programming content to launch in a separate window from the LMS SCORM player window. It is common practice to have the entry point for content be a "launcher" page that will load in the LMS SCORM player window and then open a separate window containing the learning content.

2. Avoid Top-Level Window Closure:

Avoid using methods that will result in a window being closed from the top level, such as `top.close()`.

It is common for the LMS SCORM player window to contain framesets with pages that are not visible to the learner but perform critical LMS functions. The `top.close()` method will close the LMS SCORM player window and may cause issues. On the other hand, the `window.close()` method is acceptable since it will not affect framesets and works without issue for separate content windows.

3. Placement of Exit Button:

Business Rule 2.2.1 mandates all Army IMI Courseware to have the "EXIT" button on all content pages in a consistent, unobscured location so that the learner may find it intuitively when trying to exit. The button shall be blatantly prominent to guide the learner to use it rather than the browser's window or tab close button.

4. Reiteration in Letter of Instruction (LOI):

Include a statement in the Letter of Instruction (LOI) directing learners to use the "EXIT" button within the content window to close out of the courseware instead of using the "x" button of the browser window. This will further reduce the risk of the learner closing the content window without clicking the "EXIT" button.

Content Aggregation

The information in this section pertains to the requirements that relate to the content aggregation model part of the SCORM 2004 3rd Edition specification, such as constructing the manifest for a content package to give the LMS handling instructions.

BUSINESS RULE 2.2.2: SCORM MANIFEST AND SCHEMAS

SCORM 2004 3rd Edition content packages shall contain a manifest file (imsmanifest.xml) and all SCORM 2004 3rd Edition base and extension schemas in the root level of the package. Additionally, all local schema files shall be referenced in the schemaLocation attributes.

Purpose

Business Rule 2.2.2 ensures that SCORM content packages are built to the SCORM 2004 3rd Edition specification. The inclusion of all schemas in the content package promotes interoperability by having all the reference documents contained within the package rather than requiring external lookup, which may fail.

Risk

Failure to follow Business Rule 2.2.2 creates two risks: One being that a SCORM content package may not be valid to the SCORM 2004 3rd Edition specification. The other is the SCORM content package may not be able to be validated using the Army test tools due to a schema not being present in the package – either case means that the Army will not accept the content package when it is delivered. If the schema files are not included in the content package or not referenced in the schemaLocation attributes, the XML parser may fail in the event of not having internet connection.

Verification

Verify that imsmanifest.xml as well as all SCORM 2004 3rd Edition base and extension schemas are present in the root level of the content package. The Army SCORM 2004 3rd Edition Conformance Test Suite (ACTS) will not produce passing results if the proper schema files are not present.

BUSINESS RULE 2.2.3 SCORM CONTENT PACKAGE FILES

All files that make up the content for a SCORM 2004 3rd Edition SCO shall be contained within its content package and referenced in the imsmanifest.xml file.

Purpose

Business Rule 2.2.3 ensures that SCORM content packages are built to the SCORM 2004 3rd Edition specification. The inclusion and reference to each file in the content package promotes interoperability. Additionally, the Army test tools specifically test for the presence of files in the packages and for references to all packaged files in the manifest.

Risk

Failure to follow Business Rule 2.2.3 creates the risk of SCORM content failing validation testing using the Army test tools. Failure to pass the test tools means the Army will not accept the content package.

Verification

Verify that all files within the content package are referenced within the manifest, including all manifest, metadata, and schema files as outlined in Business Rule 2.2.2. The content package will not be within compliance of the guidelines of the Acceptance Criteria if Business Rule 2.2.3 is not followed.

	BUSINESS RULE 2.2.4: SCORM OBJECTIVES GLOBAL TO SYSTEM
	The adlseq:objectivesGlobalToSystem attribute of the organization element shall be set to "false" in all Army SCORM 2004 3rd Edition content packages.

Purpose

Business Rule 2.2.4 ensures that SCOs do not make their objective data available to the entire LMS. The default value for the organization `adlseq:objectivesGlobalToSystem` attribute is "true" and this rule requires that the value must be explicitly set to false. See Figure 8 for an example of setting the `adlseq:objectivesGlobalToSystem` attribute to "false" in a content package's manifest.

SETTING ADLSEQ:OBJECTIVESGLOBALTOSYSTEM TO "FALSE" FOR THE ORGANIZATION

```
<organizations default="CCC">
 <organization identifier="CCC" adlseq:objectivesGlobalToSystem="false">
…
 </organization>
</organizations>
```

Figure 8: Code sample for setting the adlseq:objectivesGlobalToSystem attribute to false

Risk

Failure to follow Business Rule 2.2.4 creates the risk of objective data from a particular SCO overwriting or conflicting with objective data from another SCO. Giving robust unique identifiers to objectives is an often-overlooked practice, meaning many SCOs have the same default objective names. Keeping objectives out of the global system scope reduces the risk of conflicts.

Verification

Verify that the `adlseq:objectivesGlobalToSystem` attribute is present within the organization element and set to "false" in any content package you create.

BUSINESS RULE 2.2.5 ASSESSMENT OBJECTIVE SATISFACTION

SCORM 2004 3rd Edition assessment SCOs shall include the imsss:primaryObjective element in the manifest and set the satisfiedByMeasure attribute of the element to "true".

Purpose

Business Rule 2.2.5 ensures content functionality by requiring SCORM 2004 3rd Edition assessment SCOs to explicitly state that they require a minimum declared score or measure what the learner must achieve to pass.

See Figure 9 for an example of setting an item's primary objective `satisfiedByMeasure` attribute to "true" in a content package's manifest.

DECLARING A MASTERY SCORE USING THE IMSSS:MINNORMALIZEDMEASURE ELEMENT

```
<organizations default="CCC">
 <organization identifier="CCC" adlseq:objectivesGlobalToSystem="false">
  <title>Captains Career Course</title>
  <item identifier="CCCM01" identifierref="CCCM01_resources">
   <title>Captains Career Course Module 01 Exam</title>
   <imsss:sequencing>
    <imsss:controlMode choice="false" choiceExit="false" flow="true"/>
    <imsss:objectives>
     <imsss:primaryObjective satisfiedByMeasure="true"
objectiveID="CCC_M01_EXAM">

        …
     </imsss:primaryObjective>
    </imsss:objectives>
   </imsss:sequencing>
  </item>
 </organization>
</organizations>
```

Figure 9: Code sample for setting the satisfiedByMeasure attribute of a primary objective

Application

BEST PRACTICE: SET A PRIMARY OBJECTIVE FOR EACH SCO

Set a primary objective for each SCO, whether the SCO is scoring or not, to increase interoperability. It is better to define an objective in the manifest than to rely on the LMS to automatically apply a default objective that the content has no control over.

Even when a SCO does not set or require a score, it is beneficial to assign a primary objective to it in the manifest for control purposes. Default objectives may cause issues if Business Rule 2.2.5 is not followed since there will potentially be many globally scoped objectives with the same conflicting default ID.

Risk

Failure to follow Business Rule 2.2.5 prevents SCORM 2004 3rd Edition assessment SCOs from functioning as intended and creates the risk of the learner not receiving credit or receiving credit when they have not passed the assessment.

Verification

If this is a scoring SCO, verify that the `imsss:primaryObjective` element is present in the manifest and that the `satisfiedByMeasure` attribute is set to "true".

You may ignore Business Rule 2.2.5 in cases of non-scoring content. Remember that you should still set a primary objective for each SCO as outlined in the best practices.

BUSINESS RULE 2.2.6 ASSESSMENT MASTERY SCORE DECLARATION

SCORM 2004 3rd Edition assessment SCOs shall include an imsss:primaryObjective element in the manifest and declare a mastery score using the imsss:minNormalizedMeasure element.

Purpose

Business Rule 2.2.6 ensures content interoperability by requiring SCORM 2004 3rd Edition assessment SCOs to explicitly state their required mastery scores. See Figure 10 for an example of declaring a mastery score for a primary objective using the `imsss:primaryObjective` element.

DECLARING A MASTERY SCORE USING THE IMSSS:MINNORMALIZEDMEASURE ELEMENT

```
<organizations default="CCC">
 <organization identifier="CCC" adlseq:objectivesGlobalToSystem="false">
  <title>Captains Career Course</title>
  <item identifier="CCCM01" identifierref="CCCM01_resources">
   <title>Captains Career Course Module 01 Exam</title>
   <imsss:sequencing>
    <imsss:controlMode choice="false" choiceExit="false" flow="true"/>
    <imsss:objectives>
     <imsss:primaryObjective
     satisfiedByMeasure="true"
objectiveID="CCC_M01_EXAM">
       <imsss:minNormalizedMeasure>0.8</imsss:minNormalizedMeasure>
      </imsss:primaryObjective>
    </imsss:objectives>
   </imsss:sequencing>
  </item>
 </organization>
</organizations>
```

Figure 10: Code sample for declaring a mastery score within an item's primary objective

IMPORTANT: Remember that SCORM mastery scores are expressed as scaled values on a scale of 0.0 to 1.0 rather than a raw value of 0 to 100.

Risk

Failure to follow Business Rule 2.2.6 reduces interoperability because SCORM assessment SCOs that do not have declared mastery scores must rely on manual configuration each time they are loaded on an LMS.

Verification

If this is a scoring SCO, verify that the `imsss:primaryObjective` element is present, that the `imsss:minNormalizedMeasure` element exists within the `imsss:primaryObjective` element, and that a mastery score has been set within the `imsss:minNormalizedMeasure` element.

Business Rule 2.2.6 may be ignored in cases of non-scoring content.

Run-Time Environment

The information in this section pertains to the requirements that relate to the run-time environment part of the SCORM 2004 3rd Edition specification, such as usage of the SCORM API within content. Refer to Appendix B for Army recommended SCORM API implementation for specific instructional strategies.

BUSINESS RULE 2.2.7: SCORM DATA MODEL

All SCORM 2004 3rd Edition SCOs shall track learner performance using only the SCORM 2004 3rd Edition data model; assessment SCOs shall use the Interactions data model element to record all learner performance.

Purpose

Business Rule 2.2.7 ensures content interoperability by requiring SCORM 2004 3rd Edition content to track its data using the standard mechanism provided by the specification. Other methods of data storage are not permitted, per Business Rule 2.1.5.

Risk

Failure to follow Business Rule 2.2.7 prevents content from being able to track its data consistently, which may prevent it from functioning as intended.

Verification

Verify that you have only used SCORM 2004 3rd Edition data model elements to track learner progress and performance. You should also verify that you have not implemented any local storage solutions per Business Rule 2.1.5.

BUSINESS RULE 2.2.8 SCORM REQUIRED API CALLS FOR ASSESSMENTS

Credit-producing assessment SCORM 2004 3rd Edition SCOs shall at a minimum use the SCORM API as follows:

Method Calls	Data Model Elements
Call at least once:	Set a valid value at least once:

```
Initialize        cmi.exit
GetLastError      cmi.completion_status
Commit            cmi.success_status
Terminate         cmi.score.scaled
                  cmi.session_time
                  cmi.interactions.n.correct.response.n.pattern
                  cmi.interactions.n.learner_response
                  cmi.interactions.n.latency
                  cmi.interactions.n.timestamp
                  cmi.interactions.n.type
                  cmi.interactions.n.result
                  adl.nav.request
```

Purpose

Business Rule 2.2.8 ensures that the minimum required run-time behavior for SCORM 2004 3rd Edition assessment SCOs is present when the learner attempts the content. The Army specifically tests for the method calls and data model elements outlined in this rule during validation and certification.

IMPORTANT: All items listed in Business Rule 2.2.8 must be present during run-time to prevent failure during Army validation and certification.

Risk

Failure to follow Business Rule 2.2.8 causes content to fail Army validation and certification. It puts the content at risk of not functioning as intended.

Verification

If this is a scoring SCO, verify that each one of the above methods is called at least once, and that each one of the above data model elements is set at least once during normal operation of your SCO.

BUSINESS RULE 2.2.9: SCORM REQUIRED API CALLS FOR NON-ASSESSMENTS

Credit-producing, non-assessment SCORM 2004 3rd Edition SCOs shall at a minimum use the SCORM API as follows:

Method Calls	**Data Model Elements**
Call at least once:	Set valid value at least once:
▪ `Initialize`	▪ `cmi.exit`
▪ `Commit`	▪ `cmi.success_status`
▪ `Terminate`	▪ `cmi.completion_status`
	▪ `cmi.location` or `cmi.suspend_data`
	▪ `cmi.session_time`
	▪ `adl.nav.request`

Purpose

Business Rule 2.2.9 ensures that the minimum required run-time behavior for SCORM 2004 3rd Edition non-assessment SCOs is present when the learner attempts the content. During certification, the Army specifically observes the method calls and data model elements outlined in this rule.

IMPORTANT: All items listed in Business Rule 2.2.9 must be present during run-time to prevent failure during Army certification.

Risk

Failure to follow Business Rule 2.2.9 will cause content to fail Army certification.

Verification

If this is a non-scoring SCO, verify that each one of the above methods is called at least once, and that each one of the above data model elements is set at least once during normal operation of your SCO.

BUSINESS RULE 2.2.10: SCORM NAVIGATION REQUEST

All SCORM 2004 3rd Edition SCOs shall set an appropriate navigation request using the adl.nav.request data model element during run-time.

Purpose

Business Rule 2.2.10 ensures content interoperability by requiring SCORM 2004 3rd Edition content to perform explicit LMS interactions. Not all LMSs will automatically perform actions like navigation requests or have navigation buttons present in the player, so developers must program SCORM 2004 3rd Edition content without assuming the delivery platform will provide functionality not specified in the content itself.

Risk

If Business Rule 2.2.10 is not followed, when a learner exits the SCO the ALMS SCORM player window may refresh and display a "Please select a navigation action" message that leaves the learner no choice but to close the ALMS SCORM player window, thus not exiting the content normally. This may prevent the learner from receiving credit for completion.

Verification

Verify that you have set the `adl.nav.request` data model element in accordance with the content's corresponding instructional strategy.

Refer to the Appendix B: SCORM Implementation of Specific Instructional Strategies for guidance on implementing Army-recommended sequencing and `adl.nav.request` data model element values for the specific instructional strategy.

