

SCORM® 2004 3rd EDITION

Sharable Content Object Reference Model

Impact Summary

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VERSION 1.0



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Advanced Distributed Learning (ADL)

SCORM 2004 3rd Edition Impact Summary

Version 1.0

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Abstract

SCORM 2004 3rd Edition contains several changes that were influenced by various factors. These changes continue to make SCORM 2004 more stable and robust. This document provides a summary of those key changes and the impacts to current SCORM 2004 2nd Edition. This document should not be treated as an exhaustive listing of all SCORM 2004 3rd Edition changes, but rather as a guide to be used with the SCORM 2004 3rd Edition documentation suite. The document gives the reader an understanding of the changes from SCORM 2004 2nd Edition to SCORM 2004 3rd Edition and to assist in the determination of what changes are needed to SCORM 2004 products to migrate them to match the requirements defined in SCORM 2004 3rd Edition.

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SECTION 1

SCORM® 2004 3rd Edition

Impact Summary

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1.1. Purpose

This document offers a high-level overview of the key differences between SCORM 2004 2nd Edition and SCORM 2004 3rd Edition. The purpose of this document is to give the ADL Community a “heads up” of what is to come. This will allow the ADL Community to plan for these changes, make decisions about acquisitions and plan for certification (if applicable).

This document is structured in the same way as the SCORM 2004 books. There is a major section for each of the SCORM books describing the types of changes that will be occurring. All of the SCORM 2004 books will contain their own Document Revision History sections found in the appendices of the respective books. The Document Revision History section will contain more specific details on the actual changes made to the document.

Section 1.7: Summary of Impacts to Conformance contains a table describing the impacts to Content Packages and LMSs. This table outlines whether or not the changes “will impact conformance,” “may impact conformance” or does not affect conformance at all. This section could be used as a quick reference.

1.2. Source of Changes

Since the release of SCORM 2004 2nd Edition, certain key events have occurred in the evolution of SCORM and e-learning at large. These key events include such things as evolution of standards and specifications, Plugfest and feedback from the ADL Community.

The key factors that have influenced changes to SCORM 2004 2nd Edition were:

- The approval of the IEEE's Standard for XML Schema Definition (XSD) Language Binding for Learning Object Metadata (LOM) as a formal accredited IEEE Standard.
- The release of an IMS Global Consortium, Inc. maintenance update to the IMS Content Packaging Specification, the IMS Content Packaging Specification Version 1.1.4.
- SCORM Technical Working Group meetings that was held to address several reported issues with SCORM 2004 2nd Edition.
- Impacts do to continued evolution and stabilization of the ADL Registry.
- Feedback from the ADL Community:
 - Discussions, lessons learned and issues collected at Plugfest 9 and other events
 - SCORM 2004 2nd Edition Addendums and resolutions to other reported defects
 - Various editorial and technical refinements based on feedback from the ADL Community and lessons learned from SCORM implementers.
 - Incorporation of comments provided by the ADL Community during the Public Review – Request For Comment period.

1.2.1. IEEE Learning Technology Standards Committee (LTSC)

Since the release of SCORM 2004 2nd Edition, the IEEE Learning Technology Standards Committee (LTSC) LOM working group has been developing an IEEE accredited standard related to XML Binding of LOM. When SCORM 2004 2nd Edition was published, the IEEE LTSC LOM working group was in the review and approval process for this standard. Since then the IEEE working group has completed the review and approval process and the IEEE XML Binding for LOM became an accredited IEEE standard in May 2005 (refer to <http://shop.ieee.org/ieeestore/> for information on the IEEE Standard for Learning Technology – Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata).

1.2.2. IMS Global Learning Consortium, Inc.

Since the release of SCORM 2004 2nd Edition, the IMS Global Learning Consortium, Inc. has updated the IMS Content Packaging Specification set. This effort was done to update this specification set to fix defects encountered during product development and to clarify some ambiguities within the specification. The work was categorized by IMS as a maintenance release.

For more information on the IMS Content Packaging Specification Version 1.1.4 and a detailed listing of the changes made between IMS Content Packaging Version 1.1.3 and IMS Content Packaging Version 1.1.4 visit the IMS Web site at (<http://www.imsglobal.org/content/packaging/index.html>).

1.2.3. SCORM Technical Working Group Meetings

Periodically ADL will pull together ADL Community members for a face-to-face meeting to discuss various topics related to SCORM, SCORM Evolution and the ADL Initiative. Meetings were held and focused on working with a subset of the ADL Community in resolving several outstanding issues raised about SCORM 2004 2nd Edition. The meetings were also used to gather additional feedback about the SCORM, ADL Initiative and other ADL efforts.

1.2.4. Evolution and Stabilization of the ADL Registry

The ADL Initiative has been developing the ADL Registry, the first implementation of a CORDRA™ instance. One of the purposes of the ADL Registry is to manage content object metadata instances to allow for search and discovery of registered content objects. During this work, a major focus was to evaluate the metadata requirements that were defined in earlier versions of SCORM. During this process several changes were made to the SCORM Metadata Application Profiles to align with the ADL Registry and forthcoming DoD Work Instruction.

1.2.5. Feedback from ADL Community

ADL continually monitors the ADL Community in search of feedback, concerns and issues related to SCORM 2004. ADL uses events like Plugfests and other events to talk with the ADL Community. ADL also monitors the ADL Forums on ADLNet.org for discussions about topics of concern. Data is collected from these discussions and, if appropriate, incorporated in future versions of SCORM. ADL supports an “Ask the Experts” function in the SCORM section of ADLNet.org for the ADL Community to ask questions to ADL, report bugs on products, suggest enhancements to products and express other concerns/issues/requirements to ADL. All of these efforts are used to gather feedback from the ADL Community for maintaining and evolving SCORM and other ADL products.

1.3. SCORM 2004 Content Aggregation Model (CAM)

This section of the document describes the changes required to products based on the changes to the SCORM 2004 Content Aggregation Model (CAM).

