Eduworks Corporation

A Practical Introduction to SCORM – Part 1

Details of SCORM - Overview

02 – April - 2006

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Topics – Part 1

- History
- What problems SCORM solves
- Assumptions SCORM makes
- The books (and parts) of SCORM

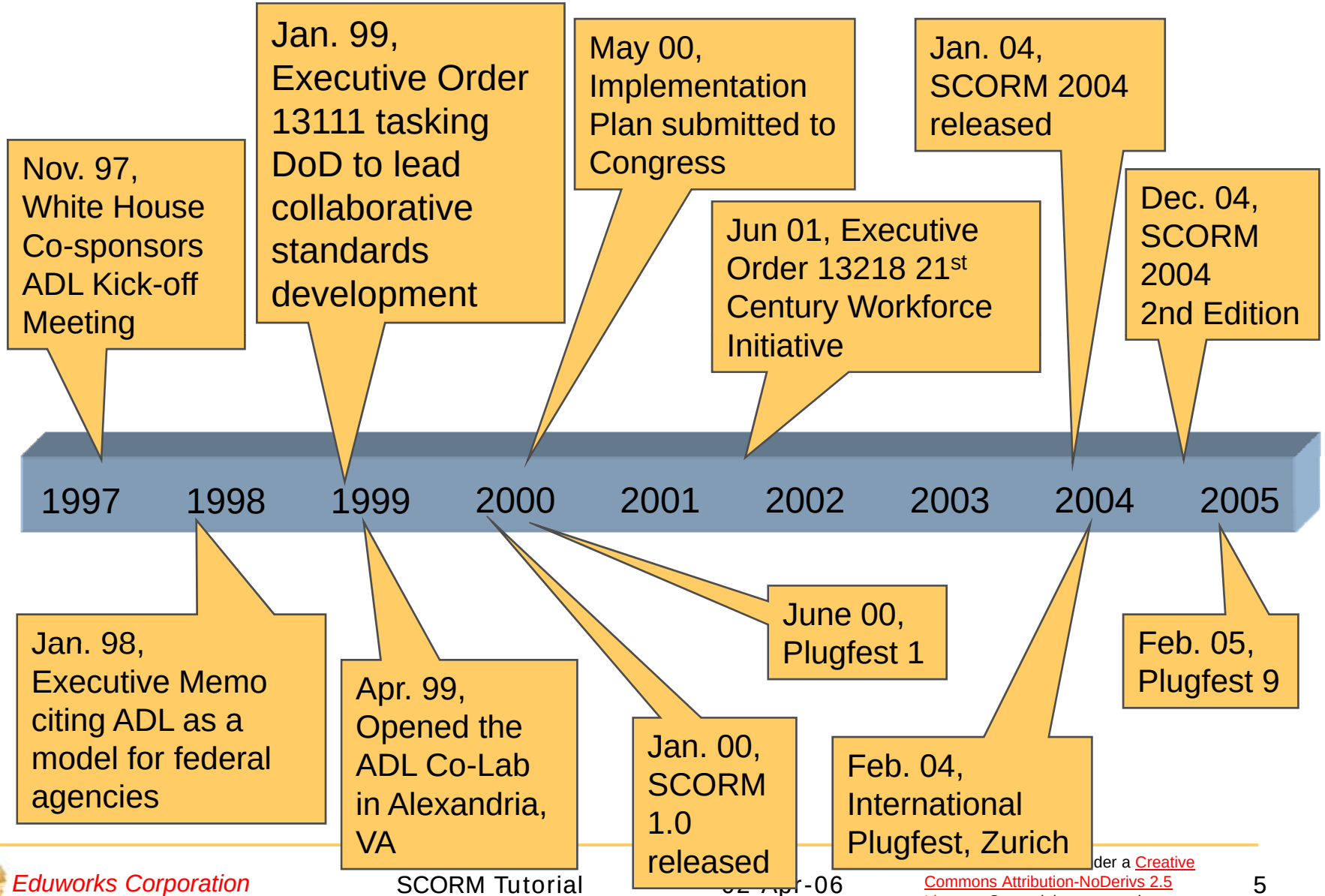
Many slides in this presentation were produced by and used with permission of the Advanced Distributed Learning initiative (www.adlnet.org).

Others were reused / repurposed from previous workshops and presentations

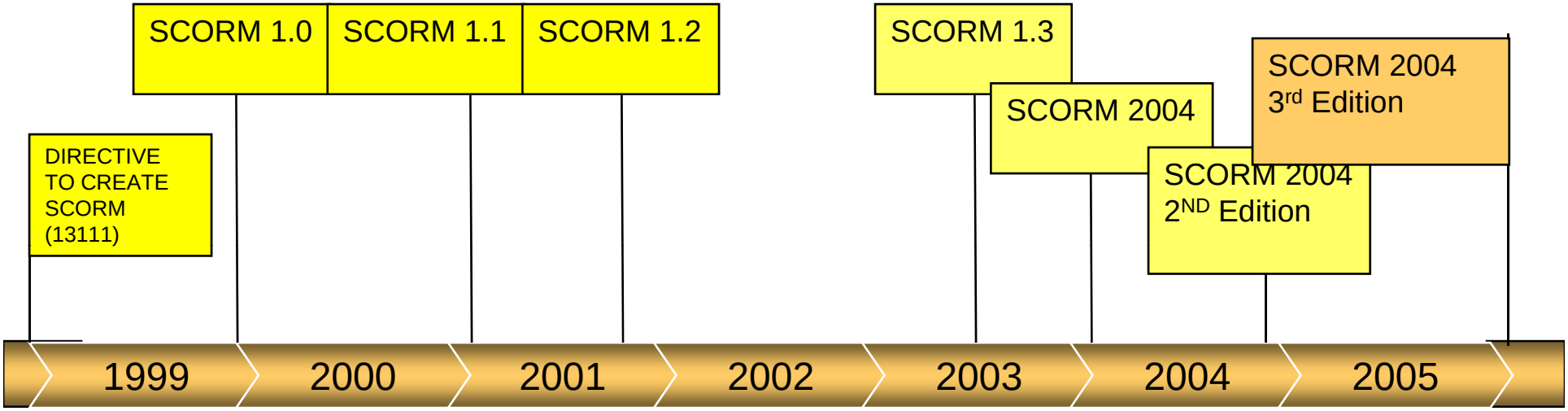
SCORM = Sharable Content Object Reference Model