3 Testing

This section of the guide covers the requirements that pertain to the third phase of the DL creation process: Testing. In this phase, it is assumed that development has finished, and the DL product is ready for validation testing to ensure it meets Army requirements. The business rules in this section are themselves normative. Explanations of business rules, best practices, and examples are informative in nature.

3.1   All Learning Content

The information in this section pertains to the testing of learning content for all IMI types.

Platform Testing

The information in this section pertains to the requirements for testing Army DL products on delivery platforms regardless of the IMI type.

BUSINESS RULE 3.1.1: TARGET PLATFORM TESTING

All SCOs shall be tested on the target delivery platform testing environment with content configuration settings identical to the live version of the platform.

Purpose

Business Rule 3.1.1 ensures that the performance of a DL product during testing by developers will match performance during Army testing and platform delivery. Developers must only test their SCOs on the target delivery platform using the same content configuration settings that would be applied to the live version. While there may exist third-party platforms for testing content, the results of testing on anything other than the target platform are unacceptable as a substitute for the requirement.

Risk

Failure to follow Business Rule 3.1.1 creates the risk of a DL product not functioning as intended on the target delivery platform because the DL product was tested in an environment that does not match the target delivery platform. Risk of improper functionality is also created when the exit options are not set correctly and the SCORM requirements are relaxed.

Verification

Verify that the SCO you are testing is configured on the target platform such that the settings match those of the live platform. Check with the appropriate POC(s) to confirm configuration settings.

Application

ALMS CTE Content Configuration

This section is to assist with configuring SCORM 2004 3rd Edition content on the ALMS Content Testing Environment (CTE) to conform to the business rules.

IMPORTANT: Refer to the CTE Knowledge Base for more information on available player templates. Review and adhere to the CTE content configurations guidance listed under the CTE Knowledge Base to ensure proper content loading.

The ALMS provides multiple player templates for SCORM content (both 1.2 and 2004). Note that both the SCORM 1.2 API and SCORM 2004 API are available in each player template. ALMS administrators typically configure SCORM 2004 3rd Edition content on the ALMS to use the "ARMY_SCORM_2004" player template, which has the following features:

- No vendor branding
- Table of Contents (TOC) and learning content appear in the same window
  - TOC is in a visible frame on the left side
  - Learning content is in a visible frame on the right side
- The initial player window size is 1024 pixels wide and 764 pixels high
  - The Table of Contents frame width is a static 200 pixels

The "ARMY_SCORM_2004" player template has reduced screen space due to the TOC frame, so developers shall launch content in a separate window per Business Rule 2.2.1.

DO NOT USE ALMS Built-in Exit Options

IMPORTANT: ALMS Administrators do not enable the ALMS Exit Options when configuring content for testing and platform delivery.

The Exit Options reduce interoperability of content by making functionality for which the content should be responsible a responsibility of the ALMS. Furthermore, exit option usage may conflict with the programming of the content and cause performance issues such as preventing the learner from receiving credit. The ALMS Exit Options should be configured to be hidden for each SCORM 2004 3rd Edition content package. Figure 11 illustrates how the configuration option for the ALMS Exit Options should appear when they are hidden for content.
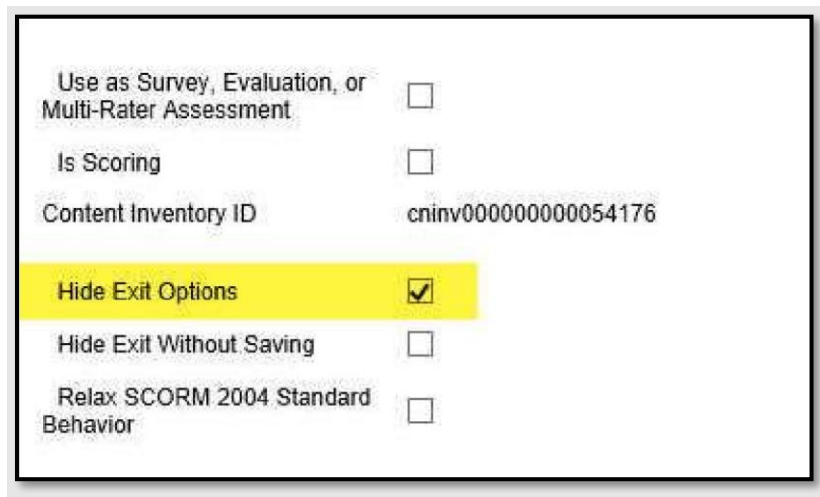
Figure 11: ALMS content option to hide ALMS Exit Options

IMPORTANT: Do not use the ALMS Exit Options as a substitute for content functionality. SCORM 2004 3rd Edition content on the ALMS should not be tested with the ALMS Exit Options active. You must select the Hide Exit Options as shown above.

WARNING: If Exit Options are not hidden, the ALMS will display a popup window to the learner upon closure of the content. The window contains three exit options that include: "Exit and Finish," "Exit and Resume Later" and "Exit without saving" (as shown in Figure

12). Except each is applied by the ALMS directly rather than the content making the navigation request per Business Rule 2.2.10.
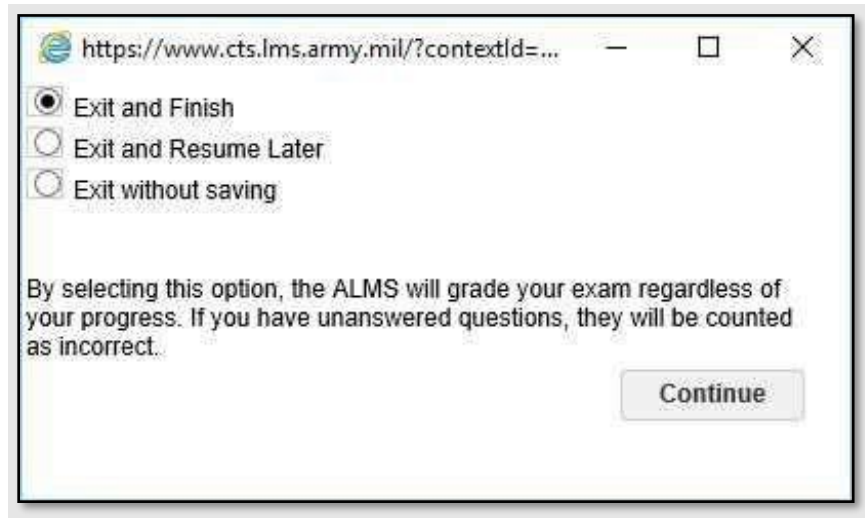
Figure 12: ALMS Exit Options pop-up window if Hide Exit Options were not selected. This is what the learner sees in the ALMS once course is complete.

BUSINESS RULE 3.1.2: COMPUTER CONFIGURATION

All content packages shall be tested using a computer with a configuration (i.e., hardware, operating system, web browser) that matches the minimum requirements of the Baseline Home Computer Configuration (BHCC).

Purpose

Business Rule 3.1.2 ensures that the performance of a DL product during testing by developers will match performance during Army testing and platform delivery. Developers must only test content packages using a setup that at a minimum matches the Baseline Home Computer Configuration (BHCC) that covers most Army learners.

IMPORTANT: The Baseline Home Computer Configuration is found in the appendices of this document.

Risk

Failure to follow Business Rule 3.1.2 creates the risk of a DL product not functioning as intended on the target delivery platform due to software-related deficiencies, such as issues with Internet Explorer's Compatibility View, not found during testing.

IMPORTANT: Windows 11 was released on October 4, 2021, as a free upgrade to Windows 10. Internet Explorer was retired and is not available in Windows 11. Instead, Microsoft Edge now has an Internet Explorer Mode to run some legacy applications.

Verification

Verify that you tested the courseware successfully on a machine that meets only the minimum system requirements allowed. Refer to BHCC for the minimum requirements.

Army Testing Tools

The information in this section pertains to the requirements for testing Army DL products using conformance testing tools regardless of the IMI type. For more information, see the Army SCORM Acceptance Criteria on the TADLP website.

BUSINESS RULE 3.1.3: CONFORMANCE TESTING TOOLS

All content packages shall be validated with conformance testing tools and methods required by the Army for the specific IMI type.

Purpose

Business Rule 3.1.3 ensures that a DL product meets Army requirements by requiring proof of content conformance using standardized testing tools and methods. Note that each IMI type will have a different set of requirements and testing tools that the Army specifies.

IMPORTANT: Keep track of all log files and results produced during testing; they are required deliverables when it comes time to submit a DL product to the Army.

Risk

Failure to follow Business Rule 3.1.3 means a DL product has not been validated for conformance and will not be accepted by the Army.

Verification

Verify that you have proof of proper functionality by providing the appropriate log files and testing results when you submit your content package to the Army.

3.2 SCORM Content

The information in this section pertains to the testing of SCORM content.

Platform Testing

The information in this section pertains to the requirements for testing Army SCORM 2004 3rd Edition DL products on delivery platforms.

BUSINESS RULE 3.2.1: SCORM STRICT MODE

All SCOs shall be tested on the target delivery platform testing environment using strict conformance settings when available. Any configuration options that relax conformance shall not be active.

Purpose

Business Rule 3.2.1 builds upon Business Rule 3.1.1 by requiring that the configuration options for SCORM 2004 3rd Edition content on an LMS match what the live version of the platform uses. SCORM 2004 3rd Edition content on Army LMSs such as the ALMS must not be configured with any relaxed conformance settings for Army testing and platform delivery.

Risk

Failure to follow Business Rule 3.2.1 means a DL product has not been validated for conformance and will not be accepted by the Army.

Verification

Verify that you have properly configured your SCO on the target delivery platform during platform testing using the information available within this guide. and/or the guidance listed under the CTE Knowledge Base.

Application

Developers should first refer to PdM ATIS guidance on configuring content on the ALMS CTE before reading. An overview of PdM ATIS guidance may be found on the PdM ATIS website.

The ALMS provides a "relaxed mode" option for SCORM 2004 3rd Edition content that lifts the default strictness requirements for content. This allows the learner to complete it in more circumstances, such as when data model elements like success status are missing. ALMS administrators do not enable SCORM "relaxed mode" for content. SCORM "relaxed mode" reduces the interoperability of SCORM 2004 3rd Edition content by making the ALMS responsible for missing functionality that should be in the content itself. Figure 13 illustrates how the configuration option for SCORM "relaxed mode" should appear when it is inactive.

Figure 13: ALMS content configuration option for SCORM "relaxed mode"

IMPORTANT: Do not use the ALMS SCORM "relaxed mode" as a substitute for content functionality. SCORM 2004 3rd Edition content on the ALMS should not be tested with SCORM "relaxed mode" active.

Army Testing Tools

The information in this section pertains to the requirements for testing Army SCORM 2004 3rd Edition DL products using conformance testing tools regardless of the IMI type.

BUSINESS RULE 3.2.2: ARMY CONFORMANCE TESTING

All SCORM 2004 3rd Edition content packages and SCOs shall pass all tests performed using the Army SCORM 2004 3rd Edition Conformance Test Suite (ACTS).

Purpose

Business Rule 3.2.2 builds upon Business Rule 3.1.3 to ensure that a SCORM 2004 3rd Edition DL product meets the SCORM 2004 3rd Edition specification requirements by requiring proof of content conformance using a standardized test. Passing results from all the tests performed by the ACTS Tool are required.

IMPORTANT: Keep track of all log files and results produced during testing; they are required deliverables when it comes time to submit a DL product to the Army.

For more information, see the Army SCORM Acceptance Criteria on the TADLP website.

Risk

Failure to follow Business Rule 3.2.2 means a DL product has not been validated for conformance and will not be accepted by the Army.

Verification

Verify that the ACTS tool produces fully passing results with a positive conformance statement, and that the log files produced by ACTS are submitted alongside your SCO as proof of SCORM 2004 3rd Edition conformance.

4 Delivery

This section of the guide covers the requirements that pertain to the final phase of the DL creation process: Delivery to the Army. In this phase, it is assumed that post-development testing has finished, the DL product has been validated for conformance to Army requirements, and the product is ready to be submitted. The business rules in this section are themselves normative. Explanations of business rules, best practices, and examples are informative in nature.

4.1   All Learning Content

The information in this section pertains to the delivery of learning content of all IMI types.

Packaging

The information in this section pertains to the requirements for deliverable items for Army DL products regardless of the IMI type.

BUSINESS RULE 4.1.1: CONTENT PACKAGE FORMAT

All learning content shall be contained in an approved content package format that the ALCMC delivery platform natively supports.

Purpose

Business Rule 4.1.1 ensures content interoperability by requiring SCOs to use standard content packages that can be loaded onto a delivery platform for use by the learner. Each IMI type defines content format standards that include how modules of content shall be packaged.

Risk

Failure to follow Business Rule 4.1.1 creates the risk of an SCO not being supported by the delivery platform due to its packaging and, consequently, not accepted by the Army.

Verification

Verify that your SCO is delivered in the approved content package format that is natively supported by the target delivery platform.

Deliverable Items

The information in this section pertains to the requirements for delivering Army DL products regardless of the IMI type.

BUSINESS RULE 4.1.2: CONTENT PACKAGE DELIVERABLES

All finalized content packages that are consumable by the learner on an ALCMC delivery platform or computer shall be delivered electronically to the Government.

Purpose

Business Rule 4.1.2 ensures the finalized DL products are delivered to the Army in a format suitable for physical records keeping. Content package deliverables must be submitted electronically to the Government.

Risk

Failure to follow Business Rule 4.1.2 means a DL delivery package is incomplete and will not be accepted by the Army.

Verification

Verify that your SCO has been delivered to the Army via electronic means.

BUSINESS RULE 4.1.3: SOURCE MATERIAL DELIVERABLES

All final contract deliverables – such as content packages, development source files, answer keys, and test logs – shall be delivered to the Government including any supporting software or tools.

Purpose

Business Rule 4.1.3 ensures that all supporting materials for DL products are delivered to the Army so that changes to products may be made if necessary, and that the Army has possession of all components of contracted work.

Risk

Failure to follow Business Rule 4.1.3 means a DL delivery package is incomplete and will not be accepted by the Army.

Verification

Verify that all non-content-package deliverables as well as any additional software required to modify them are in the Army's possession.

4.2   SCORM Content

The information in this section pertains to the requirements for delivery of Army SCORM 2004 3rd Edition DL products.

Packaging

The information in this section pertains to the requirements for deliverable items for Army SCORM 2004 3rd Edition DL products.