The changes listed in this section describe those impacts to the SCORM 2004 CAM Version 1.3.1. This section is broken up to match the major sections in the SCORM 2004 CAM Version 1.3.1:

- SCORM Content Model
- SCORM Content Packaging
- SCORM Metadata
- SCORM Sequencing and Presentation

The changes to the SCORM 2004 CAM Version 1.3.1 were primarily based on:

- SCORM 2004 2nd Edition Addendums
- SCORM Technical Working Group Meeting
- IMS Content Packaging Specification Version 1.1.4
- IEEE Standard for XML Schema Definition Language Binding for LOM
- Alignment with ADL Registry requirements
- Corrections due to reported defects from the ADL Community.

1.3.1. SCORM Content Model Changes

The following general updates were made for consistency and clarification:

- All Figures were updated to establish a consistent look and feel across all of the SCORM 2004 books.
- The use of the word meta-data was updated to remove the hyphen (metadata).

1.3.2. SCORM Content Packaging Changes

1.3-1: (sub)Manifest: Due to confusion on the use cases for using (sub)manifests, requirements on syntax and behavior processing and pending updates to clarify and rectify various issues by IMS, ADL is recommending not to use (sub)manifests at this time. The intent is to let the IMS Content Packaging Working group resolve and update the IMS Content Packaging Specification before any more guidance or requirements from ADL is given. The handling and processing of Content Packages from the standpoint of LMS is completely optional. ADL will not be testing LMS for support of (sub)manifests. All current defined requirements found in SCORM and the corresponding Conformance Requirements document have been removed.

1.3-2: All Physical Files Included in a Content Package: Added language that states all of the physical files included in a Content Package should be declared and referenced in the `imsmanifest.xml` file. This is handled by declaring a `<file>` element for each of the physical files. There should be no physical files in a Content Package that are not referenced in the manifest file. These files may be considered “extra resources” that are included with a Content Package. Having these “extra resources” may cause a wide range of problems during the lifecycle of the Content Package.

1.3-3: SPM Length for the href Attribute: Updated the language defining the SPM length for the `href` attribute. The `href` attribute is affected by any declaration of an `xml:base` attribute. The IMS Content Packaging Specification, along with SCORM, was updated to indicate that the SPM of 2000 characters was the length of the `href` with any associated `xml:base` values applied to it.

Updated the language associated with `xml:base` to make it clear that the use of `xml:base` impacts the `href` values defined in the manifest. Care should be taken, dealing with the overall characterstring length of the `href`, when using the `xml:base` attribute.

1.3-4: Clarification of the identifierref attribute on a <dependency> Element:

Updated the language associated with the `identifierref` attribute for the `<dependency>` element to indicate that the value shall only reference an `identifier` attribute of a `<resource>` element within the scope of the `<manifest>` element.

1.3-5: Parameter Construction Algorithm: Based on updates by IMS, the parameter construction algorithm was updated to accurately account for the types of parameters (query string components) that can be associated with a Universal Resource Locator (URL) and the process for constructing the absolute URL for the resource.

1.3.3. SCORM Metadata Changes

With the release of SCORM 2004 3rd Edition, requirements dealing with metadata have been removed. If metadata is going to be provided, ADL recommends the use of IEEE LOM. If metadata is provide in the manifest, then the only requirement is that the metadata be well-formed and valid to the corresponding controlling documents (e.g., XSD).

1.3.4. SCORM Sequencing and Presentation

1.3-14: Addition of the suspendAll <hideLMSUI> value: Updated the listing of vocabulary tokens that can be a value of the `<hideLMSUI>` element to include the `suspendAll`, `exitAll` and `abandonAll` values. A SCO is permitted to issue a Suspend All, Exit All and AbandonAll Navigation Request. If the designer would like to hide the LMS provided User Interface device to issue a Suspend All, Exit All or Abandon All Navigation Request, this value can be used to indicate this.

1.4. SCORM Run-Time Environment (RTE)

This section of the document describes the changes required to products based on the changes to the SCORM Run-Time Environment (RTE).

The changes listed in this section describe those impacts to the SCORM 2004 RTE Version 1.3.1. This section is broken up to match the major sections in the SCORM 2004 RTE Version 1.3.1:

- Application Programming Interface
- SCORM RTE Data Model

The changes to the SCORM 2004 RTE Version 1.3.1 were primarily based on:

- SCORM 2004 2nd Edition Addendums
- SCORM Technical Working Group Meeting
- Corrections due to reported defects from the ADL Community

1.4.1. General Changes

The following list outlines some general changes made to the SCORM RTE Version 1.3.1:

- All Figures were updated to establish a consistent look and feel across all of the SCORM 2004 books.
- Updated Figures to get a consistent look and feel across all of the SCORM 2004 books.
- Removed Section 2.1.1.2 Persisting Run-Time Data Across Learner Attempts and Activities. Due to the removal of the `adlcp:persistState` attribute in the SCORM 2004 CAM, the section describing the underlying processing of this value during run-time was also removed.
- Removed the language around SCOs and Subordinate SCOs.

1.4.2. Application Programming Interface (API) Changes

1.4.2.1: Updates to Figure 3.2.1a: Permitted Document Object Model (DOM)

Locations of an API Implementation: Updated the figure to correct some inconsistencies and interpretation issues. Some confusion existed in the ADL Community, based on this figure, about the appropriate places in the DOM that an LMS can place its API Instance. The figure was updated to clarify this issue.

1.4.2.2: Updates to Figure 3.3.1a: Illustration of Finding the API: Updated the figure to correct some inconsistencies and interpretation issues related to a SCO finding the LMS provide API Instance. The image was updated with the intent to clarify this issue.

1.4.3. SCORM Run-Time Environment Data Model Changes

1.4-3: Abandon and Abandon All Impacts on the SCORM Run-Time Environment

Data Model Elements: Added information describing the impacts of an Abandon or Abandon All Navigation Request on the persistence and the mapping to the Sequencing Tracking Model of the SCORM RTE Data Model. If an Abandon or Abandon All Navigation Request is issued, then no data mapping or persistence of data for the learner attempt should be made.

1.4-4: characterstring Data Type: Added language to describe what the SPM is for the number of characters, not the octet string which is created by a particular character set encoding.