SCORM means SCORM 2004 (3rd edition)

ADL Timeline



A SCORM IS BREWING



- Course Structure Format (XML Version of AICC Course Structure Files)
- Runtime API – developed jointly among AICC, IEEE, and ADL
- Metadata based on IMS Version 1.0

- "C" is for "Content"
- Metadata Harmonized
- Bugs Fixed
- CMI Data Model Pared back (removed pre-requisites and completion requirements)

- Added Content Packaging
- Deprecated Course Structure Format
- Created Test Suites
- Bugs Fixed

- Simple Sequencing
- Metadata Harmonized
- Bugs Fixed
- Conformance program getting started

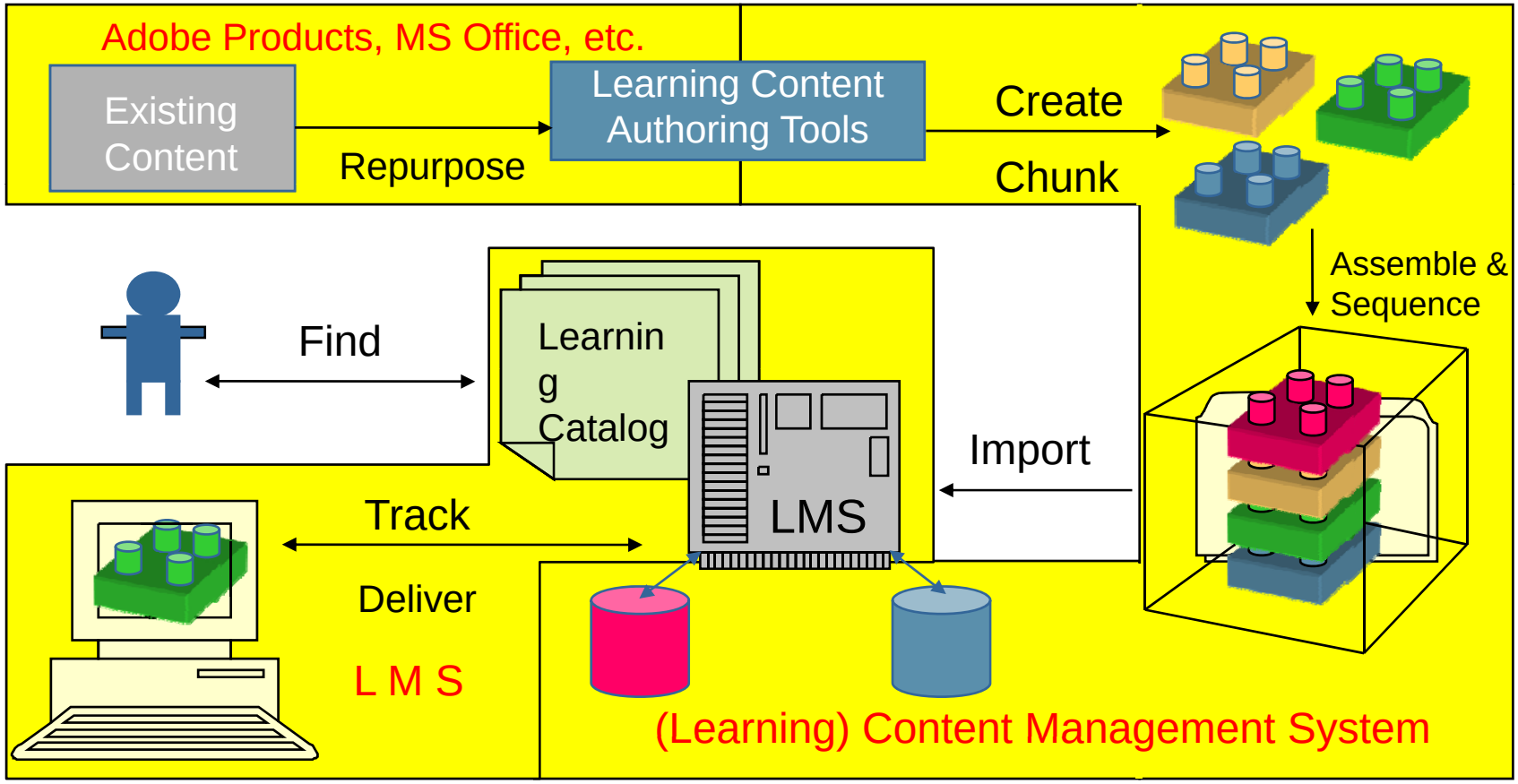
WHAT IS SCORM?

- **A REFERENCE MODEL**: A set of profiles of standards and specifications that tells you how to do something useful
- **A SOLUTION:** Solves the problem of separating Web-based training content from delivery systems
- **A STANDARD:** Adopted by most commercial LMS products and required by a DoD directive