BUSINESS RULE 4.2.1: SCORM CONTENT PACKAGE DELIVERABLES

Each SCO for use by learners shall be contained in a package interchange file (PIF) per the SCORM 2004 3rd Edition specification that the ALCMC delivery platform natively supports. Each SCORM content package shall be delivered as a single zip file. Do not nest SCORM content packages within other SCORM content packages.

Purpose

Business Rule 4.2.1 builds upon Business Rule 4.1.1 to ensure content interoperability by requiring SCOs to use the packaging format specified by the SCORM 2004 3rd Edition specification. While some delivery platforms may accept SCORM 2004 3rd Edition content in other formats, the Army requires PIFs for all SCORM 2004 3rd Edition content.

Risk

Failure to follow Business Rule 4.2.1 creates the risk of SCOs not being supported by the delivery platform due to the packaging format, which prevents Army acceptance.

Verification

Verify that the SCO is delivered to the Army in PIF format.

Deliverable Items

The information in this section pertains to the requirements for deliverable items for Army SCORM 2004 3rd Edition DL products.

BUSINESS RULE 4.2.2: SCORM VALIDATION DELIVERABLES

All SCOs delivered to the Army shall be accompanied by proof of passing results from Army SCORM 2004 3rd Edition conformance testing tools.

Purpose

Business Rule 4.2.2 ensures that proof of conformance testing is provided to the Army for all delivered SCORM 2004 3rd Edition content. Business Rule 3.2.2 lists the conformance testing tools from which output is required for delivery.

For more information, see the Army SCORM Acceptance Criteria on the TADLP website.

Risk

Failure to follow Business Rule 4.2.2 means a DL product offers no proof that it has been validated for conformance and will not be accepted by the Army.

Verification

Verify that you have delivered valid testing tool files and that they show passing results from each testing tool

Appendix A: Responsive Web Design in DL Courseware Development

Summary

This appendix addresses the use of Responsive Web Design in DL courses by defining Responsive Web Design, discussing implementation and testing for responsiveness, and outlining how some IMI authoring tools assist with making courseware responsive. With the use of tablets and phones outpacing desktops, it is critical for developers to consider other devices when designing IMI courseware.

Note: Specific products mentioned in this document are for example only. This document does not endorse any commercial services. Readers are reminded that they should select their tools or services at their sole discretion.

What is Responsive Web Design?

Responsive Web Design (RWD) is an approach to web design that makes web pages display effectively on different devices and screen sizes. RWD responds to the needs of the users and the devices they use. Therefore content, design and performance are necessary across all devices to ensure usability and satisfaction.

How to know if a design is responsive

A Responsive Web Design (RWD) has distinctive visual properties. Here are typical characteristics of RWD:

- Shows more content on a larger screen and less content on a smaller screen.
- Reorganizes and reflows the content when the display area is resized, or the screen orientation is changed.
- Adjusts the font size so that the text is always legible.
- Uses higher-resolution images on high-density screens and lower-resolution images on low-density screens.

See the Example of Responsive and Unresponsive Web Design section below.

How to tell if a design is NOT responsive

A design is not considered responsive if the web page has one or more of the following characteristics:

- It requires a large minimum screen size (e.g., must be at least 1024x768) to be functional and meaningful.
- It has only one layout design and uniformly scales the page to fit the screen regardless of its size.
- The content stays in portrait or landscape mode with big margins when the screen is rotated.
- Users must use both vertical and horizontal scrollbars to reveal the full content.
- The font size becomes unnecessarily large on a large screen or illegibly small on a small screen.

- The control buttons are in fixed size and at fixed positions regardless of the screen size, even if they obscure other content.
- The images use the same resolution regardless of the screen size.

Examples of Responsive and Unresponsive Web Design

The specific devices mentioned in this report stand for these representative screen resolutions.

Device	iPad Pro	iPad	Galaxy S5	iPhone X
Screen Diagonal Length (inches)	12.9	9.7	5.1	5.8
Width (pixels)	1024	1024	360	375
Height (pixels)	1366	768	640	812

Responsive:

The Desktop view displays all the content and functions of the page.
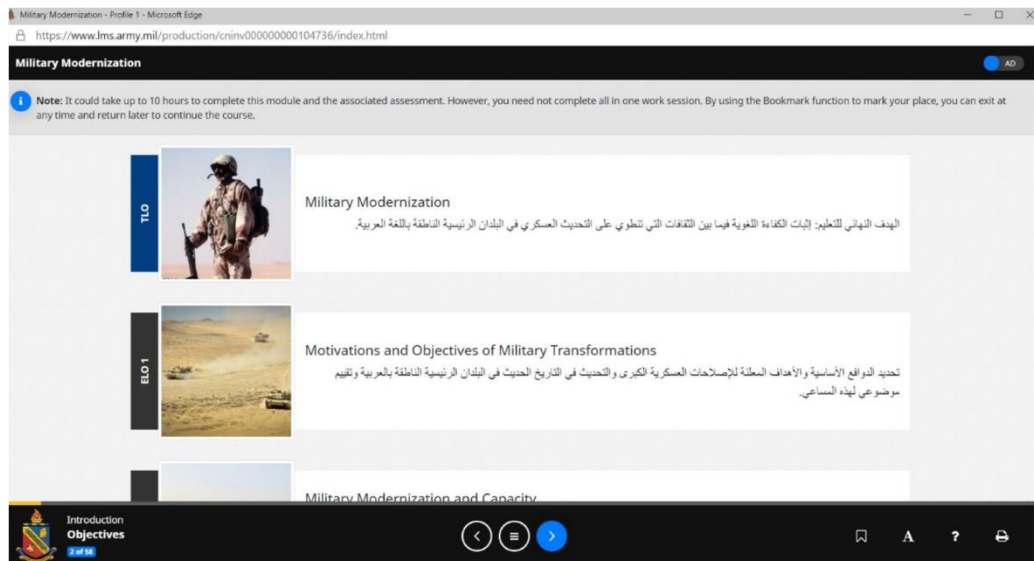
Desktop

When viewed on iPads, text and images reorganize to give the best display for the screen size. **Note** that the display differs depending on the size of the screen.
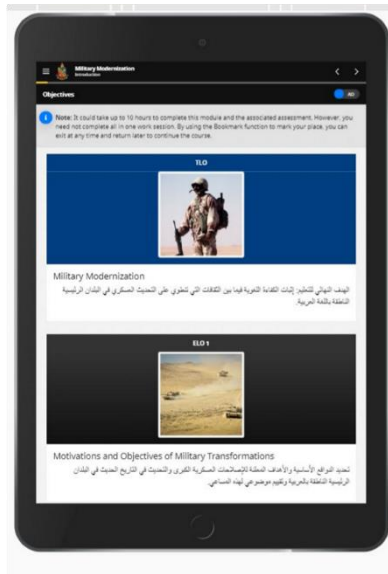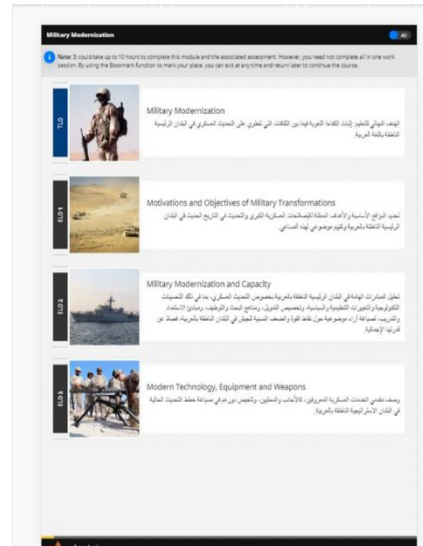
iPad   iPad Pro

Similarly, content reorganizes for optimal display on smartphones as well. **Note** that the text and image sizes differ for each screen size to take advantage of available screen real estate.
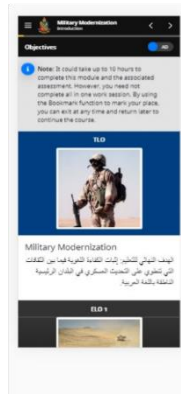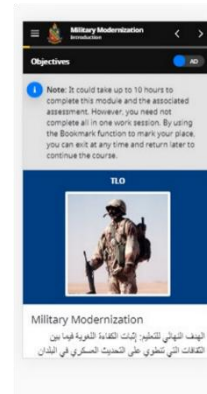
iPhone X   Galaxy S5

Unresponsive:

All content and navigation are visible on large screens but not on smaller screens.
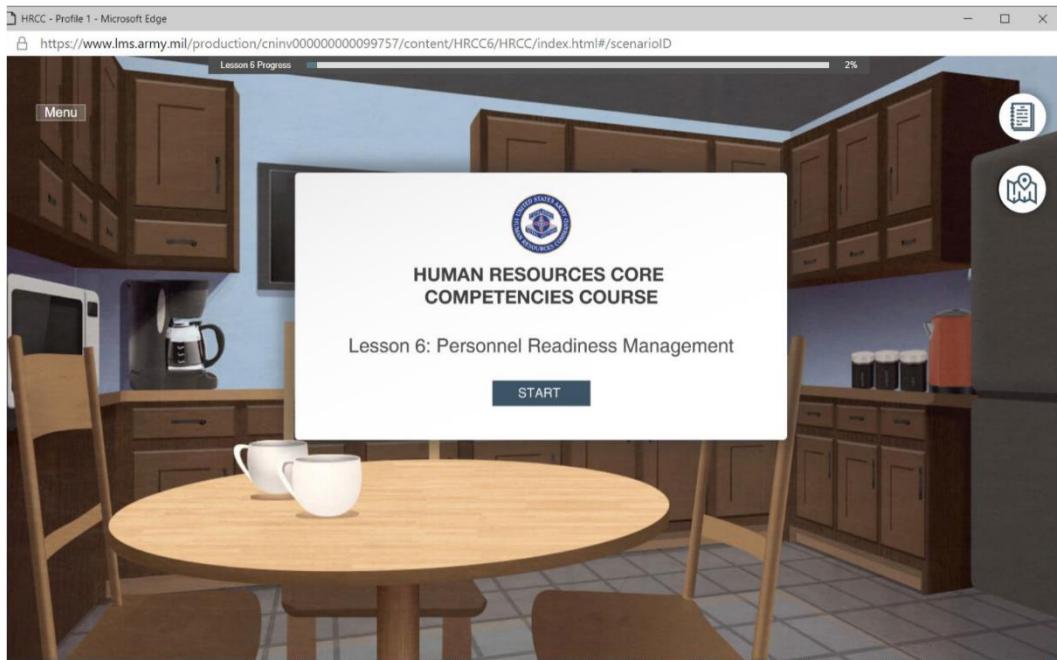
Desktop

The content becomes partially hidden on tablet screen sizes making viewing and navigation difficult if not impossible.

iPad
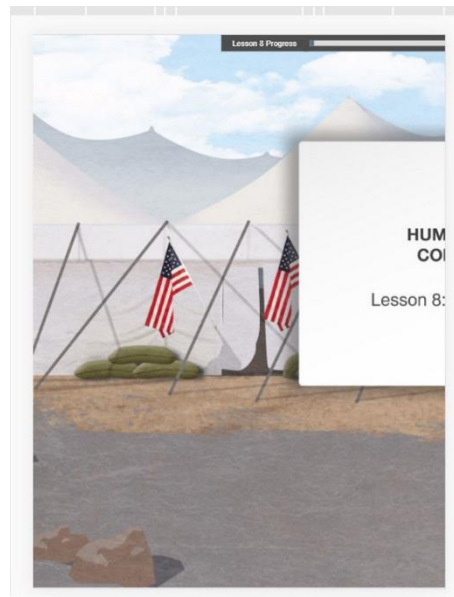
iPad Pro

Even more content is hidden on smaller phone screens, making the courseware unusable.

iPhone X

Galaxy S5

Implementing Responsive Web Design

Design and Development

RWD was originally defined by Ethan Marcotte in 2010. He described the use of three techniques (fluid grids, fluid images, and media query) in combination with web-page design to suit different screen sizes. It is important to understand that RWD is not a separate technology; it is a term used to describe an approach to web design or a set of best practices used to create a layout that responds to the device being used to view the content.

A web page designed with RWD applies CSS3 media queries, flexbox, flexible grids, flexible images, and viewport meta tag in the following ways:

Media Queries

A media query is composed of an optional media type and any number of media feature expressions. Multiple queries can be combined in several ways by using logical operators.

Media queries are simple filters that can be applied to CSS styles. They make it easy to change styles based on the device or features of the device rendering the content. For example, width, height, orientation, ability to hover, and whether the device is being used as a touchscreen may be changed.

Example:

The following media query tests to see if the current web page is being displayed as screen media (therefore not a printed document) and the viewport is at least 800 pixels wide. The CSS for the container selector will only be applied if these two things are true.
CSS Code:

```
@media screen and (min-width: 800px) {
    .container {
        margin: 1em 2em;
```

```
        }
}
```

Flexbox

> Flexbox is a one-dimensional layout method for laying out items in rows or columns. Items flex to fill additional space and shrink to fit into smaller spaces.

In Flexbox, flex items will shrink and distribute space between the items according to the space in their container as their initial behavior. By changing the values for flex-grow and flex-shrink you can indicate how you want the items to behave when they encounter more or less space around them.