1.4-5: language type Data Type: Added requirements that the `langcode` and `subcode` values shall be 1 to 8 characters in length.

1.4-6: long identifier type Data Type: Added language describing that a `long_identifier_type` cannot, by definition, be an empty characterstring. They are used to identify a value and hence cannot be empty.

1.4-7: short identifier type Data Type: Added language describing that a `short_identifier_type` cannot, by definition, be an empty characterstring. They are used to identify a value and hence cannot be empty.

1.4-8: time(second, 10,0) Data Type: Updated an error with the range of the YYYY. Change `1970 >= YYYY >= 2038` to `1970 <= YYYY <= 2038`. Also added language that states that the default value, if no Time Zone Designator is provided, is Coordinated Universal Time (UTC).

1.4-9: timeinterval(second, 10,2) Data Type: Updated the language to state that zero-padding of value shall be acceptable. For example, `P05Y` is equivalent to `P5Y`. Added more language describing the normative syntax for the value. If the data model element, that is of type `timeinterval(second, 10, 2)`, contains a value, then the designator `P` shall be present. If the value of years, months, days, hours, minutes or seconds is zero, the value and corresponding designation (e.g., `Y` if there is no year) may be omitted, but at least one designator and value shall be present in addition to the designator `P`. The designator `T` shall be omitted if all of the time components (hours, minutes, and seconds) are zero.

1.4-10: cmi.completion_status Updates: Based on a SCORM Technical Working Group meeting, updated the LMS Behavior Requirements for handling the determination of `cmi.completion_status`. Table 4.2.4.1a defines the Completion Status determination requirements, however no requirements were defined on when this determination shall occur. This behavior is based on whether a `cmi.completion_threshold` is defined and when the `cmi.completion_status` is determined. The `cmi.completion_status` shall be evaluated each time a `GetValue()` request is made for the `cmi.completion_status` element.

Added normative language on how the value of `not attempted` affects the Sequencing Tracking Model. If the `cmi.completion_status` is set to `not attempted`, then the Attempt Progress Status shall be set to `true` and Attempt Completion Status shall be set to `false`.

Updated Table 4.2.4.1a to correct an error with the conditionals used. For the example given when a Completion Threshold is defined, a Progress Measure is defined (greater than the Completion Threshold), updated the conditional to indicate that if the Progress Measure is greater than or equal to the Completion Threshold, then the Completion Status is evaluated to complete.

Updated Table 4.2.4.1a to correct the evaluation of `cmi.completion_status` when a Completion Threshold (`cmi.completion_threshold`) is known and no Progress Measure (`cmi.progress_measure`) is provided. In this case, regardless of the `cmi.completion_status` value being set or not, the `cmi.completion_status` shall be evaluated to `unknown`. The current table states that the evaluation shall be whatever is currently being stored at the `cmi.completion_status`. If a Completion Threshold is defined and no Progress Measure is provided to assist in the determination of Completion, the LMS cannot make any assumption and the Completion Status and the evaluation should be to an `unknown` state.

1.4-11: cmi.entry Updates: Updated the language around the use of the `resume` data value. Added language that states that a `resume` shall be used in cases where a SCO issues a Suspend All Navigation Request.

1.4-12: cmi.exit Updates: Updated the LMS Behavior Requirements to explain how an LMS handles the initialization of the `cmi.exit` data model element when a different learner session is started. The `cmi.exit`, regardless of how it was set in the previous learner session, shall be uninitialized and return back to the default value of an empty characterstring.

Updated the Sequencing Impacts section to change the navigation request associated with the value of `logout`. Change the navigation request from a Suspend All to an Exit All.

Added an ADL Note that defines that the `logout` value is being deprecated and should not be used by content developers.

1.4-13: cmi.interactions.n.objectives.n.id Updates: Added missing behavior requirements for processing a `SetValue()` call when the identifier passed into the `SetValue()` call has already been used in the learner attempt and stored in an earlier array position. If the supplied value of the `SetValue()` is a value that has already been used (not unique within the set of interaction objective identifiers) in an earlier array position within a learner attempt, then the LMS shall set the error code to 351 – General Set Failure and return `false`.

1.4-14: cmi.scaled_passing_score Updates: Added more information under the LMS Behavior Requirements dealing with the initialization of the `cmi.scaled_passing_score` data model element.

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- If the IMS Simple Sequencing namespace attribute `imsss:satisfiedByMeasure` associated with the `<imsss:primaryObjective>` element for the `<imscp:item>` element that references the SCO is equal to `true`, then the value provided by the `<imsss:minNormalizedMeasure>` element associated with the `<imsss:primaryObjective>` element for the `<imscp:item>` element that references the SCO resource shall be used to initialize this data model element.
 - If the IMS Simple Sequencing namespace attribute `imsss:satisfiedByMeasure` associated with the `<imsss:primaryObjective>` element for the `<imscp:item>` element that references the SCO is equal to `true` and no value is provided for the `<imsss:minNormalizedMeasure>` element associated with the `<imsss:primaryObjective>` element for the `<imscp:item>` element that references the SCO resource, then the LMS shall initialize this data model element to 1.0 (default value).
 - If the IMS Simple Sequencing namespace attribute `imsss:satisfiedByMeasure` associated with the `<imsss:primaryObjective>` element for the `<imscp:item>` element that references the SCO is equal to `false`, then the LMS shall not make any assumptions of a scaled passing score.

1.4-15: cmi.success_status Updates: Based on a SCORM Technical Working Group meeting, updated the LMS Behavior Requirements for handling the determination of `cmi.success_status`. Table 4.2.22.1a defines the Success Status determination requirements, however no requirements were defined on when this determination shall occur. This behavior is based on whether or not a `cmi.scaled_passing_score` is defined and when the `cmi.success_status` is determined. The `cmi.success_status` shall be evaluated each time a `GetValue()` request is made for the `cmi.success_status` element. The requirements defined in table 4.2.22.1a shall be used in this evaluation process.

1.4-16: cmi.suspend_data Updates: Based on a SCORM Technical Working Group meeting, updated the SPM of the `cmi.suspend_data` from 4000 characters to 64000 characters.