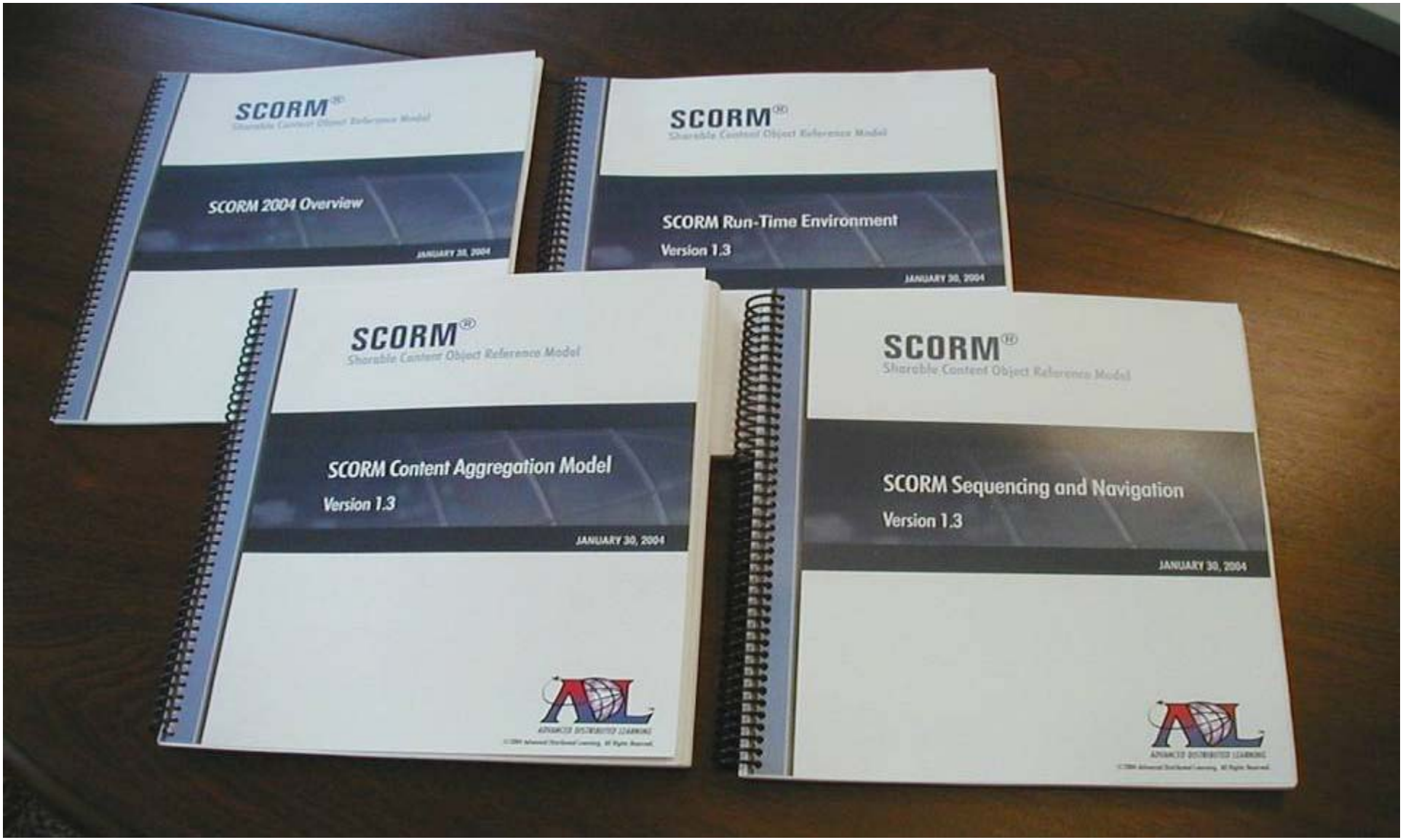
SCORM ASSUMES ...

- A particular content lifecycle (next slide)
- Web-based content
  - Interactive (optional)
  - Static (designed ahead of delivery)
- A single learner
- Progress by objectives

SCORM CONTENT LIFECYCLE



A SET OF BOOKS



THE SCORM BOOKS

Content Aggregation Model

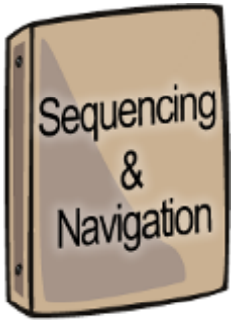
1. **Learning Object Metadata (1484.12)**
2. **Content Packaging (IMS Specification)**

Describe, export, transport and import

Run-Time Environment

3. **Application Programming Interface (1484.11.2)**
4. **Data Model (1484.11.1)**