Implementation Example:

In the example below, the flex items will each take an equal amount of space in the flex container using the shorthand of flex:

CSS Code:

```
.container {
    display: flex;
}
.item {
    flex: 1;
}
```

HTML Code:

```
<div class="container">
    <div class="item">A</div>
    <div class="item">B</div>
    <div class="item">C</div>
</div>
```

Result

Container

A B C
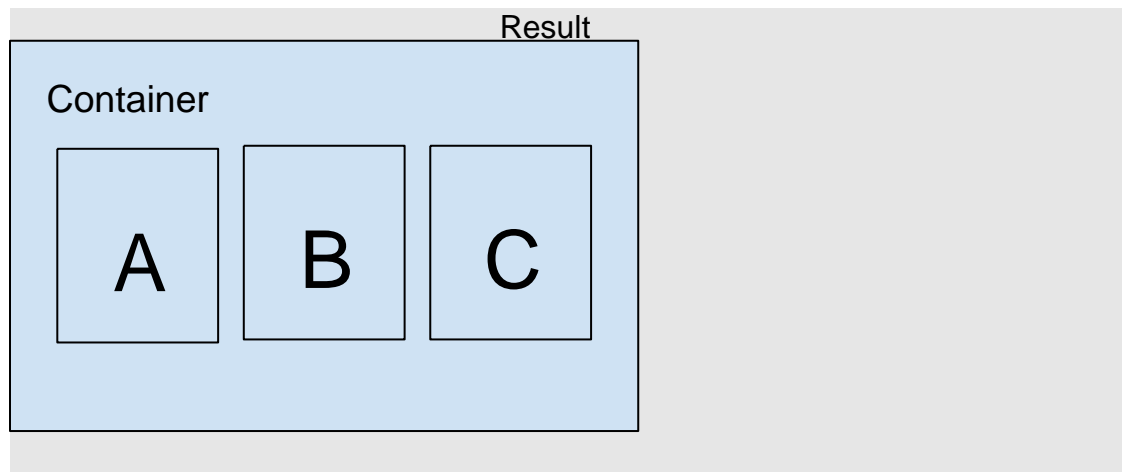
Flexible grids with the "fr" unit

CSS Grid Layout is a two-dimensional layout system for the web. It lays out content in rows and columns. In addition to creating grids using lengths and percentages, using "fr" units can flexibly size grid rows and columns. This unit represents one fraction of the available space in the grid container.

The "fr" unit distributes space in proportion, therefore it can have different positive values for each track.

Example:

In the example below, the container has a grid layout with 3 tracks in each row. The first track gets 2fr of the available space and the other two tracks get 1fr, making the first track larger.

CSS Code:

```
.container {
    display: grid;
    grid-template-columns: 2fr 1fr 1fr;
}
```

HTML Code:

```
<div class="container">
    <div>A</div>
    <div>B</div>
    <div>C</div>
    <div>D</div>
    <div>E</div>
    <div>F</div>
    <div>G</div>
</div>
```

Result:

Container

A	B	C
D	E	F
G		
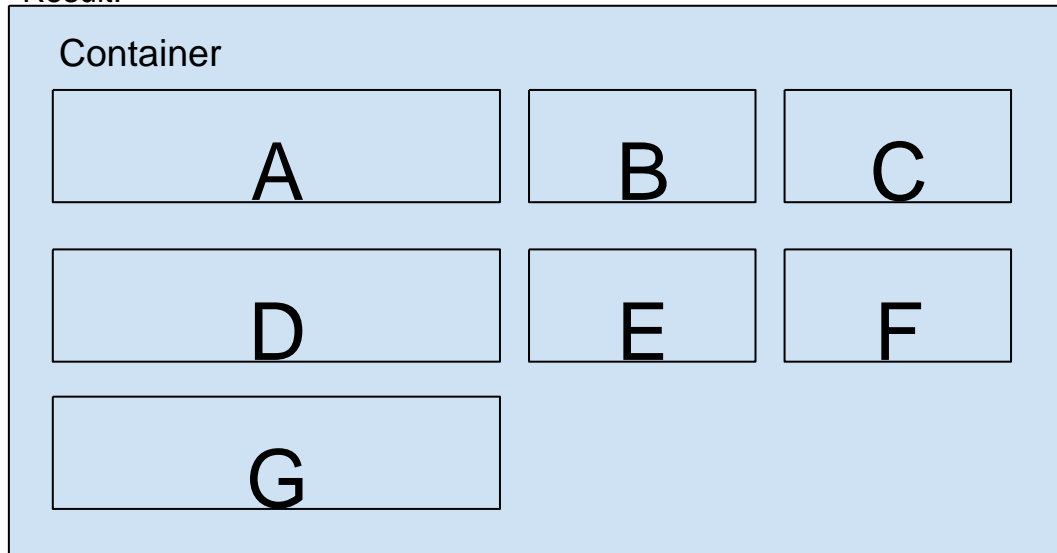
Flexible images

Flexible images are sized in relative units to prevent them from displaying outside their containing element.

Set the max-width CSS attribute of images to 100%. This will make the image shrink to fit the space when the viewport size is smaller than the image. However, because the max-width rather than the width is 100%, the image will not stretch larger than its natural size.

Implementation Example:

CSS Code:

```
img {
    max-width: 100%;
}
```

Responsive Typography

Responsive typography involves changing font sizes within media queries to correspond to screen size. Thus, developers do not have to compromise on screen size.

For example, set the level 1 heading to 4rem, meaning it will be four times the base font size. This large heading is meant only for larger screen sizes, so a smaller heading is created first. The larger hearing will overwrite the smaller heading using media queries when the user has a screen size of at least 1200px.

Implementation Example:

CSS Code:

```
html {
    font-size: 1em;
}
h1 {
    font-size: 2rem;
}

@media (min-width: 1200px) {
  h1 {
    font-size: 4rem;
  }
}
/* based on viewpoint width */
h1 { font-size: 6vw; }
h1 { font-size: calc(1.5rem + 3vw); }
```

The viewport meta tag

Viewport is a meta tag in the head of a HTML document. The viewport defines the user's visible area of a web page. It varies with the device and will be smaller on a mobile phone than on a desktop monitor.

A meta viewport tag gives the browser instructions on how to control the page's dimensions and scaling. This allows the page to reflow content to match different screen sizes, whether rendered on a small mobile phone or a large desktop monitor.

Example:

In the example below, the meta tag instructs mobile browsers that they should set the width of the viewport to the device width and scale the document to 100% of its intended size. This shows the document at the mobile-optimized size.

HTML Code:

```
<meta name="viewport" content="width=device-width,initial-
                      scale=1">
```

Testing and Verifying Responsive Design

Visual Inspection: On a desktop computer, a browser window can be resized by dragging its edge or corner. This is the simplest way to visually inspect the page's responsiveness.

Browser Emulator: On Windows and Linux, the hot key to launch the developer tool is F12. The emulator has different names on different browsers: Internet Explorer has an "Emulation" tab, Google Chrome and the latest Edge have "device toolbar," and Firefox has "Responsive Design Mode." If a browser window cannot be resized (e.g., its opener has set "resizable=no" option in the `window.open` function) or if specific screen sizes are to be checked, developers can use the emulator function of the developer tools provided by most browsers.

Code inspection: Examples of CSS code inspection include:

- Use of relative length units such as em, rem, vm, and vh instead of pixel-based absolute length units such as px and pt.
- Use of methods mentioned in the previous section such as media queries and flexible images.

Testing tools:

- There are many websites, tools, and commercial services available to test a site's responsiveness across a wide range of resolutions and specific devices.

Tools for Responsive Design

Responsive Design using Web Development Tools

Many web development design systems, frameworks, and libraries offer built-in support for responsive web design. Below are some examples of such resources that support RWD:

- **Bootstrap** - A free, open-source CSS framework directed at responsive, mobile-first web development. It offers CSS- and JavaScript-based design templates for text, forms, buttons, navigation, and other interface components.
- **Foundation** - A responsive front-end framework that provides a responsive grid and HTML and CSS UI components, templates, and code snippets for text, forms, buttons, navigation, and other interface elements.
- **Material Design** - An adaptable system of guidelines, components, and tools that support the best practices of user interface design, backed by open-source code.
- **W3.CSS** - A small, fast CSS framework that includes a responsive, mobile-first grid system to handle layout.

Authoring Tools Support for Responsive Web Design

Many IMI authoring tools can support the implementation of Responsive Web Design. The following is a summary of the responsive design capabilities of three authoring tools (Adobe Captivate; Articulate Storyline 360 and Trivantis Lectora) currently used by some Army IMI developers.

Note: This is not an exhaustive list nor in any way an endorsement of using or not using a specific authoring tool. Developers must decide on their own what tools to use to meet their needs.

Adobe Captive

Adobe Captive 2019 has added "Fluid Boxes" to automatically wrap and align content to display on any device or browser. A Fluid Box expands or shrinks the objects within it to fill available free space or prevent overflow and excessive scrolling. Developers may use several settings for the Fluid Boxes to retain some control of how the content displays. Furthermore, older desktop only courses can be converted to responsive modules using Fluid Boxes. More detailed guidance on the Responsive Web Design from Adobe Captivate is available at their website.

Articulate Storyline 360

Articulate Storyline 360 and Studio 360 use a responsive player to adjust content to the screen size and orientation of mobile devices. The player, added when courseware is published, hides sidebar menus, and offers mobile-friendly playback controls. There are two player styles: the *modern* player which gives learners the same view on all devices, and the *classic* player which looks different on desktop computers and mobile devices. Both player styles are responsive on tablets and smartphones. To read more information about Articulate Storyline Responsive Web Design go to their website.

Trivantis Lectora

Lectora 16 and higher offers "Responsive Course Design" (RCD) where course content is designed specifically for: desktop; tablet landscape/portrait; and phone landscape/portrait. RCD uses a "desktop first" approach where content is designed for a desktop view first, then the design resizes for tablet and phone views. The tablet and phone views can be adjusted (such as adding or removing buttons) without affecting the desktop view.

Lectora also offers an option to update older courses (down to version 12) to make them responsive to different screen sizes. Mobile views (tablet and phone) scale the content to fit the exact width of the screen, adding vertical scrolling if the content is taller than the screen height. This allows developers to know exactly how the content will be rendered on each device. Content published in the phone view will look the same on every phone, regardless of the screen size. For more information on Lectora's Responsive Web Design, visit their website.

Appendix B: SCORM Implementation of Specific Instructional Strategies

The Army-recommended sequencing for SCORM 2004 3rd Edition DL products mentioned in the SCORM content development section 2.2 General Best Practices.

Instructional Strategies

The Army employs three instructional strategies for SCORM 2004 3rd Edition DL products for both assessment and non-assessment content:

Unlimited Attempts: Content that is designed to allow the learner as many attempts as necessary to achieve mastery uses the unlimited attempts instructional strategy. The content is programmed to make a final evaluation of the learner's progress only when the learner successfully completes the content.

Single Attempt: Content that is designed to allow the learner a single attempt uses the single attempt instructional strategy. The content is programmed to make a final evaluation of the learner's progress based on their performance in the single attempt.

Multiple Limited Attempts: Content that is designed to allow the learner only a specific number of attempts uses the multiple limited attempts instructional strategy. The content is programmed similarly to the unlimited attempts instruction strategy, with an attempt limit placed on the content using LMS configuration settings.

IMPORTANT: On the ALMS testing platform, do NOT place any assessment in the Post Class Assessment section. All posttests must be within the Learning Content section. Failing to do this will get unexpected results on the deployed courses.

SCORM Components of an Instructional Strategy

There are two components of each instructional strategy that may be applied to SCORM 2004 3rd Edition content:

Manifest sequencing: The usage of SCORM 2004 3rd Edition sequencing elements on both SCOs and their organizations within the manifest for a content package. Manifest sequencing instructs the LMS on how to handle evaluation of data after the learner's attempt on content is finished. It consists of the organizational level rollup rules and SCO-level primary objective.

SCORM API Programming: The usage of the SCORM 2004 3rd Edition API within a SCO's content. SCORM API programming functions together with the sequencing in the manifest to provide a desired outcome regarding how the LMS evaluates the learner's attempts.

IMPORTANT: Remember that assessment and non-assessment content may require different implementations of each instructional strategy. The sub-section for each instructional strategy discusses the differences for both content types where necessary.

Unlimited Attempts Instructional Strategy

This section discusses how to implement the unlimited attempts instructional strategy for assessment and non-assessment SCORM 2004 3rd Edition content.

Assessment Content

Assessments with unlimited attempts use three rollup rules in the manifest and specific values for four data model elements in SCOs.

Organization Rollup Rules

The unlimited attempts instructional strategy for assessments uses these three rollup rules in the organization sequencing to ensure performance:

If all children are satisfied:

- **Roll up "completed" for completion status**

  When the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a completion status of "completed" so the system can evaluate the learning assignment.

- **Roll up "satisfied" for satisfaction status**

  Additionally, when the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a satisfaction status (analogous with success status) of "satisfied" so the learner can receive credit for the learning assignment upon evaluation.

If any children are *not* satisfied:

- **Roll up "incomplete" for completion status**

  When the learner exits the SCO after a failing attempt, tell the LMS that the learning content has an overall completion status of "incomplete" so the system will not evaluate the learning assignment. This rollup rule is critical to enabling the unlimited attempts instructional strategy.

Figure 1 contains an example of the markup required to add rollup rules to the organization sequencing for an unlimited attempts instructional strategy.

ORGANIZATION ROLLUP RULES FOR THE UNLIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```xml
<organization>
…
 <item>…</item>
 <imsss:sequencing>
  <imsss:rollupRules>
   <imsss:rollupRule childActivitySet="all">
    <imsss:rollupConditions conditionCombination="all">
     <imsss:rollupCondition condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="completed"/>
   </imsss:rollupRule>
   <imsss:rollupRule childActivitySet="all">
    <imsss:rollupConditions conditionCombination="all">
     <imsss:rollupCondition condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="satisfied"/>
   </imsss:rollupRule>
   <imsss:rollupRule childActivitySet="any">
    <imsss:rollupConditions conditionCombination="any">
     <imsss:rollupCondition operator="not" condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="incomplete"/>
   </imsss:rollupRule>
  </imsss:rollupRules>
 </imsss:sequencing>
</organization>
```

Figure 1: Manifest code sample for organization rollup rules using the unlimited attempts instructional strategy

SCO Primary Objective

Per Business Rule 2.2.6, assessment SCOs must have a primary objective with a minimum normalized measure for the required mastery score. Figure 2 contains an example of the markup required to add a primary objective that includes a minimum passing score for a SCO in the manifest.

PRIMARY OBJECTIVE FOR AN ASSESSMENT SCO USING THE UNLIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```xml
<item identifier="SCO-ID" identifierref="SCO-RES" isvisible="true">
  <title>SCO Title</title>
  <imsss:sequencing>
    <imsss:objectives>
      <imsss:primaryObjective satisfiedByMeasure="true"
objectiveID="scoObj">
        <imsss:minNormalizedMeasure>0.8</imsss:minNormalizedMeasure>
      </imsss:primaryObjective>
    </imsss:objectives>
  </imsss:sequencing>
</item>
```

Figure 2: Code sample for primary objective in an assessment SCO using the unlimited attempts instructional strategy

The unlimited attempts instructional strategy for assessments sets four specific SCORM 2004 3rd Edition data model elements within the SCO to ensure rollup performance and desired learning progress status. Below are these data model elements and their applicable values:

- cmi.completion_status: "completed" or "incomplete"
- cmi.success_status: "passed" or "unknown"
- cmi.exit: "normal" or "suspend"
- adl.nav.request: "exit", "exitAll", or "suspendAll"

Their actual values depend on the learner performance and the specific desired outcome:

When the learner passes the assessment, the assessment rolls up as "Successful." Set the data model elements as the following:

- cmi.completion_status = completed
- cmi.success_status = passed
- cmi.exit = normal
- adl.nav.request = exit

When the learner fails the assessment, the assessment does not roll up. The values of data model elements depend on another design decision: whether the learners are allowed to see their responses when retaking the assessment. If the courseware is designed NOT to allow the learners to see their previous responses, the courseware should set the data model elements as the following:

- cmi.completion_status = incomplete
- cmi.success_status = unknown
- cmi.exit = normal
- adl.nav.request = exitAll

If the assessment is designed to allow the learners to see their previous responses, the courseware should set the data-model elements as the following to retain the progress data:

- cmi.completion_status = incomplete
- cmi.success_status = unknown
- cmi.exit = suspend
- adl.nav.request = suspendAll

Note that to allow the learners to see their previous responses, the courseware must be programmed to retrieve the saved answers from the previous session and display them to the learner.