1.4-17: Mapping of Primary Objective Status from cmi.objectives and/or cmi.success_status/cmi.score.scaled Updates: Based on a SCORM Technical Working Group meeting, updated the behavior that describes what values are mapped to the SCOs primary objective tracking data from the SCORM Run-Time Environment Data Model:

- If the SCO only sets the `cmi.success_status` and `cmi.score.scaled`, these values shall be mapped to the SCO's associated activity's primary objective tracking data.
- If the SCO only sets the `cmi.objectives.n.success_status` and `cmi.objectives.n.score.scaled` for the objective that shares the primary objective's ID, then these values shall be mapped to the SCO's associated activity's primary objective tracking data. This is a change to SCORM 2004 2nd

Edition, because the SCORM 2004 2nd Edition described that the `cmi.success_status` and `cmi.scaled.score` would override these values.

- If the SCO sets both the `cmi.success_status` and `cmi.score.scaled` and the `cmi.objectives.n.success_status` and `cmi.objectives.n.score.scaled` for the objective that shares the primary objective's ID, then the values provided by `cmi.success_status` and `cmi.scaled.score` shall override any values provided in `cmi.objectives.n.success_status` and `cmi.objectives.n.score.scaled`. This is the same behavior as defined in SCORM 2004 2nd Edition.

New Conformance Requirement test cases have been created to test this behavior.

1.4-18: Altering the value of an already set Identifier: Based on a SCORM Technical Working Group meeting, updated the API Implementation behavior requirements for the `cmi.objectives.n.id` data model element. Once the data model element's value has been established, either through a mapping based on the Objective Progress Information defined for the associated Activity or an explicit `SetValue()` call by the SCO, the SCO is not permitted to change the value of this identifier. If the SCO attempts to change the value of the `cmi.objectives.n.id` to a different value, the LMS shall return false and set the error code to 351- General SetValue Error.

Also created an additional SCORM Extension Error Code to describe this behavior to assist LMS implementation in the use of the `GetDiagnostic()` API call.

1.5. SCORM Sequencing and Navigation (SN)

This section of the document describes the changes required to products based on the changes to the SCORM 2004 Sequencing and Navigation (SN).

The changes listed in this section describe those impacts to the SCORM 2004 SN Version 1.3.1. This section is broken up to match the major sections in the SCORM 2004 SN Version 1.3.1:

- Sequencing Concepts
- Sequencing Definition Model
- Sequencing Behaviors
- SCORM Navigation Model
- Appendix C – Sequencing Behavior Pseudo Code Changes

The changes to the SCORM 2004 RTE Version 1.3.1 were primarily based on:

- SCORM 2004 2nd Edition Addendums
- SCORM Technical Working Group Meeting
- Corrections due to reported defects from the ADL Community

1.5.1. General Changes

The following list outlines some general changes made to the SCORM SN Version 1.3.1:

- All Figures were updated to establish a consistent look and feel across all of the SCORM 2004 books.
- Updated Figures to get a consistent look and feel across all of the SCORM 2004 books.

1.5.2. Sequencing Concepts

1.5-1: Sequencing Collection: Added a new section that describes the purpose of collecting common sequencing information and taking advantage of the sequencing collection concept described by IMS Simple Sequencing (SS). This section also describes the rules for deriving the “final” Sequencing Information that applies to specific learning activities. This section describes how to “merge” the information defined in the Sequencing Collection with any information that is defined on the activity.

1.5-2: Using (Sub)Manifests in a Content Package: Updated this section to reflect the fact that the use of (sub)manifests are not required nor recommended until further notice. This decision is based on the fact that the IMS is currently looking at this issue in detail and working on a major update to the IMS Content Packaging Specification which will address this and other things. Until further notice, ADL is recommending not to use (sub)manifests.

1.5.3. Sequencing Definition Model

1.5-3: Updates to the Sequencing Definition Model: Various Sequencing Definition Model elements have been updated to ensure their accuracy with the IMS SS Specification and to clarify their usage. These changes were made to ensure that the definitions used were in synch with IMS SS and to provide additional information. These changes should not affect any implementation.

1.5.4. Sequencing Behaviors

1.5-4: New Table Describing Data Mapping Added: Added Table 4.5.4a: Run-Time Data to Sequencing Tracking Data Mapping Summary to describe how the data model elements defined in the SCORM RTE Data Model map or affect the elements defined in the Sequencing Tracking Model.

1.5-5: Processing an Abandon or Abandon All Navigation Request: Updated Section 4.5.4: End Attempt Process to describe the requirements on handling the SCORM RTE Data Model and Sequencing Tracking Model on an abandon attempt. If the attempt on the Current Activity ends due to an Abandon or Abandon All Navigation Request, the data mapping described in Table 4.5.4a does not occur, an abandoned attempt does not cause the End Attempt Process to be invoked and does not affect the state of the activity.

1.5-6: Reversing Decision Defined in Addendum 2.25 – Clarification and Changes Needed for Non-Tracked Activities: The SCORM 2004 Addendum Version 1.2 lists a change that was made to SCORM 2004. Addendum 2.25 was added to define LMS behavior for the tracking status information for “non-tracked” activities (Tracked = false). The change introduced in the addendum defined that the default statuses should be used in all evaluations and that no run-time data initialization is applied to “non-tracked” activities. This decision is being reversed based on a better understanding of use cases that need to be supported. Updated the SCORM 2004 Sequencing and Navigation book to describe that SCOs associated with activities that are “not tracked” (Tracked = false) are required to have their SCORM Run-Time Environment Data Model elements initialized if read maps are defined. Also updated the SCORM 2004 Sequencing and Navigation book to describe that upon termination, no mapping of the SCO’s Run-Time Environment Data to the activity tracking data shall be performed (in these cases the activity is not tracked). The Conformance Requirements were also updated to correct the current sequencing test cases that tested the old behavior. The Conformance Test Suite was also updated to test this new behavior.