Launch, track, communicate learner info



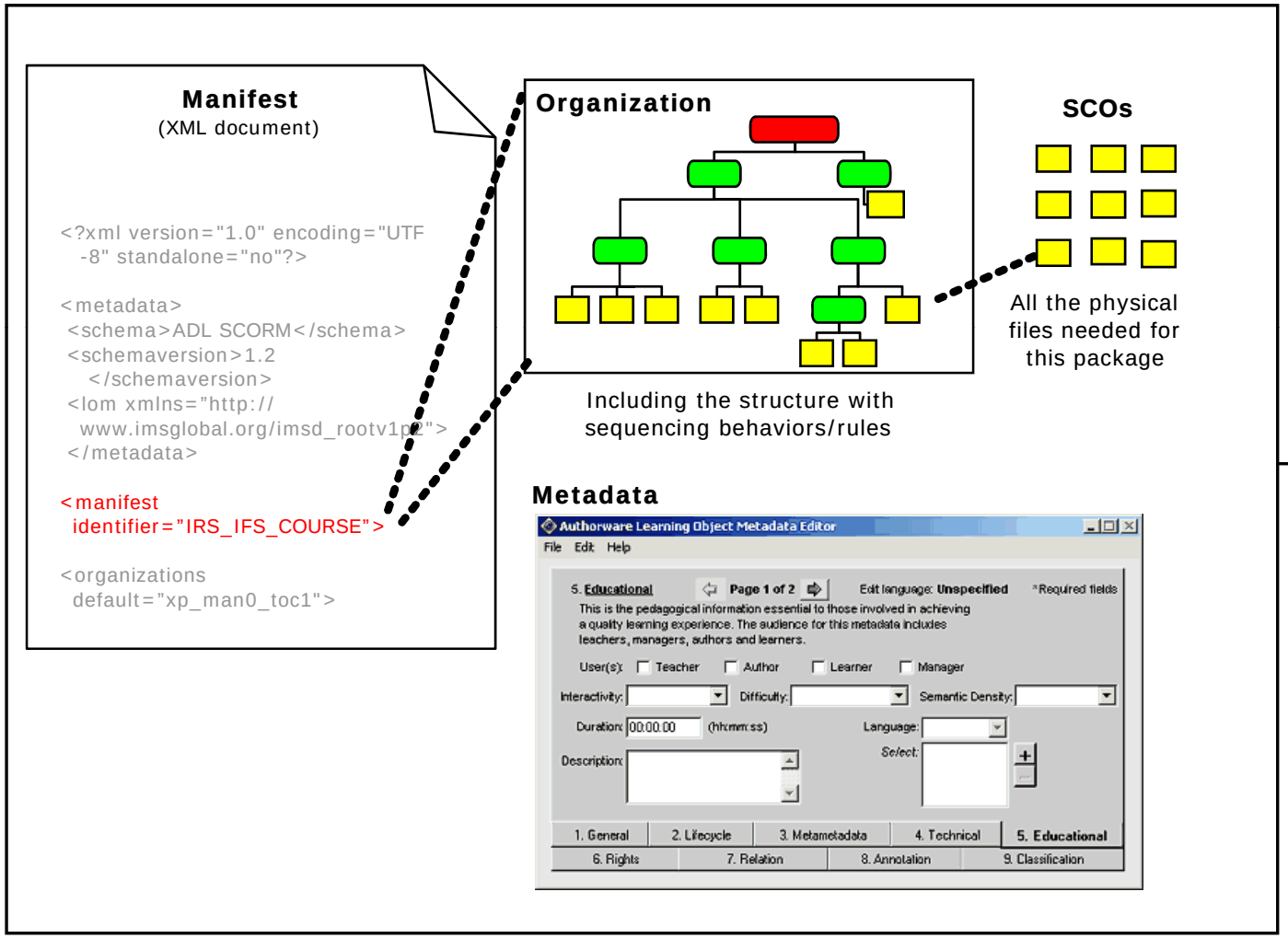
Sequencing & Navigation

5. **IMS Simple Sequencing**

Adaptive learning, instructional design

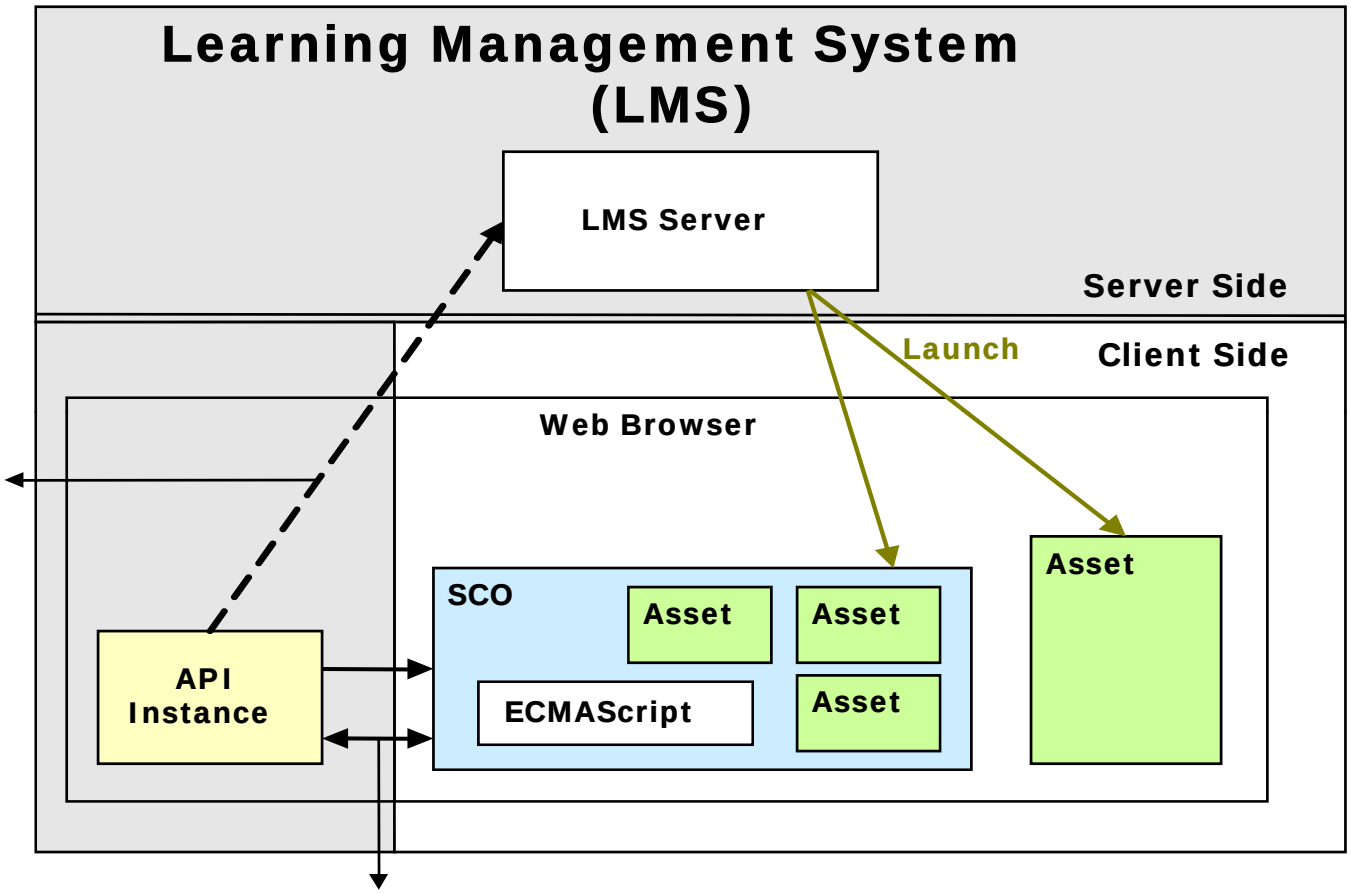
SCORM Content Aggregation Model

Content Package



Package Interchange Format

SCORM Runtime Environment



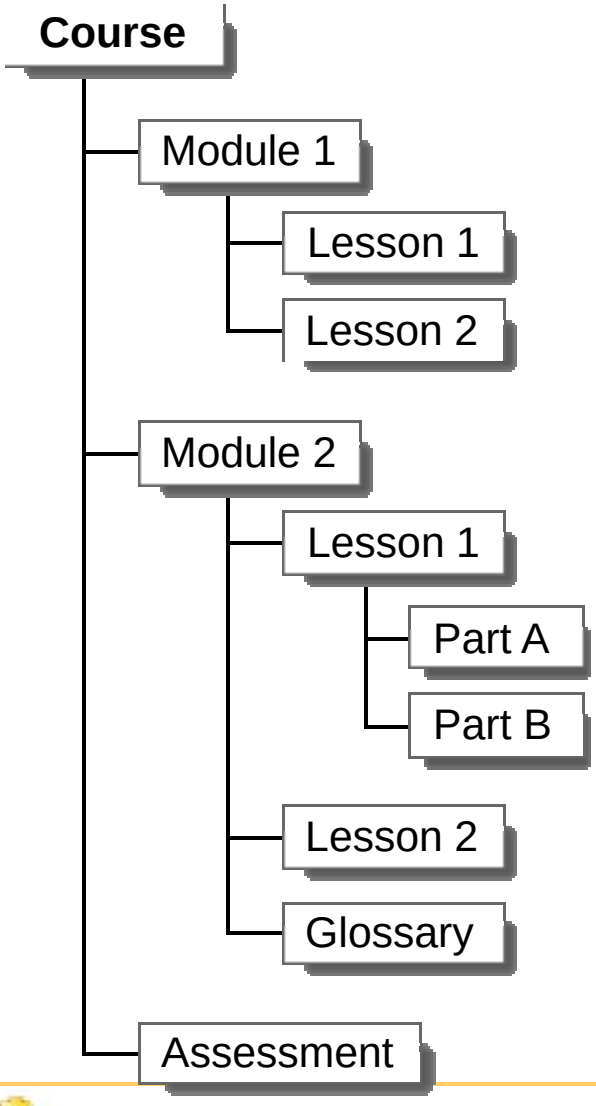
Data Model: Actual data sent back and forth between a SCO and LMS