Non-Assessment Content

Non-assessment content with unlimited attempts <u>uses the same three rollup rules</u> in the manifest as unlimited attempts assessments, but potentially different values for the four data model elements in SCOs.

Organization Rollup Rules

The unlimited attempts instructional strategy for non-assessment content uses the same three rollup rules in the organization sequencing that apply to assessments. Again, the three rollup rules used for the unlimited attempt strategy are:

If all children are satisfied:

- **Roll up "completed" for completion status**

  When the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a completion status of "completed" so the system can evaluate the learning assignment.

- **Roll up "satisfied" for satisfaction status**

  Additionally, when the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a satisfaction status (analogous with success status) of "satisfied" so the learner can receive credit for the learning assignment upon evaluation.

If any children are *not* satisfied:

- **Roll up "incomplete" for completion status**

  When the learner exits the SCO after a failing attempt, tell the LMS that the learning content has an overall completion status of "incomplete" so the system will not evaluate the learning assignment. This rollup rule is critical to enabling the unlimited attempts instructional strategy.

SCO Primary Objective

Recall that the best practice of assigning a primary objective for any SCO applies to all SCOs regardless of whether they are scoring or not. The difference between the two for the primary objective is that assessment SCOs are required to have a minimum normalized measure. Figure 3 contains an example of the markup required to add a primary objective to a non-assessment SCO.

PRIMARY OBJECTIVE FOR A NON-ASSESSMENT SCO USING THE UNLIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```
<item identifier="SCO-ID" identifierref="SCO-RES" isvisible="true">
  <title>SCO Title</title>
  <imsss:sequencing>
    <imsss:objectives>
      <imsss:primaryObjective satisfiedByMeasure="false"
objectiveID="scoObj" />
    </imsss:objectives>
  </imsss:sequencing>
</item>
```

Figure 3: Code sample for primary objective in a non-assessment SCO using the unlimited attempts instructional strategy

SCO API Activity

The unlimited attempts instructional strategy for non-assessment content sets the four SCORM 2004 3rd Edition data model elements found in the assessment strategy, but with different potential values. The four data model elements and their values for the non-assessment content unlimited attempts strategy are:

Set cmi.completion_status to "completed" or "incomplete"

> Non-assessment content should send a completion status value of "completed" if the learner completes the content. If the learner has not yet completed content, a value of "incomplete" will work with the organization rollup rules to prevent the LMS from evaluating attempts until the learner completes the content.

Set cmi.success_status to "passed" or "unknown"

> A non-assessment SCO should send a success status value of "passed" when the learner completes the content. Although a non-assessment SCO may not have a score attached, it is still best practice to assign a success status with completion status for non-assessment content. It is also best practice to set success status to "unknown" as an initial value at the beginning of an assessment.

Set cmi.exit to "normal" or "suspend"

> The value for the cmi.exit data model element depends on whether learners should be able to review non-assessment content or not. When the design allows learners to review completed content, the content sends a cmi.exit value of "suspend" to tell the LMS to retain the attempt data. A cmi.exit value of "normal" will tell the LMS to create a new attempt data set if the learner launches the SCO again, and previous attempt data will no longer be available. A SCO must set cmi.exit to "normal" in the last session.

Set adl.nav.request to "exit" or "suspendAll"

> When the design for non-assessment content allows for the learner to retain their attempt if it is not yet complete, the content sets a "suspendAll" navigation request to tell to the LMS to retain the attempt and its data. Suspending the attempt allows the learner to complete the content over multiple sittings using content functionality such as bookmarking. When the learner completes the SCO, the content should send a navigation request value of "exit" to tell the LMS to evaluate the attempt and grant credit to the learner.

Single Attempt Instructional Strategy

This section discusses how to implement the single attempt instructional strategy for assessment and non-assessment SCORM 2004 3rd Edition content.

Assessment and Non-Assessment Content

The single attempt instructional strategy enforces a limit of one attempt on content. The single attempt instructional strategy best practices apply equally to assessment and non-assessment content.

Organization Rollup Rules

The single attempt instructional strategy uses two rollup rules in the organization sequencing to ensure rollup performance. The two rollup rules used for the strategy are:

If all children are satisfied, roll up "completed"

> When the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a completion status of "completed" so the system can evaluate the learning assignment.

If all children are satisfied, roll up "satisfied"

> Additionally, when the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a satisfaction status (analogous with success status) of "satisfied" so the learner can receive credit for the learning assignment upon evaluation.

IMPORTANT: The rollup rule that communicates a completion status of "incomplete" on failed attempts shall not be used for single attempt instructional strategy.

Figure 4 contains an example of the markup required to add rollup rules to the organization sequencing for the single attempt instructional strategy.

ORGANIZATION ROLLUP RULES FOR THE SINGLE ATTEMPT INSTRUCTIONAL STRATEGY

```
<organization>
…
<item>…</item>
<imsss:sequencing>
 <imsss:rollupRules>
  <imsss:rollupRule childActivitySet="all">
   <imsss:rollupConditions conditionCombination="all">
    <imsss:rollupCondition condition="satisfied"/>
   </imsss:rollupConditions>
   <imsss:rollupAction action="completed"/>
  </imsss:rollupRule>
  <imsss:rollupRule childActivitySet="all">
   <imsss:rollupConditions conditionCombination="all">
    <imsss:rollupCondition condition="satisfied"/>
   </imsss:rollupConditions>
   <imsss:rollupAction action="satisfied"/>
  </imsss:rollupRule>
</imsss:rollupRules>
 </imsss:sequencing>
</organization>
```

Figure 4: Code sample for organization rollup rules using the single attempt instructional **strategy**

SCO Primary Objective

Per Business Rule 2.2.6, assessment SCOs must have a primary objective with a minimum normalized measure for the required mastery score. If the SCO is a non-assessment SCO, a mastery score is not required. Figure 5 contains an example of the markup required to add a primary objective that includes a minimum passing score for a SCO in the manifest.

PRIMARY OBJECTIVE FOR AN ASSESSMENT SCO USING THE SINGLE ATTEMPT INSTRUCTIONAL STRATEGY

```
<item identifier="SCO-ID" identifierref="SCO-RES" isvisible="true">
  <title>SCO Title</title>
  <imsss:sequencing>
    <imsss:objectives>
      <imsss:primaryObjective satisfiedByMeasure="true"
objectiveID="scoObj">
        <imsss:minNormalizedMeasure>0.8</imsss:minNormalizedMeasure>
      </imsss:primaryObjective>
    </imsss:objectives>
  </imsss:sequencing>
</item>
```

Figure 5: Code sample for primary objective in an assessment SCO using the single attempt instructional strategy

The single attempt instructional strategy sets the same four SCORM 2004 3rd Edition data model elements as the unlimited attempts instructional strategy. The four data model elements and their values for the single attempt strategy are:

Set cmi.completion_status to "completed"

> The completion status of the SCO factors into rollup at the organization level. For assessments, the SCO should send a completion status value of "completed" when the learner completes the content, regardless of performance.

Set cmi.success_status to "passed" or "failed"

> The success status of the SCO factors into rollup for the organization level. As seen in the previous section, a value of "passed" ("satisfied" in the manifest sequencing) triggers the corresponding two rollup rules in the organization sequencing. The SCO should send a success status of either "passed" or "failed" based on the learner's scaled score.

Set cmi.exit to "normal"

> The value for the cmi.exit data model element tells the LMS how to handle data for an attempt when the learner exits the SCO. A cmi.exit value of "normal" tells the LMS to finalize the data for a particular attempt and to begin a new data set if the learner launches the SCO again. An assessment SCO should send a cmi.exit value of "normal" when the learner ends their attempt, regardless of learner performance.

Set adl.nav.request to "exit"

> The navigation request affects the sequencing actions the LMS will apply to the SCO and its organization when the learner exits a SCO. A navigation request value of "exit" tells the LMS to exit the SCO in the system's logical sequencing, which triggers an evaluation of the content tree with elements such as rollup rules.

IMPORTANT: the intent of the SCO API activity in both the single attempt and unlimited attempts instructional strategies is to tell the LMS to record a discrete set of data for each learner attempt. The difference between the two instructional strategies lies in the organization sequencing rollup rules, where a specific rollup rule is used to tell the LMS not to evaluate an attempt if the learner has not passed.

Multiple Limited Attempts Instructional Strategy

This section discusses how to implement the multiple limited attempt instructional strategy for assessment and non-assessment SCORM 2004 3rd Edition content.

Assessment Content

Assessments with multiple limited attempts use three rollup rules in the manifest and specific values for four data model elements in SCOs.

Organization Rollup Rules

The multiple limited attempts instructional strategy for assessments uses these three rollup rules in the organization sequencing to ensure performance:

If all children are satisfied:

- **Roll up "completed" for completion status**

  When the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a completion status of "completed" so the system can evaluate the learning assignment.

- **Roll up "satisfied" for satisfaction status**

  Additionally, when the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a satisfaction status (analogous with success status) of "satisfied" so the learner can receive credit for the learning assignment upon evaluation.

If any children are *not* satisfied:

- **Roll up "incomplete" for completion status**

  When the learner exits the SCO after a failing attempt, tell the LMS that the learning content has an overall completion status of "incomplete" so the system will not evaluate the learning assignment. This rollup rule is critical to enabling the unlimited attempts instructional strategy.

Figure 1 contains an example of the markup required to add rollup rules to the organization sequencing for a multiple limited attempts instructional strategy.

ORGANIZATION ROLLUP RULES FOR THE MULTIPLE LIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```xml
<organization>
…
 <item>…</item>
 <imsss:sequencing>
  <imsss:rollupRules>
   <imsss:rollupRule childActivitySet="all">
    <imsss:rollupConditions conditionCombination="all">
     <imsss:rollupCondition condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="completed"/>
   </imsss:rollupRule>
   <imsss:rollupRule childActivitySet="all">
    <imsss:rollupConditions conditionCombination="all">
     <imsss:rollupCondition condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="satisfied"/>
   </imsss:rollupRule>
   <imsss:rollupRule childActivitySet="any">
    <imsss:rollupConditions conditionCombination="any">
     <imsss:rollupCondition operator="not" condition="satisfied"/>
    </imsss:rollupConditions>
    <imsss:rollupAction action="incomplete"/>
   </imsss:rollupRule>
  </imsss:rollupRules>
 </imsss:sequencing>
</organization>
```

Figure 1: Manifest code sample for organization rollup rules using the multiple limited attempts instructional strategy

SCO Primary Objective

Per Business Rule 2.2.6, assessment SCOs must have a primary objective with a minimum normalized measure for the required mastery score. Figure 2 contains an example of the markup required to add a primary objective that includes a minimum passing score for a SCO in the manifest.

PRIMARY OBJECTIVE FOR AN ASSESSMENT SCO USING THE MULTIPLE LIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```xml
<item identifier="SCO-ID" identifierref="SCO-RES" isvisible="true">
  <title>SCO Title</title>
  <imsss:sequencing>
    <imsss:objectives>
      <imsss:primaryObjective satisfiedByMeasure="true"
objectiveID="scoObj">
        <imsss:minNormalizedMeasure>0.8</imsss:minNormalizedMeasure>
      </imsss:primaryObjective>
    </imsss:objectives>
  </imsss:sequencing>
</item>
```

Figure 2: Code sample for primary objective in an assessment SCO using the multiple limited attempts instructional strategy

The multiple limited attempts instructional strategy for assessments sets four specific SCORM 2004 3rd Edition data model elements within the SCO to ensure rollup performance and desired learning progress status. Below are these data model elements and their applicable values:

- cmi.completion_status: "completed" or "incomplete"
- cmi.success_status: "passed" or "unknown"
- cmi.exit: "normal" or "suspend"
- adl.nav.request: "exit", "exitAll", or "suspendAll"

Their actual values depend on the learner performance and the specific desired outcome:

When the learner passes the assessment, the assessment rolls up as "Successful." Set the data model elements as the following:

- cmi.completion_status = completed
- cmi.success_status = passed
- cmi.exit = normal
- adl.nav.request = exit

When the learner fails the assessment, the assessment does not roll up. The values of data model elements depend on another design decision: whether the learners are allowed to see their responses when retaking the assessment. If the courseware is designed NOT to allow the learners to see their previous responses, the courseware should set the data model elements as the following:

- cmi.completion_status = incomplete
- cmi.success_status = unknown
- cmi.exit = normal
- adl.nav.request = exitAll

If the assessment is designed to allow the learners to see their previous responses, the courseware should set the data-model elements as the following to retain the progress data:

- cmi.completion_status = incomplete
- cmi.success_status = unknown
- cmi.exit = suspend
- adl.nav.request = suspendAll

IMPORTANT: The value of "failed" is unacceptable for cmi.success_status for the multiple limited attempts strategy.

Note that to allow the learners to see their previous responses, the courseware must be programmed to retrieve the saved answers from the previous session and display them to the learner.

Non-Assessment Content

Non-assessment content with multiple limited attempts <u>uses the same three rollup rules</u> in the manifest as unlimited attempts assessments, but potentially different values for the four data model elements in SCOs.

Organization Rollup Rules

The multiple limited attempts instructional strategy for non-assessment content uses the same three rollup rules in the organization sequencing that apply to assessments. Again, the three rollup rules used for the multiple limited attempt strategy are:

If all children are satisfied:

- **Roll up "completed" for completion status**

  When the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a completion status of "completed" so the system can evaluate the learning assignment.

- **Roll up "satisfied" for satisfaction status**

  Additionally, when the learner exits the SCO after a successful attempt, tell the LMS that the learning content overall has a satisfaction status (analogous with success status) of "satisfied" so the learner can receive credit for the learning assignment upon evaluation.

If any children are *not* satisfied:

- **Roll up "incomplete" for completion status**

  When the learner exits the SCO after a failing attempt, tell the LMS that the learning content has an overall completion status of "incomplete" so the system will not evaluate the learning assignment. This rollup rule is critical to enabling the unlimited attempts instructional strategy.

SCO Primary Objective

Recall that the best practice of assigning a primary objective for any SCO applies to all SCOs regardless of whether they are scoring or not. The difference between the two for the primary objective is that assessment SCOs are required to have a minimum normalized measure. Figure 3 contains an example of the markup required to add a primary objective to a non-assessment SCO.

PRIMARY OBJECTIVE FOR A NON-ASSESSMENT SCO USING THE MULTIPLE LIMITED ATTEMPTS INSTRUCTIONAL STRATEGY