1.5-7: Interoperable behavior for “walking off the activity tree”: Based on a SCORM Technical Working Group meeting, an updated was made to the SCORM 2004 3rd Edition to allow Continue Navigation Requests to “walk off the activity tree.” In these cases, the Termination and Rollup Process shall be applied to current activity with a Continue Sequencing Request pending – the attempt on the current activity should end, rollup should be applied and the currently delivered content should be taken away. Then a Continue Sequencing Request should be processed. If the Continue Sequencing Request results in identifying an activity to deliver, then the LMS should deliver it.

However, if the Continue Sequencing Request results in walking off the Activity Tree (currently Pseudo Code Exception – SB.2.1-1), the current attempt on the root of the Activity Tree should end and the Sequencing Session should end, returning control to the LMS. This new behavior replaces the Pseudo Code Exception being thrown.

All of these changes were made in various places in the SCORM Sequencing Pseudo Code. These changes do not place any new User Interface requirements on LMS vendors. Additional LMS Conformance Tests were added to manually (through human interaction) check that an LMS correctly adheres to these changes.

1.5-8: Read Maps to Shared Global Objectives: If a read map is defined to a shared global objective the data from the shared global objective will always be used in sequencing rule and rollup rule evaluations, when it is defined; in addition to SCO Run-Time Environment data model initialization, regardless of the local objective state.

1.5-9: Removed Requirement for Attempt Progress Status: Removed the requirement that the Activity must be attempted before the Attempt Progress Information can be used in sequencing rule and rollup rule evaluations. LMSs shall use the Attempt Progress Information regardless of the value of the Activity Attempt Count.

1.5-10: New Table Describing Data Initialization Added: Added Table 4.9.2a: Sequencing Tracking Data Mapping to SCO Run-Time Data Summary to describe how elements defined in the Sequencing Tracking Model affect the initialization of the SCO's run-time data model elements prior to the launch of the SCO.

1.5.5. The SCORM Navigation Model

1.5-11: Updates to SuspendAll Navigation Event: Updated Table 5.2a: Navigation Events and Descriptions to change the Source of a Suspend All Navigation Event. Changed LMS Only to LMS or SCO.

1.5-12: Updates to the Run-Time User Interface Device Vocabulary: Updated table 5.6.3b: Run-Time User Interface Device Vocabulary to add the `suspendAll`, `exitAll` and `abandonAll` tokens.

In conjunction with this change, updated the SCORM XML Controlling Document, SCORM CAM Version 1.3 Navigation XML XSD (`adlnav_v1p3.xsd`), to add the `suspendAll` token to the list of values accepted by the `<hideLMSUI>` element.

Updated Table 5.6.4a: SCORM Navigation Data Model to add the `suspendAll` token to the Value Space of the navigation request (`adl.nav.request`). This will permit SCO to issue a `SetValue()` call to invoke a Suspend All Navigation Request. Also added a note that indicates using `exitAll`, `abandonAll` and `suspendAll` may limit the reuse of a SCO.

1.5-13: <presentation> Element User Interface Requirement: Added stricter language describing required LMS behavior to honor `adlnav <presentation>` elements by

restricting the LMS provided User Interface devices provide to the learner. These requirements support a more interoperable learner experience.

1.5-14: Interoperable User Interfaces: Added stricter language describing required LMS behavior to provide (or not to provide) User Interface devices that would trigger Navigation Requests when processed would (would not) result in identifying content for launch. These requirements support a more interoperable learner experience.

1.5.6. Appendix C – Sequencing Behavior Pseudo Code Changes

1.5-15: Pseudo Code Changes: A number of changes have been made to the SCORM Pseudo Code to address clarification and behavioral errors. SCORM does not mandate how LMSs implements the Pseudo Code; it only requires that an LMS act "as-if" it has implemented the Pseudo Code. Conformance testing of Pseudo Code changes is detailed below (Section 1.6 Conformance Requirement) for each updated or changed LMS Sequencing Test Case.

1.6. Additional Resources

There are additional resources that are recommended that will help in describing these changes in more detail:

- SCORM 2004 Documentation 2nd Edition Addendum Version 1.2. Available at (<http://www.adlnet.org/scorm/history/2004/documents.cfm>)
- IMS Content Packaging Summary of Changes and the IMS Content Packaging Specification Version 1.1.4. Available at (<http://www.imsglobal.org/content/packaging/index.html>)

1.7. Summary of Impacts on Conformance

This table describes the impacts to conformance to current SCORM 2004 2nd Edition products. The table is focused only on LMSs and Content Packages. These are currently the only two products that can be certified by an ADL Certification Center. It should be noted that some of the changes may impact Metadata and SCOs, these impacts are described in the Content Package column, due to the fact that they are all embodied in a Content Package.

Change	Content Packages: Impact To Conformance	LMS: Impact to Conformance	Additional Comments
Content Aggregation Model			
1.3-1: (sub)Manifest	None	None	<p>Content Packages: Recommendation to not use (sub)manifests. Content Packages that contain (sub)manifests will be issued with a WARNING from the Conformance Test Suite.</p> <p>LMS: No test will be run to test the LMSs ability to process a Content Package that contains (sub)manifests.</p>
1.3-2: All Physical Files Included in a Content Package	None	None	<p>Content Packages: A Content Package encountered with the physical files that are not referenced by an element/attribute in the manifest will be flagged with a WARNING issued the Conformance Test Suite.</p> <p>LMS: Not Applicable</p>
1.3-3: SPM Length for the href Attribute	None	None	<p>Content Packages: Clarification of the SPM of the href for a resource where an xml:base is included. Since this was a change to an SPM, the Conformance Test Suite will issue a WARNING if the newly clarified SPM is violated.</p> <p>LMS: Should not impact LMS algorithm used to determine the absolute URL from the Content Package.</p>