Communication with backend server is not specified in SCORM.

API: *Communications Link between a SCO and LMS*

Data Model: Data retrieved from and stored in the LMS from the SCO

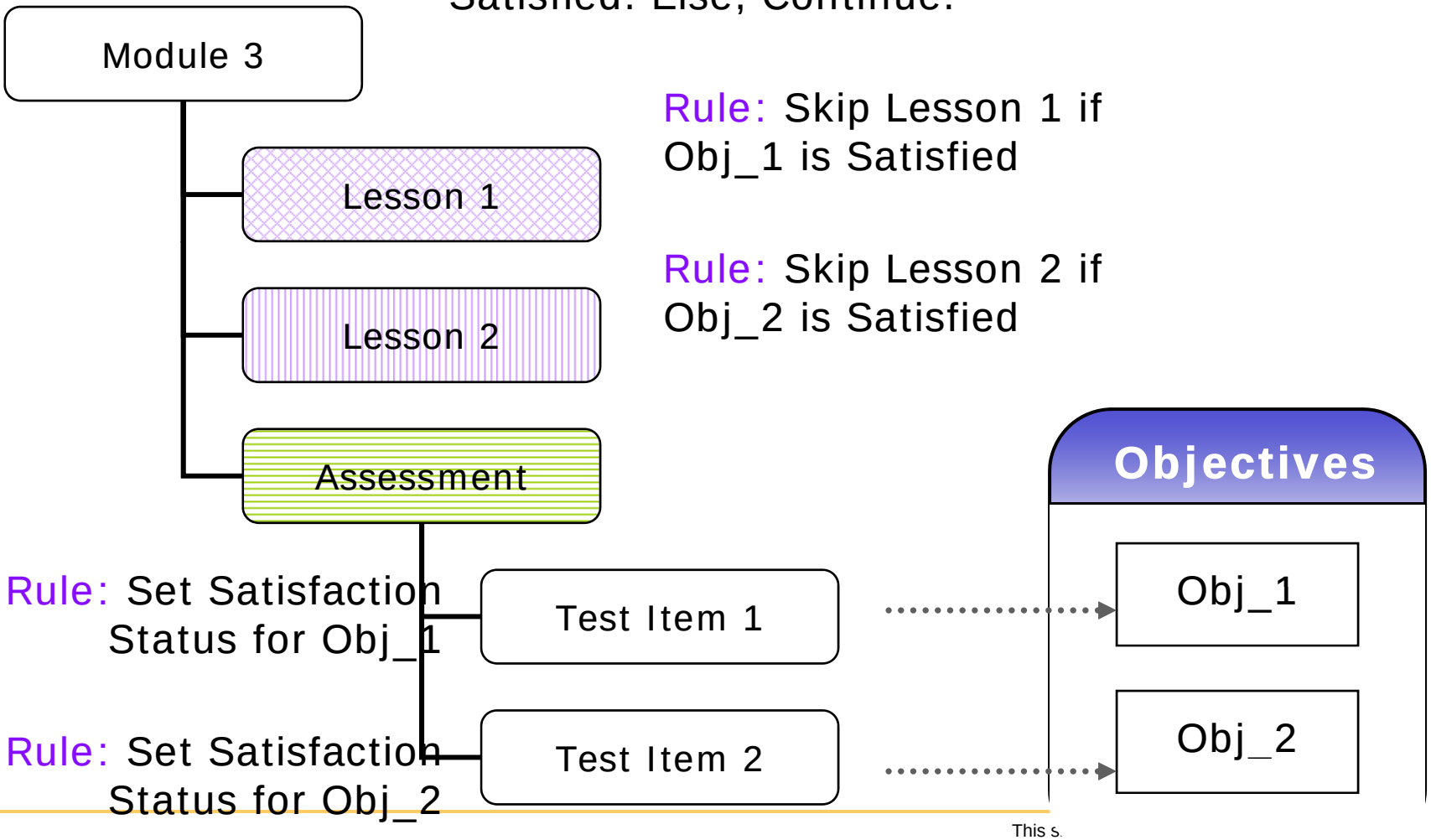
Sequencing & Navigation



- **Activities are aggregated and organized into a tree.**
- **A default traversal path can be modified by a learning designer.**
- **Traversal is triggered by a sequencing request.**
- **Request is triggered either by the learner through navigation events or by the delivery system.**
- **Sequencing rules are evaluated at runtime and can be conditional.**
- **Activities are delivered one at a time.**
- **Actual content resides in leaves of the tree**

Remediation Using Objectives

Rule: Exit if Obj_1 AND Obj_2 are Satisfied. Else, Continue.