```
<item identifier="SCO-ID" identifierref="SCO-RES" isvisible="true">
  <title>SCO Title</title>
  <imsss:sequencing>
    <imsss:objectives>
      <imsss:primaryObjective satisfiedByMeasure="false"
objectiveID="scoObj" />
    </imsss:objectives>
  </imsss:sequencing>
</item>
```

Figure 3: Code sample for primary objective in a non-assessment SCO using the multiple limited attempts instructional strategy

SCO API Activity

The multiple limited attempts instructional strategy for non-assessment content sets the four SCORM 2004 3rd Edition data model elements found in the assessment strategy, but with different potential values. The four data model elements and their values for the non-assessment content unlimited attempts strategy are:

Set cmi.completion_status to "completed" or "incomplete"

Non-assessment content should send a completion status value of "completed" if the learner completes the content. If the learner has not yet completed content, a value of "incomplete" will work with the organization rollup rules to prevent the LMS from evaluating attempts until the learner completes the content.

Set cmi.success_status to "passed" or "unknown"

A non-assessment SCO should send a success status value of "passed" when the learner completes the content. Although a non-assessment SCO may not have a score attached, it is still best practice to assign a success status with completion status for non-assessment content. It is also best practice to set success status to "unknown" as an initial value at the beginning of an assessment.

Set cmi.exit to "normal" or "suspend"

The value for the cmi.exit data model element depends on whether learners should be able to review non-assessment content or not. When the design allows learners to review completed content, the content sends a cmi.exit value of "suspend" to tell the LMS to retain the attempt data. A cmi.exit value of "normal" will tell the LMS to create a new attempt data set if the learner launches the SCO again, and previous attempt data will no longer be available. A SCO must set cmi.exit to "normal" in the last session.

Set adl.nav.request to "exit" or "suspendAll"

> When the design for non-assessment content allows for the learner to retain their attempt if it is not yet complete, the content sets a "suspendAll" navigation request to tell to the LMS to retain the attempt and its data. Suspending the attempt allows the learner to complete the content over multiple sittings using content functionality such as bookmarking. When the learner completes the SCO, the content should send a navigation request value of "exit" to tell the LMS to evaluate the attempt and grant credit to the learner.

IMPORTANT: The value of "failed" is unacceptable for cmi.success_status for the multiple limited attempts strategy.

Regarding ALMS Attempt Limits on SCO Launching

The definition and implementation of "attempt" in ALMS is different from SCORM 2004 3rd Edition Specifications. The ALMS counts each time the learner launches and exits the content as an attempt, which corresponds to a "session" as defined in SCORM 2004 3rd Edition. An attempt in SCORM 2004 3rd Edition may consist of more than one session, and it is completed after the value of cmi.exit data model element is set to "normal." For the purposes of consistent attempt tracking, the Army only uses the ALMS attempt limit configuration setting for the multiple limited attempts instructional strategy.

The above information is critical to keep in mind since the ALMS will use the rollup rules in the content package to determine the learning content's Completion Status, and the ALMS will not perform conditional evaluation based on whether the learner has reached the attempt limit or not. In other words, if the learner has failed and reached the attempt limit, the ALMS will keep the Completion Status as "Not Evaluated" instead of finalizing it as "Unsuccessful." The "Launch" button for the content will no longer be available and the learner will only have access to the content by re-registering for the course. There is no reliable way to enforce the attempt-limit-based conditional evaluation from within content, so the lack of functionality to support the attempt-limit-based conditional evaluation is an acceptable limitation of SCORM 2004 3rd Edition content for ALMS platforms.

Appendix C: Instructional Strategy for Accommodating Special Scoring Requirements

Summary

This appendix addresses the need to allow the learner unlimited attempts to take the course and assessment until reaching a predetermined passing score (e.g., 70%). Once the passing score has been reached, the learner will be allowed to retake the training course and assessment as many times as the learner desires without updating the score. This is accomplished by creating two different offerings using the same content package: Offering 1 is set up as the prerequisite for Offering 2 and records the first passing score as the final score. Offering 2 is set up as the refresher course and as a non-scoring learning activity with unlimited attempts.

Assessment Scoring Requirements

"The first passing score of 70% or better that the learner achieves is the final score recorded. The student should be able to retake an assessment as many times as they choose but must not receive credit for any further scores higher than their first passing score."

This means a learning content package (e.g., Course, Module or Lesson) needs be programmed to assume unlimited attempts after course completion but at the same time record, report, and retain only the first passing score (e.g., 70%), in ALMS.

Assessment Challenges

In the ALMS, if the learning content is configured with unlimited attempts, a student may retake the learning content as well as the assessment repeatedly until 100% or an ideal score has been reached. On the other hand, if the learning content is configured to record and retain the first passing score of 70% or better, the learning content would be considered "completed", then the learning content will no longer be available to the student since it has been completed. The two components of the scoring requirements conflict with each other from the perspective of the ALMS.

Although the requirement for "unlimited attempts until a student reaches the passing score" has been implemented within the learning content, the instructional and assessment strategy requirements call for:

- Recording and retaining the first passing score along with course completion status
- Retaining the student's ability to retake the same learning content with unlimited attempts after the student has completed the course with a passing score.

It impossible for developers to detect using code if a lesson/SCO had been passed/completed with a score of 70% or better from a previous attempt. In accordance with SCORM 2004 3rd Edition Run-Time Environment Specifications, the GetValue SCORM used to retrieve the score—"cmi.score.scaled" and "cmi.score.raw"—applies only to the SCO's current attempt. There is no way for the SCO to retrieve the scores of

previous attempts to overwrite the score made in a new attempt because the score and completion status data in the SCORM Run-Time Environment are attempt specific and only available within that particular attempt.

Proposed Assessment Strategy

Within the ALMS create two separate offerings for each unit of instruction (e.g., lesson, module, or course) using the same content package:

> Offering 1: Prerequisite for Offering 2, scoring, one attempt, learning content programmed to only report completion upon reaching passing score (e.g.,70%).

> Offering 2. Accessible upon Offering 1 completion. Unlimited attempts, non-scoring.

Offering 1 is set up as a prerequisite for Offering 2. The same learning content package will be referenced and used in both offerings but only loaded once. The student may take the Offering 1 with unlimited attempts until the learner reaches the passing score. Then the 1st and only passing score will be recorded as the final score for the unit of instruction. This feature or capability needs to be programmed into the content package. Upon completing Offering 1 which is the prerequisite for Offering 2, the students may take the non-scoring learning content until remediation is achieved. Their scores for Offering 2 will NOT be rolled up or reported and will not affect their first passing score made in Offering 1.

Assessment Strategy Test on CTE

The test described below illustrates the process for implementing and verifying the feasibility of the assessment and instructional strategy recommended.

Test initial setups:

1st Offering.

2nd Offering.

Test processes and steps:

Confirm that Offering 2 will be blocked if the student has not completed Offering 1.

Confirm that the first passing score from Offering 1 is recorded and that it cannot be overridden.

Verify that Offering 2 will be accessible for the student after completing Offering 1.

Verify that the student can have unlimited attempts to access the learning content in Offering 2.

Setup: 1st Offering

Content settings:

Attempts allowed: 1.

Setup: 2nd Offering

Content settings:

Attempts allowed: unlimited.

Go to "Related Info" Tab.

Click "Add Prerequisites."

Search and select the 1st offering in the popup window.

Then the Offering 1 will be added as a prerequisite.

Test Processes: Step 1

Confirm the 2nd offering will be blocked if the student has not completed the first offering.

Login as a student.

Search and try to register the 2nd offering.

Expected result:

A warning message from ALMS pops up explaining that the prerequisites must be finished before registering for this offering. The message also provides a link to register the prerequisites (the first offering).

⬣ Registration could not be completed

You must complete the following required offering pre-requisites before you can register for this offering. You can register for individual pre-requisites below. Note: You will leave this page when you start the registration process. Print this list for your reference.

Name	Type	Actions
DLC TEST 1.1.9.20	Offering	Register

Print This Page   **Find Another Offering**

Test Processes: Step 2

Confirm that the first passing score from Offering 1 is recorded and that it cannot be overridden.

Search for Offering 1 and register.

Complete Offering 1.

Expected result:

Students will complete the lesson within one attempt only if the passing score is reached. Once all lessons in this module are completed, The Offering 1 will be completed.

Test Processes: Step 3

Verify that Offering 2 will be accessible for the student after completing Offering 1.

Log in using the same student account that completed Offering 1.

Search for Offering 2 and register.

Expected result:

The Offering 2 is accessible.

Test Processes: Step 4

Verify that the student can have unlimited attempts to access the learning content in Offering 2.

Achieve a passing attempt in Offering 2.

Take lessons multiple times to verify that unlimited attempts are allowed.

Expected result:

The student can have unlimited attempts to access the learning content and no score is reported or rolled up into the total score for the unit of instruction.

Test Results: Successful

This proposed instructional strategy satisfies the assessment scoring requirements:

"The first passing score of 70% or better that the learner achieves is the final score recorded. The student should be able to retake an assessment as many times as they like but cannot get a higher score than their first passing score.

Appendix D: Baseline Home Computer Configurations for Army Distributed Learning Products

Summary

This document establishes the Baseline Home Computer Configurations (BHCC) and references the Digital Training Facility (DTF) Student Workstation configuration for the development of Army Distributed Learning (DL) web-based courseware and learning products developed for Army Learning Management Systems. The guidance prescribed within this document provides the standards and specifications for contractors and proponents to use when developing Army courseware and learning products. These guidelines shall be used with all development efforts targeting Army learners to promote optimal content access for all learners.

BHCC for Army DL Courseware and Learning Products

#	Item	Description and Notes
1	**Minimum Computer Configuration**	
1.1	Central Processing Unit (CPU)	1.6 GHz (or higher) (32-bit or 64-bit), 2 core
1.2	Random Access Memory (RAM)	4GB or greater
1.3	Storage:	16 Gigabyte free storage area
1.4	Graphics Card and Display	Minimum Resolution 1024 x 768 Minimum Color Depth: 24Bit
2.	**Graphics/Media**	
2.1	Audio and Video Standards	Audio Format: MPEG 3 (mp3) Audio bite Bit rate 64 kbps . Video Format: MPEG 4 (.mp4) Video Codec: MPEG 4 Part 10 codec H.264
2.2	Minimum internet bandwidth	Bitrate: *with 1.2mbps*
3.	**Operating Systems**	
3.1	Microsoft	Microsoft Windows 7, Windows 8.1, and Windows 10

4.	**Internet Web Browsers**	See Defense Information Systems Agency, Security Requirements Guides and Security Technical Implementation Guides for the security configurations of the below web browsers.
4.1	Microsoft Edge	Learning/courseware products shall be developed with minimum browser version of Version **77**.
4.2	Mozilla Firefox	Learning/courseware products shall be developed with browser backward compatibility of 10 browser versions.
4.3	Google Chrome	Learning/courseware products shall be developed with browser backward compatibility of 4 browser versions.

Digital Training Facility (DTF) -- Workstation Configuration

- HP RCTO UMA i7-10610U FHD for Camera 650 G7 Base NB PC
- OS Localization US
- Windows 10 Pro 64
- Integrated HD 720p DualAryMic Webcam
- 16GB (1x16GB) DDR4 2666
- 512GB PCIe NVMe Three Layer Cell Solid State Drive
- Intel Wi-Fi 6 AX200 ax 2x2 MU-MIMO 160MHz +Bluetooth 5 WW 3 Cell 48 WHr Long Life

Appendix E: 3D Model Specifications

Introduction

With the use of 3D models becoming more and more prevalent in education and training environments, the need has arisen for a set of specifications for model creation. A set of accepted standards not only ensures that the Government is supplied with quality, fully functional models, but it also allows for the sharing and re-use of models, thus reducing the amount of redundant work and resources used.

Overview and Description

This appendix establishes specifications for the creation of 3D models developed for Army DL products to ensure the highest quality and functionality. The following specifications for topology, texturing, and organization provides assurance that 3D models will function properly for intended use and re-use.

The intended audience is designers and developers of 3D models.

Specification sections include realism, files & format, organization, geometry, materials & textures, and animations & transforms.

3D models shall have no licensing restrictions that prevent the native source files from being used and distributed in an unlimited fashion and for all Government purposes.

Artifacts may be produced with any software in accordance with the business rules, best practices and the following specifications.

Specifications

ID (3DS-)	Title	Description
Realism		
1.01	Real-World Representation	The 3D model shall accurately depict the real-world object it represents in proportion and scale using centimeters, and in texture and material regardless of viewing angle. The model's appearance shall be indistinguishable from a photograph of the real-world object when rendered full frame at 2048 x 2048.

1.01-e1	Real-World Representation Exception for Models of Exceeding Size Variance	Models of objects that have a real-world scale that require magnification or distance to see, such as amoebas and solar systems, are exempt from the real-world scale requirement.
	Files & Format	
2.01	Source File Format	3D models shall be delivered in .fbx file format along with all source files from the native software used to create the models, including all native texture files used for texture creation with the texture maps, such as non-destructive Photoshop files or Substance files.
2.02	License/Copyright Restrictions	3D models shall have no licensing restrictions that prevent the native source files from being used and distributed in an unlimited fashion and for all Government purposes.
2.03	Third-Party Tools and Plug-ins	3D models shall have no external references nor require third-party tools or plug-ins unless otherwise indicated in this specification or specifically authorized by the Government.
2.04	No Extraneous Objects	Model file shall include only the 3D model specified. No extraneous helpers, shapes, splines, or other unexpected objects not specifically needed for model functionality shall be present.
2.05	Model Naming	3D models shall have uniquely and appropriately named hierarchy objects. Model name shall be descriptive of the file content and not contain file extensions. All words used for the product name except for articles, conjunctions and prepositions shall have an initial capital letter.
	Organization	
3.01	Model Naming	3D models shall have uniquely and appropriately named hierarchy objects. Model name shall be descriptive of the file content and not contain file extensions. All words used for the product name except for articles, conjunctions and prepositions shall have an initial capital letter.

3.02	Empty Objects	No empty objects are permitted. 3D models shall have no empty objects that have names but nothing else.
3.03	Multiple Objects	Models with multiple objects should include a grouping or hierarchy for moving all objects in the model together. The model shall consist of objects logically separated into individual pieces and individual materials.
3.04	Single Layer	Entire model shall be contained within a single, non-default layer named the same as the model file.
3.05	Subdividable Topology	Model can be cleanly subdividable for higher detail and still retain the shape of the model.
Geometry		
4.01	Quadrangles and Triangles	3D models shall use quadrangles and triangles only.
4.02	Isolated Vertices	3D models shall have no isolated vertices. Each vertex shall be attached to a face.
4.03	Coincident or Coplanar Faces	3D models shall have no coincident or coplanar faces (no faces or polygons that are redundant or overlapping or denote the same surface).
4.04	Backfacing or Inverted Face Normals	No backfacing or inverted face normals are permitted. All normals should be pointing out toward the correct direction for rendering without errors.
4.05	Coincident Edges	No coincident edges (Unwelded Seams) are permitted. Any two edges on an object that meet or overlap in the same position must be welded
4.06	Clean Edge Flow	Models shall have the best possible edge flow, with sufficient geometry to meet these requirements without superfluous geometry.

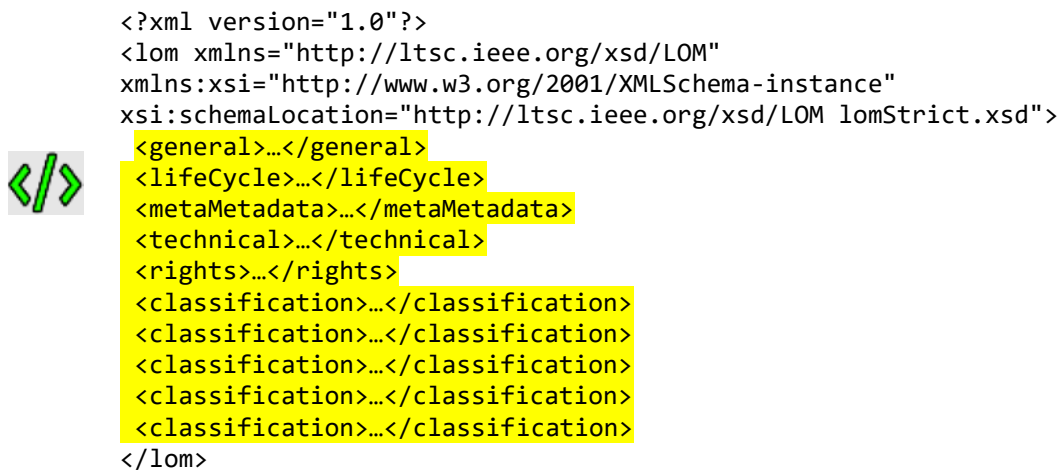| 4.07	Clean Edge Flow Exception for Models of Exceeding Size Variance	Objects such as screws, bolts, rivets, wires, and other objects which are small in comparison to the overall model size do not have to follow the Clean Edge Flow rules. This includes objects that represent a thin real-life object as a one-sided object, where the shape of the object is depicted via an opacity map.
4.07-e1	Hidden Seams	3D models shall have UV texture seams hidden in less visible areas.
4.08	Archives	Archives shall not contain multiple renderer versions; separate download archives should be provided for different renderers, even from the same 3d application. All bitmap textures are archived with each required model file in a flat file structure, or in a single subfolder beneath the main product file, or in a single named ZIP file where model files are each placed into their own named ZIP files.
4.09	Sealed Geometry	3D model geometry shall be completely sealed so that there are no openings where backfaces would be visible. This includes geometry visible through transparent objects or materials.
4.10	Poles with More Than 5 Edges	Avoid poles with more than five edges whenever possible.
	Materials & Textures	
5.01	Materials	All objects shall have at least one material applied. Multiple materials shall be separated with consideration of the different surface types or intended material properties.
5.02	Texture File Names	Materials and Bitmap texture files shall be named descriptively. Generic or default names are not acceptable.
5.03	Texture Maps Resolution	Texture maps shall be a square resolution at a minimum of 1024 x 1024.
5.04	PBR Texture Maps	3D models shall include all PBR texture maps.
5.05	Texture Paths	All texture paths shall be relative for submission.

5.06	Texture Files	Texture maps shall be named with the same name as the material they are applied to followed by the correct file extension. All texture maps shall be saved as BMP, JPG, PNG or TGA, PSD or TIF file format. All texture files shall have a correct file extension. There must be no text after the file extension.
5.07	Texture Stretching	3D models shall have no obvious texture stretching.
5.08	Unwrapped UVs	All 3D models shall include unwrapped UVs.
Animation & Transforms		
6.01	Rigging for Animation	3D models intended for animation shall include all necessary rigging and function as expected.
6.02	Animation Play	Animation shall play smoothly. There shall be no spikes in an animation graph that would cause obvious glitches, hitches, or unnatural movement.
6.03	Animation Looping	Animation designated as looping shall be seamless and loop smoothly.
6.04	Model Transforms	3D models shall have frozen/reset transforms unless the model is animated.

Appendix F: Metadata

This section is to assist with implementation details for metadata that describes Army SCORM 2004 3rd Edition DL content. Where Business Rule 1.2.2 lists the required fields for metadata, the discussion here is about how the fields appear in an XML document, and the required values for specific fields.

Each resource (e.g., an organization or SCO) must be accompanied by metadata that describes the resource itself. There are six primary elements in which metadata fields and values exist: `general`, `lifeCycle`, `metaMetadata`, `technical`, `rights`, and `classification`. Figure 1 provides a condensed example of how each element appears in a metadata file. Note that there are multiple `classification` elements, and each element contains multiple fields.

PRIMARY ELEMENTS IN A SCORM 2004 3RD EDITION METADATA FILE