1.3-4: Clarification of the identifierref attribute on a <dependency> Element	May impact conformance	None	<p>Content Packages: Stricter requirements added by the IMS Content Packaging Specification that only permits a <dependency> element to reference a <resource> element that is in the same scope as the <dependency> elements parent <resource> element. If Content Packages contain a <dependency> element that references a <resource> element identifier that is not a sibling of the containing <resources> element, the Content Package will fail conformance.</p> <p>LMS: Not Applicable</p>
1.3-5: Parameter Construction Algorithm	May impact conformance	May impact conformance	<p>Content Packages: May impact Content Packages if the correct syntax (defined by the IMS Content Packaging Specification) for the parameters attribute is not adhered to.</p> <p>LMS: May impact the run-time state of the content object being launched, if the LMS does not adhere to the parameter construction algorithm. This behavior is not tested by the Conformance Test Suite.</p>
1.3-6: Multiplicity of the <lom> Element	None	None	<p>Content Packages: Clarification added, multiple <lom> elements were always permitted.</p> <p>LMS: Not Applicable</p>
1.3-7: Clarification of <language> Element's Value	None	None	<p>Content Packages: Clarification was added and a new value must be supported by systems that process metadata.</p> <p>LMS: Not Applicable</p>
1.3-8: VCard Syntax in a LOM Instance	None	None	<p>Content Packages: Clarification was added on the syntax of the elements of type VCard. Current Conformance Test Suite does not test the VCard syntax for validity.</p> <p>LMS: Not Applicable</p>
1.3-9: LOM.MetaMetadata.Contribute Multiplicity Corrected	None	None	<p>Content Packages: Updated the SPM, to lower the value. Current systems that support the old SPM will support the new SPM. If Metadata Instances contains more than 10 <contribute> elements, then the Conformance Test Suite will issue a WARNING.</p> <p>LMS: Not Applicable</p>

1.3-10: LOM.MetaMetadata.Contribute.Entity Multiplicity Corrected	None	None	Content Packages: Updated the SPM, to lower the value. Current systems that support the old SPM will support the new SPM. If Metadata Instances contains more than 10 <entity> elements, then the Conformance Test Suite will issue a WARNING. LMS: Not Applicable
1.3-11: LOM.Relation.Resource Multiplicity Corrected	May impact Content Packages if the Content Package contains Metadata and the LOM.Relation.Resource is used more than once.	None	Content Packages: Updated the SPM, to change the multiplicity from 0 to More to 0 or 1. Current Content Packages that support the old multiplicity and contain more than 1 <resource> element will fail conformance. LMS: Not Applicable
1.3-12: LOM.Relation.Resource Description Multiplicity Corrected	None	None	Content Packages: Updated the SPM, to change the multiplicity from 0 to 1 to 0 or More. All current instance should not fail since the multiplicity was changed to support more than what was currently supported. LMS: Not Applicable
1.3-13: SCORM Metadata Application Profile Alignment with ADL Registry Requirements	May impact conformance	None	Content Packages: Changes to the metadata requirements were put in place to align with evolution work of the ADL Registry. These changes impact the current application profiles. A single application profile is defined with a new set of consolidate requirements to match ADL Registry requirements. No change to the requirements of providing metadata, meaning it is still optional to provide metadata in a Content Package. LMS: Not Applicable
1.3-14: Addition of the suspendAll <hideLMSUI> value	None	Impacts LMS (See Note)	Content Packages: All current Content Packages will not fail conformance. A new element was added. LMS: A set of new values were added to the <hideLMSUI> element and LMS are now required to support this value and process the Content Package appropriately. UI impacts and these are not tested. Since this is a UI related test, this aspect is not tested.
Run-Time Environment			

1.4-1: Updates to Figure 3.2.1a: Permitted Document Object Model (DOM) Locations of an API Implementation	None	None	Content Packages: Not Applicable LMS: No impact, update to clarify an image.
1.4-2: Updates to Figure 3.3.1a: Illustration of Finding the API	None	None	Content Packages: Not Applicable LMS: No impact, update to clarify an image.
1.4-3: Abandon and Abandon All Impacts on the SCORM Run-Time Environment Data Model Elements	None	May impact conformance	Content Packages: Not Applicable LMS: The new test packages added to the Conformance Test Suite will test to make sure data persistence is managed correctly when an Abandon or an Abandon All Navigation Requests are made.
1.4-4: characterstring Data Type	None	None	Content Packages: Not Applicable LMS: Editorial changes to clarify that the SPM is the number of characters not octets.
1.4-5: language_type Data Type	May impact conformance	None	Content Packages: Content Packages that contain SCOs that use langcodes or subcodes with more than eight characters will now fail the Conformance Test Suite. LMS: Not Applicable
1.4-6: long_identifier_type Data Type	May impact conformance	May impact conformance	Content Packages: If the Content Package contains a SCO that makes a SetValue() call on a data model element of type long_identifier_type and the value use is an empty characterstring or contains all whitespace, the Content Package will fail conformance. LMS: If the LMS permitted those SCORM Run-Time Environment Data Model elements typed as long_identifier_types to contain a value of an empty characterstring or a string that contains all whitespace, then the LMS will fail conformance.

1.4-7: short_identifier_type Data Type	May impact conformance	May impact conformance	<p>Content Packages: If the Content Package contains a SCO that makes a SetValue() call on a data model element of type short_identifier_type and the value use is an empty characterstring or contains all whitespace, the Content Package will fail conformance.</p> <p>LMS: If the LMS permitted those SCORM Run-Time Environment Data Model elements typed as long_identifier_types to contain a value of an empty characterstring or a string that contains all whitespace, then the LMS will fail conformance.</p>
1.4-8: time(second, 10,0) Data Type	None	None	<p>Content Packages: Editorial Change</p> <p>LMS: Editorial Change</p>
1.4-9: timeinterval(second, 10,2) Data Type	May impact conformance	May impact conformance	<p>Content Packages: If a Content Package contains a SCO that was setting a data model element of type timeinterval(second,10,2) and the SCO was using a zero-padded value, the SCO will now be conformant.</p> <p>LMS: If the LMS does not support zero-padded values for data model elements of type timeinterval(second,10,2), then the LMS will fail conformance.</p>
1.4-10: cmi.completion_status Updates	None	May impact conformance	<p>Content Packages: Important to understand the change and the results of calling GetValue() for the cmi.completion_status element. The expected value returned may be different.</p> <p>LMS: If the LMS does not evaluate the GetValue() calls to cmi.completion_status based on the table defined in the SCORM Run-Time Environment book, then the LMS will fail conformance.</p>
1.4-11: cmi.entry Updates	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: If the LMS did not support setting cmi.entry to resume when a suspended learner attempt (through a Suspend All navigation request made by the SCO) then the LMS will fail conformance.</p>