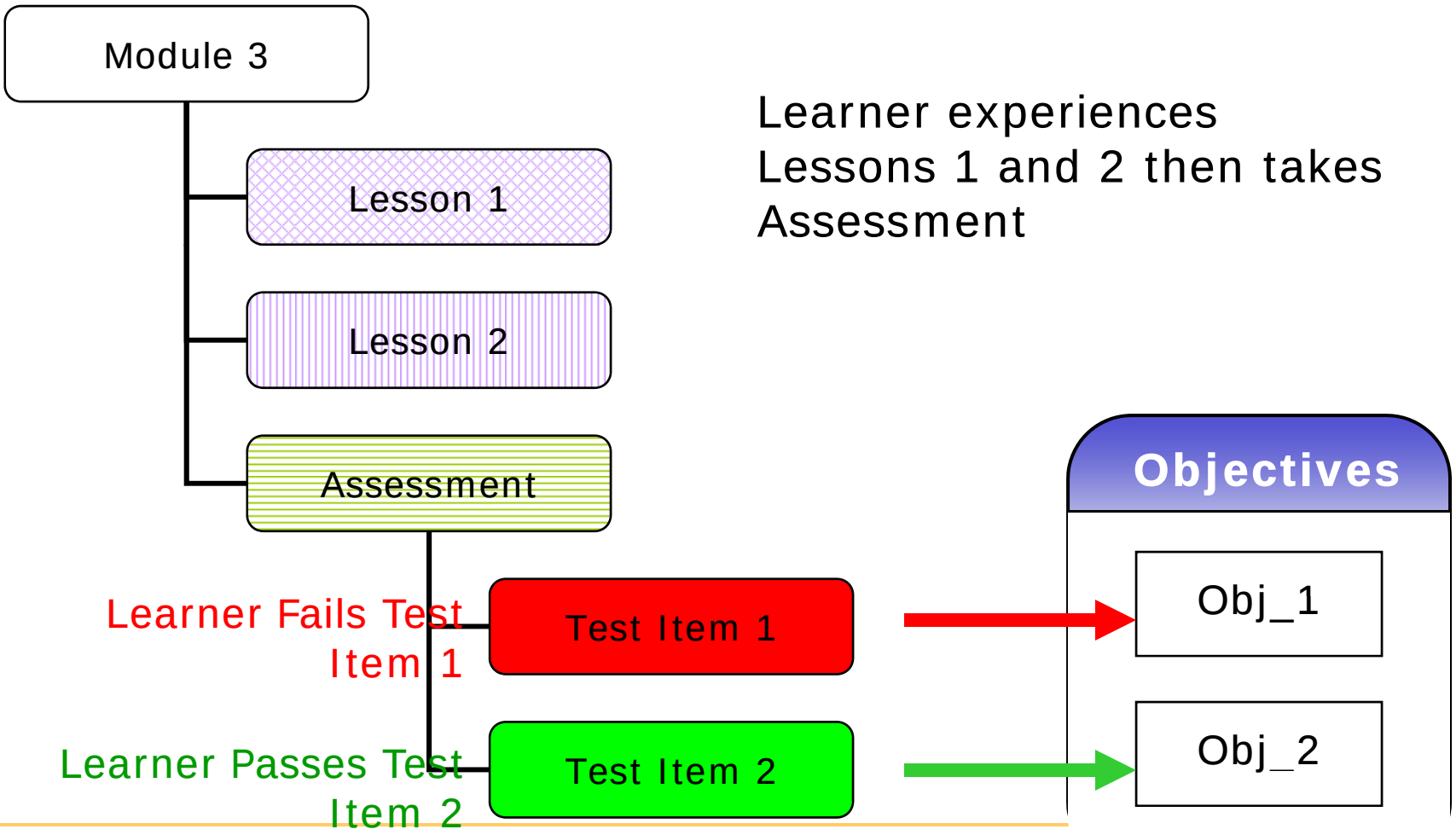
Rule: Skip Lesson 1 if Obj_1 is Satisfied