```
<?xml version="1.0"?>
<lom xmlns="http://ltsc.ieee.org/xsd/LOM"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM lomStrict.xsd">
 <general>…</general>
 <lifeCycle>…</lifeCycle>
 <metaMetadata>…</metaMetadata>
 <technical>…</technical>
 <rights>…</rights>
 <classification>…</classification>
 <classification>…</classification>
 <classification>…</classification>
 <classification>…</classification>
 <classification>…</classification>
</lom>
```

Figure 1: Code sample for primary elements in a SCORM 2004 3rd Edition metadata file

Table 1 lists all the fields in an Army SCORM 2004 3rd Edition metadata file, the path for each in the XML document, and the required value(s) where applicable. Use the table as a quick reference when creating metadata files for SCORM 2004 3rd Edition content. The subsections following this table provide a detailed discussion of each the metadata fields.

Table 1

Army SCORM 2004 3rd Edition Metadata Fields

Field	XML Paths	Required Value(s)
Catalog	general.identifier.catalog	ATIA
Entry	general.identifier.entry	TBD
Title	general.title	
Language	general.language	
Description	general.description	
Keywords	general.keyword	
Aggregation Level	general.aggregationLevel	
Version	lifeCycle.version	1.0
Status	lifeCycle.status	final
ADLPA Role	lifeCycle.contribute.role	publisher
ADLPA Name, Address, Email	lifeCycle.contribute.entity	
Date of Submission	lifeCycle.contribute.date	
Metadata Catalog Identifier	metaMetadata.identifier.catalog	TBD
Metadata Entry Identifier	metaMetadata.identifier.entry	TBD
Metadata Specifications	metaMetadata.metadataSchema	LOMv1.0 SCORM_CAM_v1.3 ADLv1.0

Metadata Language	metaMetadata.language	
File Formats	technical.format	
Cost	rights.cost	no
Copyright and Other Restrictions	rights.copyrightAndOtherRestrictions	no
MOS and Skill Level Classification		
Purpose	classification.purpose	discipline
Description	classification.description	
Keyword	classification.keyword	
SQI Classification		
Purpose	classification.purpose	discipline
Description	classification.description	
Keyword	classification.keyword	
ASI Classification		
Purpose	classification.purpose	discipline
Description	classification.description	
Keyword	classification.keyword	
Task Numbers and Descriptions Classification		
Purpose	classification.purpose	educational objective
Description	classification.description	
Keyword	classification.keyword	
Learning Objectives (Action, Condition, Standard) Classification		
Purpose	classification.purpose	educational objective
Description	classification.description	
Keyword	classification.keyword	

508 Compliant Classification		
Purpose	classification.purpose	accessibility restrictions
Description	classification.description	
Keyword	classification.keyword	
Security Level (Foreign disclosure) Classification		
Purpose	classification.purpose	security level
Description	classification.description	
Keyword	classification.keyword	
ADL-R Requirement Classification		
Purpose	classification.purpose	collection
Description	classification.description	
Keyword	classification.keyword	

General Identifier Fields

This section discusses the identifier fields within the `general` element of the metadata document.

Catalog and Entry

The two general identifier fields `catalog` and `entry` are used by the Army for management purposes. Both fields together represent a mechanism for assigning a unique identifier to the item that the metadata file describes. The required value for the `catalog` element is "ATIA" and the required value for the `entry` element is "TBD". Figure 2 contains sample code showing how the two fields appear.

THE CATALOG AND ENTRY FIELDS IN SCORM 2004 3RD EDITION METADATA

```
<general>
 <identifier>
  <catalog>ATIA</catalog>
  <entry>TBD</entry>
 </identifier>
 …
</general>
```

Figure 2: Code sample for catalog and entry fields in SCORM 2004 3rd Edition metadata

General Fields

This section discusses the non-identifier fields within the `general` element of the metadata document.

Title

The `title` field describes the name of the resource that the metadata is for. Note that the string sub-element contains the text value for the `title` field, and that the title value shall match the one in the manifest. Figure 3 contains sample code showing how the `title` field appears.

THE TITLE FIELD IN SCORM 2004 3RD EDITION METADATA

```
<general>
 …
 <title>
  <string>Captains Career Course</string>
 </title>
 …
</general>
```

Figure 3: Code sample for title field in SCORM 2004 3rd Edition metadata

Language

The `language` field describes the language for the content of the resource using two-letter language codes specified in ISO 639-2. Figure 4 contains sample code showing how the `language` field appears.

THE TITLE FIELD IN SCORM 2004 3RD EDITION METADATA

```
<general>
 …
 <language>en</language>
 …
</general>
```

Figure 4: Code sample for language field in SCORM 2004 3rd Edition metadata

The two-letter language codes in ISO 639-2 are referenced on the Library of Congress website. Look under "more" then "Library Standards" and see ISO 639-2 under "Information Resources Retrieval."

Description

The description field contains a general description of the resource. Note that the string sub-element contains the text value for the description field. Figure 5 contains sample code showing how the description field appears.

THE DESCRIPTION FIELD IN SCORM 2004 3RD EDITION METADATA

```
<general>
 …
 <description>
  <string>Basic description of the Captains Career Course</string>
 </description>
 …
</general>
```

Figure 5: Code sample for description field in SCORM 2004 3rd Edition metadata

Keyword

The keyword field contains a keyword or phrase that describes the resource. There can be multiple keywords for any given resource. Note that the string sub-element contains the text value for the keyword field. Figure 6 contains sample code showing how the keyword field appears.

THE KEYWORD FIELD IN SCORM 2004 3RD EDITION METADATA

```
<general>
…
<keyword><string>Captain</string></keyword>
<keyword><string>Leadership skills</string></keyword>
…
</general>
```

Figure 6: Code sample for keyword field in SCORM 2004 3rd Edition metadata

Aggregation Level

The aggregation level field identifies the type of resource the metadata describes in the context of its granularity, such as whether the resource is a SCO or an organization. The aggregation level for Army SCORM 2004 3rd Edition content shall be one of the two following levels:

"2" indicating a SCO

"3" indicating an organization

Note the source sub-element value is always "LOMv1.0", and the value sub-element that contains the numeric value for the aggregation level. Figure 7 contains sample code showing how the aggregation level field appears.

THE AGGREGATION LEVEL FIELD IN SCORM 2004 3RD EDITION METADATA

```
<general>
…
<aggregationLevel>
<source>LOMv1.0</source>
<value>2</value>
</aggregationLevel>
…
</general>
```

Figure 7: Code sample for aggregation level field in SCORM 2004 3rd Edition metadata
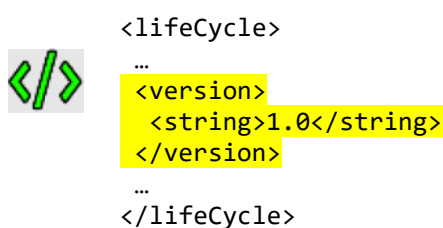
Lifecycle Fields

This section discusses the fields within the `lifeCycle` element of the metadata document.

Version

The `version` field contains the version or edition of the resource. The `version` field must always be "1.0" for the initial delivery. Note that the `string` sub-element contains the text value for the `version` field. Figure 8 contains sample code showing how the `version` field appears.

THE VERSION FIELD IN SCORM 2004 3RD EDITION METADATA