1.4-12: cmi.exit Updates	None	May impact conformance	Content Packages: Not Applicable LMS: Deprecated the "logout" vocabulary for cmi.exit. LMS should not implement behavior around this element.
1.4-13: cmi.interactions.n.objectives.n.id Updates	None	May impact conformance	Content Packages: Not Applicable LMS: If the LMS did not handle the invalid call in a similar manner as for other elements where an identifier is not allowed to exist in the collection more than once, then the LMS will fail conformance.
1.4-14: cmi.scaled_passing_score Updates	None	May impact conformance	Content Packages: Not Applicable LMS: If the LMS was initializing the cmi.scaled_passing_score to the value held in the <minNormalizedMeasure> when the satisfiedByMeasure attribute was set to false, then the LMS will now fail conformance.
1.4-15: cmi.success_status Updates	None	May impact conformance	Content Packages: Important to understand the change and the results of calling GetValue() for the cmi.success_status element. The expected value returned may be different. LMS: If the LMS does not evaluate the GetValue() calls to cmi.success_status based on the table defined in the SCORM Run-Time Environment book, then the LMS will fail conformance.
1.4-16: cmi.suspend_data Updates	None	May impact conformance	Content Packages: Not Applicable LMS: This change may impact LMS conformance depending on the SPM supported. If the LMS did not support a minimum of 64000 characters, then the LMS will fail conformance.
1.4-17: Mapping of Primary Objective Status from cmi.objectives and/or cmi.success_status/cmi.score.scaled Updates	None	Will impact conformance	Content Packages: Not Applicable LMS: New language was added to the SCORM 2004 3rd Edition to describing how and when the cmi.objectives.n.success_status and cmi.objectives.n.score.scaled affect the Sequencing Tracking Model versus cmi.success_status and cmi.score.scaled. These changes directly affect current tests that are performed and the results.

1.4-18: Altering a cmi.objectives.n.id	None	Will impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: The SCORM 2004 3rd Edition RTE Book was updated to make the cmi.objectives.n.id element a write-once element. Any attempts by a SCO to change this value will result in an error – this change requires that an LMS provide a “General Set” error code.</p>
Sequencing and Navigation			
1.5-1: Sequencing Collection	None	None	<p>Content Packages: Editorial change.</p> <p>LMS: Editorial change, no new test cases were added. If LMS should still be conformant.</p>
1.5-2: Using (Sub)Manifests in a Content Package	None	None	<p>Content Packages: Recommendation to not use (sub)manifests. Content Packages that contain (sub)manifests will be issued with a WARNING from the Conformance Test Suite.</p> <p>LMS: No test will be run to test the LMSs ability to process a Content Package that contains (sub)manifests.</p>
1.5-3: Updates to the Sequencing Definition Model	None	None	<p>Content Packages: Editorial changes</p> <p>LMS: Editorial changes</p>
1.5-4: New Table Describing Data Mapping Added	None	None	<p>Content Packages: Not Applicable</p> <p>LMS: This table was added for clarification. The mapping requirements were already defined in various places in the SCORM 2004 Sequencing and Navigation book along with the SCORM 2004 Run-Time Environment Book.</p>
1.5-5: Processing an Abandon or Abandon All Navigation Request	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: New test cases were added to ensure that the LMS does not perform the data mapping from the SCORM Run-Time Environment Data Model into the Sequencing Tracking Model when the SCO is taken away due to an Abandon or Abandon All Navigation Event.</p>

1.5-6: Reversing Decision Defined in Addendum 2.25 – Clarification and Changes Needed for Non-Tracked Activities	None	Will impact conformance	Content Packages: Not Applicable LMS: This update reverses a SCORM 2004 2nd Edition Addendum decision to support use cases that have been brought to our attention. Because of this, what is currently being tested by the Conformance Test Suite has been updated. These new test cases test the opposite of what is described in the Addendum, which will cause LMSs that pass conformance to fail when the new version of the Conformance Test Suite is made available.
1.5-7: Interoperable behavior for “walking off the activity tree”:	None	May impact conformance	Content Packages: Not Applicable LMS: The changes to the SCORM 2004 3rd Edition entail added more specific language on handling a Pseudo Code exception. The change is centered on not throwing the exception, but ending the Sequencing Session on the activity tree. New test cases are being added to test this change. This may impact LMSs if they are not handling these “exception” cases as now defined.
1.5-8: Read Maps to Shared Global Objectives	None	May impact conformance	Content Packages: Not Applicable LMS: New LMS tests were added to ensure that LMSs utilize known global data for any Read Map.
1.5-9: Removed Requirement for Attempt Progress Status	None	May impact conformance	Content Packages: Not Applicable LMS: An activity no longer needs to be attempted for its completion status and data mappings to apply. New LMS tests were added to ensure an LMS does not require an attempt to assess valid tracking data.
1.5-10: Run-Time Data Initialization Table	None	None	Content Packages: Not Applicable LMS: Not Applicable
1.5-11: Updates to SuspendAll Navigation Event	None	May impact conformance	Content Packages: Not Applicable LMS: A new ADL Navigation Data Model test will be added to ensure that an LMS supports a SCO invoking a Suspend All Navigation Request

1.5-12: Updates to the Run-Time User Interface Device Vocabulary	May impact conformance	May impact conformance	<p>Content Packages: Several new vocabulary terms where added to the ADL Navigation CP extension XSD. New SCORM 2004 3rd Edition Packages must use the new XSD.</p> <p>LMS: Several new vocabulary terms where added to the ADL Navigation CP extension XSD. LMSs will be tested to ensure they accept packages that include the new vocabulary terms.</p>
1.5-13: <presentation> element	None	Not Directly	<p>Content Packages: Not Applicable</p> <p>LMS: LMSs will now be tested to ensure they properly interpret the <presentation> element by hiding specified UI controls.</p>
1.5-14: Interoperable User Interface	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: The UI provided by an LMS will be tested to ensure that it meets SCORM UI Interoperability requirements.</p>
1.5-15: Pseudo Code Changes	None	Not Directly	<p>Content Packages: Not Applicable</p> <p>LMS: SCORM does not mandate how LMS implements the p-code; it only requires that an LMS act "as-if" it has implemented the p-code. Conformance testing of p-code changes is detailed below for each updated/changed LMS Sequencing Test Case.</p>
Conformance Requirements - Sequencing Conformance Requirements			
1.6-1: Test Case SX-3 Updated:	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: Removed the (sub)manifest from the test case.</p>