Rule: Skip Lesson 2 if Obj_2 is Satisfied

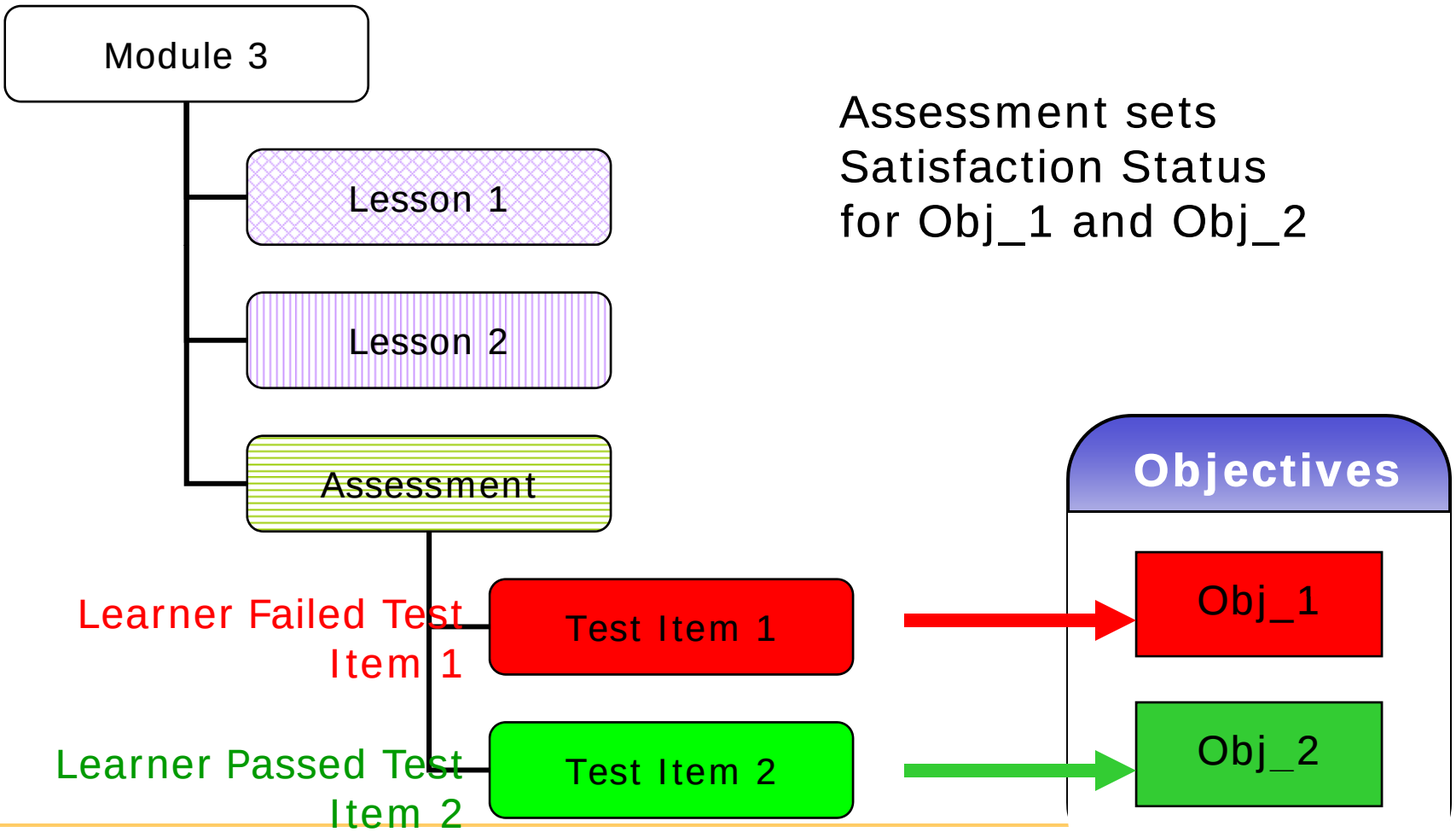
Rule: Set Satisfaction Status for Obj_1

Rule: Set Satisfaction Status for Obj_2

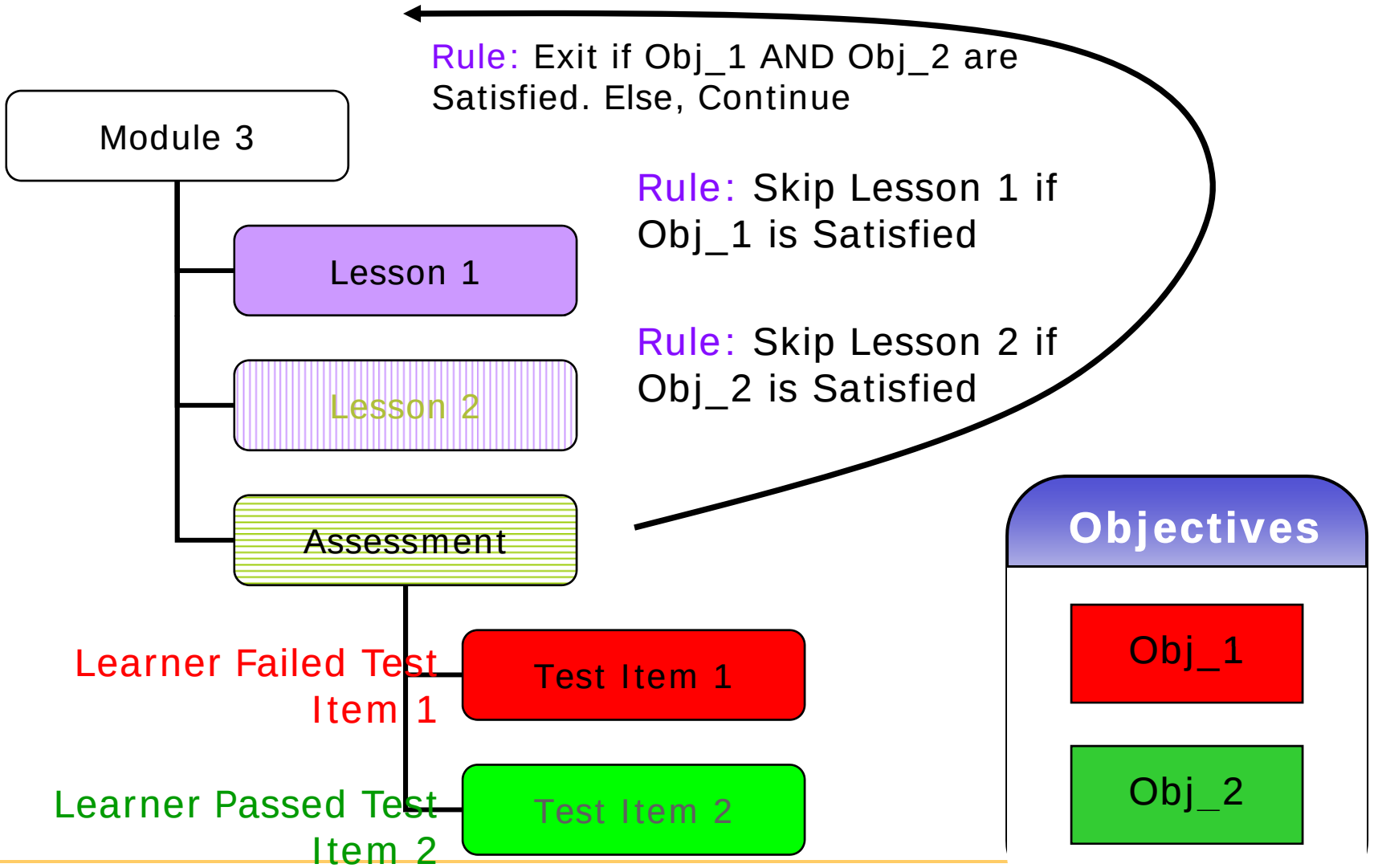
Remediation Using Objectives



Remediation Using Objectives



Remediation Using Objectives

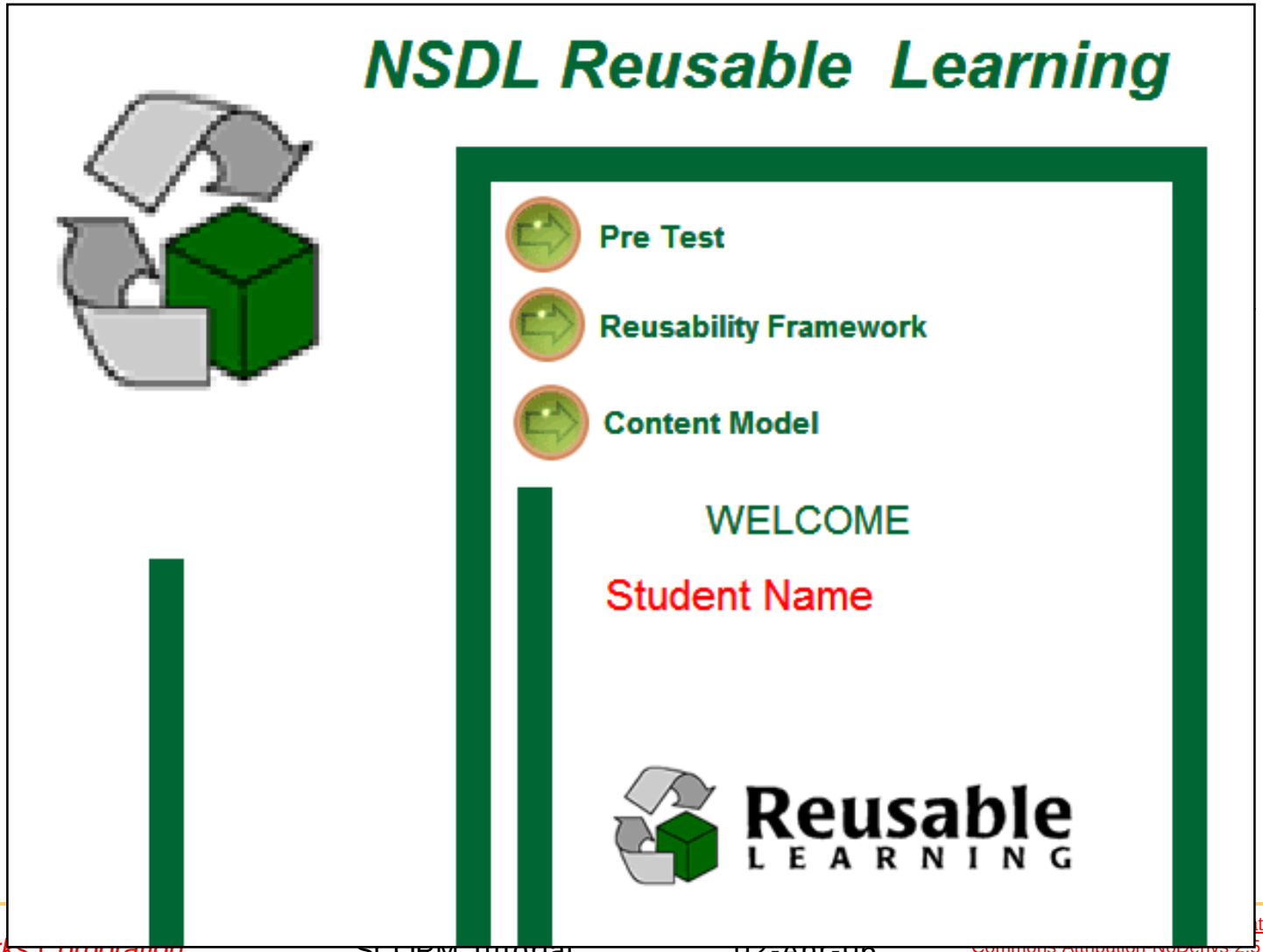


```
<?xml version="1.0" encoding="UTF-8"?>
<!--This is a Reload version 1.1.1 SCORM 2004 Content Package document-->
<!--Spawned from the Reload Content Package Generator - http://www.reload.ac.uk-->
<manifest xmlns="http://www.imsglobal.org/xsd/imscp_v1p1" xmlns:lom="http://ltsc.ieee.org/xsd/LOM" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:adlcp="http://www.adlnet.org/xsd/adlcp_v1p3" xmlns:imsss="http://www.imsglobal.org/xsd/imsss" xmlns:adlseq="http://www.adlnet.org/xsd/adlseq_v1p3"
xmlns:adlnav="http://www.adlnet.org/xsd/adlnav_v1p3" identifier="MANIFEST-CCED0204-39ED-D02A-67D6-D44E36B537CE" xsi:schemaLocation="http://www.imsglobal.org/xsd/imscp_v1p1 imscp_v1p1.xsd
http://ltsc.ieee.org/xsd/LOM lom.xsd http://www.adlnet.org/xsd/adlcp_v1p3 adlcp_v1p3.xsd http://www.imsglobal.org/xsd/imsss imsss_v1p0.xsd http://www.adlnet.org/xsd/adlseq_v1p3 adlseq_v1p3.xsd
http://www.adlnet.org/xsd/adlnav_v1p3 adlnav_v1p3.xsd" version="1.3">
 <metadata>
  <schema>ADL SCORM</schema>
  <schemaversion>CAM 1.3</schemaversion>
 </metadata>
 <organizations default="ORG-C141BB3E-BE8A-5FDC-0876-FA10C4774C14">
  <organization identifier="ORG-C141BB3E-BE8A-5FDC-0876-FA10C4774C14">
   <title>Template 5 - Remediation</title>