```
<lifeCycle>
 …
 <version>
  <string>1.0</string>
 </version>
 …
</lifeCycle>
```
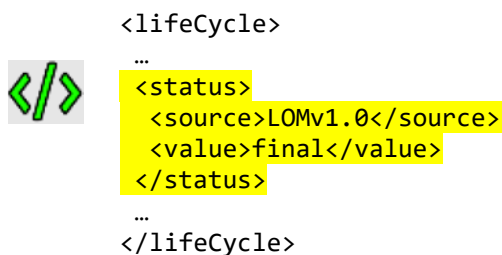
Figure 8: Code sample for version field in SCORM 2004 3rd Edition metadata

Status

The `status` field contains the submittal status for the resource. Note the `source` sub-element value is always "LOMv1.0", and the `value` sub-element that contains the status value. The status value must always be "final" for delivery. Figure 9 contains sample code showing how the `status` field appears.

THE STATUSLEVEL FIELD IN SCORM 2004 3RD EDITION METADATA

```
<lifeCycle>
 …
 <status>
  <source>LOMv1.0</source>
  <value>final</value>
 </status>
 …
</lifeCycle>
```

Figure 9: Code sample for status field in SCORM 2004 3rd Edition metadata

128

Lifecycle Contributor Fields

This section discusses the contributor fields within the `lifeCycle` element of the metadata document.

Contributor fields are contained within a `contribute` sub-element.

ADLPA Role

The `role` field describes the role of the ADLPA; the field has a required value of "publisher". Note that the `source` sub-element value is always "LOMv1.0", and the `value` sub-element contains the role value.

Figure 10 contains sample code showing how the `role` field appears.

THE ROLE FIELD IN SCORM 2004 3RD EDITION METADATA

```
<lifeCycle>
 <contribute>
  <role>
   <source>LOMv1.0</source>
   <value>publisher</source>
  </role>
 </contribute>
</lifeCycle>
```

Figure 10: Code sample for role field in SCORM 2004 3rd Edition metadata

ADLPA Name, Address, and Email

The `entity` field contains the name, address, and contact information of the ADLPA in vCard format per RFC 6350. The field value must contain the full name, address, school code, and e-mail of the ADLPA.

Figure 11 contains sample code showing how the `entity` field appears.

THE ENTITY FIELD IN SCORM 2004 3RD EDITION METADATA

```
<lifeCycle>
<contribute>

   …
   <entity>
BEGIN:VCARD
VERSION:2.1
N:U.S. Army Infantry SchoolORG:U.S. Army;Army Infantry School;Fort Benning
NOTE:071 ADR;DOM;
WORK:Suite 650;6751 Constitution Loop;Fort Benning;GA;31905- 4502;U.S.
EMAIL;INTERNET:soldierinfo@benning.army.mil
END:VCARD
   </entity>
 </contribute>
</lifeCycle>
```

Figure 11: Code sample for entity field in SCORM 2004 3rd Edition metadata

The vCard format is referenced on the Internet Engineering Task Force (IETF) web page for RFC 6350: https://tools.ietf.org/html/rfc6350.

Date of Submittal

The `date` field contains the date of approved submission of the resource in YYYY-MM-DD format. Note the `datetime` sub-element that contains the field value. Figure 12 contains sample code showing how the `date` field appears.

THE DATE FIELD IN SCORM 2004 3RD EDITION METADATA

```
<lifeCycle>
 <contribute>

  …
  <date>
   <datetime>2004-07-10</datetime>
  </date>
 </contribute>
</lifeCycle>
```

Figure 12: Code sample for date field in SCORM 2004 3rd Edition metadata

Meta-Metadata Identifier Fields

This section discusses the identifier fields within the `metaMetadata` element of the metadata document.

Catalog and Entry

The two meta-metadata identifier fields `catalog` and `entry` are used by the Army for content management purposes. Both fields together represent a mechanism for assigning a unique identifier for the item that the metadata file describes. The required value for both elements is "TBD". Figure 13 contains sample code showing how the meta-metadata identifier fields appear.

THE CATALOG AND ENTRY FIELD IN SCORM 2004 3RD EDITION METADATA

```
<metaMetadata>
 <identifier>
  <catalog>TBD</catalog>
  <entry>TBD</entry>
 </identifier>
 …
</metaMetadata>
```

Figure 13: Code sample for the meta-metadata catalog and entry fields in SCORM 2004 3rd Edition metadata

Meta-Metadata Fields

This section discusses the non-identifier fields within the `metaMetadata` element of the metadata document.

Schema

The `metadataSchema` field identifies the name and version of a specification schema to which the metadata document abides. The Army requires three `metadataSchema` elements with the following values:

"LOMv1.0"

"SCORM_CAM_v1.3"

"ADLv1.0"

Figure 14 contains sample code showing how the `metadataSchema` field appears.

THE METADATASCHEMA FIELD IN SCORM 2004 3RD EDITION METADATA

```
<metaMetadata>
…
 <metadataSchema>LOMv1.0</metadataSchema>
 <metadataSchema>SCORM_CAM_v1.3</metadataSchema>
 <metadataSchema>ADLv1.0</metadataSchema>
 …
</metaMetadata>
```

Figure 14: Code sample for metadataSchema field in SCORM 2004 3rd Edition metadata

Language

The meta-metadata `language` field describes the language for the content of the resource using ISO 639-1 two-letter language codes. Figure 15 contains sample code showing how the `language` field appears.

THE LANGUAGE FIELD IN SCORM 2004 3RD EDITION METADATA

```
<metaMetadata>
 …
 <language>en</language>
 …
</metaMetadata>
```

Figure 15: Code sample for meta-metadata language field in SCORM 2004 3rd Edition metadata

The two-letter language codes in ISO 639-1 are referenced on the Library of Congress website. Look under "more" then "Library Standards" and see ISO 639-2 under "Information Resources Retrieval Standards."

Technical Fields

This section discusses the fields within the `technical` element of the metadata document.

Format

The `format` field identifies all the technical data types included within the resource the metadata describes using Multipurpose Internet Mail Extensions (MIME) types. Note that one `format` sub element is required for each discrete data type. Figure 16 contains sample code showing how the format field appears.

THE FORMAT FIELD IN SCORM 2004 3RD EDITION METADATA

```
<technical>
…
<format>text/html</format>
<format>image/jpeg</format>
<format>video/mp4</format>
…
</technical>
```

Figure 16: Code sample for format field in SCORM 2004 3rd Edition metadata

Rights Fields

This section discusses the fields within the `rights` element of the metadata document.

Cost

The `cost` field indicates whether use of the resource that the metadata describes requires payment. Note the source sub-element value is always "LOMv1.0", and along with the `value` sub-element that contains the role value. The Army requires the value for the field to be "no". Figure 17 contains sample code showing how the `cost` field appears.

THE COST FIELD IN SCORM 2004 3RD EDITION METADATA

```
<rights>
    <cost>
    <source>LOMv1.0</source>
    <value>no</source>
    </cost>
…
</rights>
```

Figure 17: Code sample for cost field in SCORM 2004 3rd Edition metadata

Copyright and Other Restrictions

The `copyrightAndOtherRestrictions` field indicates whether copyright or other restrictions apply to the use of the resource that the metadata describes. Note the `source` sub-element value is always "LOMv1.0", and along with the `value` sub-element that contains the role value. The Army requires the value for the field to be "no". Figure 18 contains sample code showing how the `copyrightAndOtherRestrictions` field appears

---

THE COPYRIGHTANDOTHERRESTRICTIONS FIELD IN SCORM 2004 3RD EDITION METADATA

```
<rights>
  <copyrightAndOtherRestrictions>
    <source>LOMv1.0</source>
    <value>no</source>
  </copyrightAndOtherRestrictions>
 …
</rights>
```

Figure 18: Code sample for copyrightAndOtherRestrictions field in SCORM 2004 3rd Edition metadata

Classification Types and Fields

This section discusses the fields within the `classification` element of the metadata document. The Army requires a `classification` element for each of the following classifications:

- Military Occupation Specialty (MOS) and Skill Level
- Special Qualification Identifier (SQI; if learning content is classified with SQI)
- Additional Skill Identifier (ASI; if learning content is classified with ASI)
- Tasks
- Learning Objectives
- Revised Section 508 Compliance
- Foreign Disclosure
- ADL Registry (if applicable)

IMPORTANT: Army DL metadata must contain at least five classification elements: MOS and Skill Level, Tasks, Learning Objective, Revised Section 508 Compliance and Foreign Disclosure; the other fields are used only when applicable per direction of the ADLPA.

Purpose, Description, and Keyword

Each classification has the same three fields: `purpose`, `description`, and `keyword`. The values for each field will change depending on the type of classification. Note the `source` sub-element in the `purpose` field, which always has a value of "LOMv1.0", and along with the `value` sub-element that contains the role value. For the `description` and `keyword` fields, note the `string` sub-element that contains the value. Figure 19 contains sample code showing the `purpose`, `description`, and `keyword` fields using the ASI classification as an example.

EXAMPLE ASI CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>discipline</value>
 </purpose>
 <description>
  <string>Q6 Long Range Surveillance Leader<string>
 </description>
 <keyword>
  <string>Long Range Surveillance Leader</string>
 </keyword>
</classification>
```

Figure 19: Code sample for ASI classification in SCORM 2004 3rd Edition metadata

MOS and Skill Level

The MOS and Skill Level `classification` element requires a `purpose` field value of "discipline" and a textual description and keyword(s) of the MOS for the resource that the metadata describes. Figure 20 contains sample code showing how the MOS and Skill Level `classification` element appears.

MOS AND SKILL LEVEL CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>discipline</value>
 </purpose>
 <description>
  <string>11C2 Indirect Fire Infantryman<string>
 </description>
 <keyword>
  <string>Indirect Fire Infantryman</string>
 </keyword>
</classification>
```

Figure 20: Code sample for MOS and Skill Level classification in SCORM 2004 3rd Edition metadata

SQI

The SQI `classification` element requires a `purpose` field value of "discipline" and a textual descriptions and keyword(s) of the SQI for the resource that the metadata describes. Figure 21 contains sample code showing how the SQI classification element appears.

SQI CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>discipline</value>
 </purpose>
 <description>
  <string>E Mountaineer<string>
 </description>
 <keyword>
  <string>Mountaineer</string>
 </keyword>
</classification>
```

Figure 21: Code sample for SQI classification in SCORM 2004 3rd Edition metadata

ASI

The ASI `classification` element requires a `purpose` field value of "discipline" and a textual descriptions and keyword(s) of the ASI for the resource that the metadata describes. Figure 22 contains sample code showing how the ASI classification element appears.

ASI CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>discipline</value>
 </purpose>
 <description>
  <string>Q6 Long Range Surveillance Leader<string>
 </description>
 <keyword>
  <string>Long Range Surveillance Leader</string>
 </keyword>
</classification>
```

Figure 22: Code sample for ASI classification in SCORM 2004 3rd Edition metadata

Tasks

The Tasks `classification` element requires a `purpose` field value of "educational objective" and a textual descriptions and keyword(s) of the critical tasks for the resource that the metadata describes. Figure 23 contains sample code showing how the Tasks classification element appears.

TASKS CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>educational objective</value>
 </purpose>
 <description>
  <string> 071-312-3003 Lay An M60 Machine Gun Using Field Expedients;
071-312-3007 Prepare A Range Card For An M60 Machine gun; 071-312-3025
Main An M60 Machine Gun<string>
 </description>
 <keyword>
  <string>Range Card</string>
 </keyword>
</classification>
```

Figure 23: Code sample for Tasks classification in SCORM 2004 3rd Edition metadata

Learning Objectives

The Learning Objectives `classification` element requires a `purpose` field value of "educational objective" and a textual descriptions and keyword(s) of the Action, Condition, and Standard for the resource that the metadata describes. Figure 24 contains sample code showing how the Learning Objectives classification element appears.

LEARNING OBJECTIVES CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>educational objective</value>
 </purpose>
 <description>
  <string>Action: Lay An M60 Machine gun Using Field Expedients;
Condition: Given Interactive Multimedia Instruction; Standard: The
Standards are met when the learner has completed the IMI lesson and
achieved a passing score on a separately administered test.<string>
 </description>
 <keyword>
  <string>M60 Machine Gun using Field Expedients</string>
 </keyword>
</classification>
```

Figure 24: Code sample for Learning Objectives classification in SCORM 2004 3rd Edition metadata

Revised Section 508 Compliance

The Revised Section 508 Compliance `classification` element requires a `purpose` field value of "accessibility restrictions". The `description` field requires a value of either "508 Compliant" or "Not 508 Compliant". The keyword field requires a value of either "508" or "Not 508". Figure 25 contains sample code showing how the Revised Section 508 Compliance classification element appears.

REVISED SECTION 508 COMPLIANCE CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>accessibility restrictions</value>
 </purpose>
 <description>
  <string>508 Compliant</string>
 </description>
 <keyword>
  <string>508</string>
 </keyword>
</classification>
```

Figure 25: Code sample for Revised Section 508 Compliance classification in SCORM 2004 3rd Edition metadata

Foreign Disclosure

The Foreign Disclosure `classification` element requires a `purpose` field value of "security level". The `description` and `keyword` fields each require a value of the Foreign Disclosure statement in three-character format (e.g., FD1). Figure 26 contains sample code showing how the Foreign Disclosure classification element appears.

FOREIGN DISCLOSURE CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>security level</value>
 </purpose>
 <description>
  <string>FD1</string>
 </description>
 <keyword>
  <string>FD1</string>
 </keyword>
</classification>
```

Figure 26: Code sample for Foreign Disclosure classification in SCORM 2004 3rd Edition metadata

143

ADL Registry

The ADL Registry `classification` element requires a `purpose` field value of "collection" and a textual description and keyword(s) for the taxonomy of the content the metadata describes. Figure 27 contains sample code showing how the ADL Registry classification element appears.

ADL REGISTRY CLASSIFICATION IN SCORM 2004 3RD EDITION METADATA

```
<classification>
 <purpose>
  <source>LOMv1.0</source>
  <value>collection</value>
 </purpose>
 <description>
  <string>ADL/DOD Content Taxonomy Category</string>
 </description>
 <keyword>
  <string>DOD</string>
 </keyword>
</classification>
```

Figure 27: Code sample for ADL Registry classification in SCORM 2004 3rd Edition metadata