1.6-2: Test Case SX-4a Added	None	May impact conformance	Content Packages: Not Applicable LMS: Added to test the data persistence behavior related to Abandon and Abandon All navigation requests.
1.6-3: Test Case SX-4b Added	None	May impact conformance	Content Packages: Not Applicable LMS: Added to test the data persistence behavior related to Abandon and Abandon All navigation requests.
1.6-4: Test Case OB-7a Added	None	May impact conformance	Content Packages: Not Applicable LMS: Tests the initialization of the cmi.objectives collection from a shared global objectives and data mapping from the cmi.objectives collection to the primary objective.
1.6-5: Test Case OB-7b Added	None	May impact conformance	Content Packages: Not Applicable LMS: Tests the initialization of the cmi.objectives collection from a shared global objectives and data mapping from the cmi.objectives collection to the primary objective.
1.6-6: Test Case OB-8a Added	None	May impact conformance	Content Packages: Not Applicable LMS: Tests that the LMS properly process and Exit All rule that also ends the Sequencing Session by exiting the root of the Activity Tree.
1.6-7: Test Case OB-8b Added	None	May impact conformance	Content Packages: Not Applicable LMS: Tests that the LMS properly process and Exit All rule that also ends the Sequencing Session by exiting the root of the Activity Tree.
1.6-8: Test Case OB-9a Added:	None	May impact conformance	Content Packages: Not Applicable LMS: Added to test the persistence of shared global objectives across Content Packages (e.g., courses).

1.6-9: Test Case OB-9b Added	None	May impact conformance	Content Packages: Not Applicable LMS: Added to test the persistence of shared global objectives across Content Packages (e.g., courses).
Additional Conformance Test Suite Changes			
1.7-1: Detection of XSDs Required for <adlcp:location> at the Root of the Package	May impact conformance	None	Content Packages: If a Content Package uses the <adlcp:location> element and the schemas needed to validate the file are not located at the root of the Content Package, then the Content Package will fail conformance. LMS: Not Applicable.
1.7-2: Missing conformance requirement for leaf item elements	May impact conformance	None	Content Packages: If a Content Package contains a leaf <item> element and the leaf <item> does not contain an identifierref attribute or the identifierref attribute is an empty characterstring, then the Content Package will fail conformance. LMS: Not Applicable.
1.7-3: Error in API version checking	None	May impact conformance	Content Packages: Not Applicable. LMS: The Conformance Test Suite was updated to properly test for the API version. If an LMS has defined its API Implementation's version number and it uses a fourth character and the fourth character is not a period (.), then the Conformance Test Suite will fail the LMS.
1.7-4: Metadata minimum character tests	May impact conformance	None	Content Packages: If a Content Package contains SCORM metadata, and the required elements are present but the values of these elements are an empty string, the Conformance Test Suite will now fail the Content Package. LMS: Not Applicable.
1.7-5: Content Packaging test missing conformance check for the <item> element	May impact conformance	None	Content Packages: If a Content Package contains more than one <adlcp:completionThreshold> element defined on an <item>, the Conformance Test Suite will now fail the Content Package. LMS: Not Applicable

1.7-6: Missing test for the Referenced Objective attribute of a Rule Condition	May impact conformance	None	<p>Content Packages: If a Content Package contains a referencedObjective attribute and the value does not reference an objective (<primaryObjective> or <objective>) defined in the manifest, the Conformance Test Suite will now fail the Content Package.</p> <p>LMS: Not Applicable.</p>
1.7-7: Verification of valid parameter syntax for an <item> element	May impact conformance	None	<p>Content Packages: New checks were added to make sure the parameter attribute of an <item> adheres to the syntax defined in the IMS Content Packaging Specification Version 1.1.4. If a Content Package does not contain the correct syntax, the Conformance Test Suite will fail the Content Package.</p> <p>LMS: Not Applicable.</p>
1.7-8: Unicode Support for SCORM Run-Time Environment Data Model Elements	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: New tests were added to test LMSs support for Unicode characterstrings. Some of the SCORM Run-Time Environment Data Model Elements are defined to support Unicode characters. If an LMS does not support Unicode characters for these data model elements, then the Conformance Test Suite will fail the LMS.</p>
1.7-9: LMS Behavior Test added for processing a Suspend All Navigation Request (adl.nav.request)	None	May impact conformance	<p>Content Packages: Not Applicable</p> <p>LMS: New tests were added to test LMSs behavior when processing an adl.nav.request set to "suspendAll". The test makes sure that the cmj.entry is set to "resume" and that data that was persisted in the previous learner session is available in the resumed learner attempt. If the LMS does not support this behavior, then the Conformance Test Suite will fail the LMS.</p>
1.7-10: Use of adlcp:persistState will now cause failures	May impact conformance	None	<p>Content Packages: If a Content Package uses the adlcp:persistState attribute, then the Conformance Test Suite will now fail the Content Package. Older versions of the Conformance Test Suite warned users that the attribute was deprecated.</p> <p>LMS: Not Applicable</p>

<p>1.7-11: Inclusion of a <file> element that shares the href of the <resource></p>	<p>May impact conformance</p>	<p>None</p>	<p>Content Packages: If a Content Package contains a resource that is local to the Content Package (not referenced externally), then there is a requirement that a <file> element exists and that it shares the same href as the <resource>. A check has been added to make sure Content Packages support this requirement. If the Content Package does not support this requirement, then the Conformance Test Suite will fail the Content Package.</p> <p>LMS: Not Applicable</p>
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APPENDIX A

References

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