   <item identifier="ITEM-CFA9D822-93BB-D9FE-9243-267245B0E2C3" isvisible="true">
    <title>Retry Aggregation</title>
    <item identifier="ITEM-A0BAB980-6C55-EF4A-6080-D73FFB8D9B32" identifierref="RES-592A8E69-7EB7-B001-4F69-50C13209E942">
     <title>SCO-1 Lesson</title>
     <imsss:sequencing>
      <imsss:controlMode choice="true" choiceExit="true" flow="false" forwardOnly="false" useCurrentAttemptObjectiveInfo="true" useCurrentAttemptProgressInfo="true" />
      <imsss:sequencingRules>
       <imsss:preConditionRule>
        <imsss:ruleConditions conditionCombination="all">
         <imsss:ruleCondition operator="noOp" condition="satisfied" />
        </imsss:ruleConditions>
        <imsss:ruleAction action="skip" />
       </imsss:preConditionRule>
      </imsss:sequencingRules>
      <imsss:rollupRules rollupObjectiveSatisfied="false" rollupProgressCompletion="false" objectiveMeasureWeight="1.0000" />
      <imsss:objectives>
       <imsss:primaryObjective satisfiedByMeasure="false" objectiveID="obj_1">
        <imsss:mapInfo targetObjectiveID="obj_1" readSatisfiedStatus="true" readNormalizedMeasure="false" writeSatisfiedStatus="false" writeNormalizedMeasure="false" />
       </imsss:primaryObjective>
      </imsss:objectives>
     </imsss:sequencing>
    </item>
<item identifier="ITEM-D33D161E-B754-CEA4-5143-23255555C211" identifierref="RES-62A44D18-4897-1AAA-AA29-0825BB40FA0E">
     <title>SCO-2 Lesson</title>
```

This is from a SCORM imsmanifest file for the simple sequencing template on the previous page.

The code is more than 3 pages long.

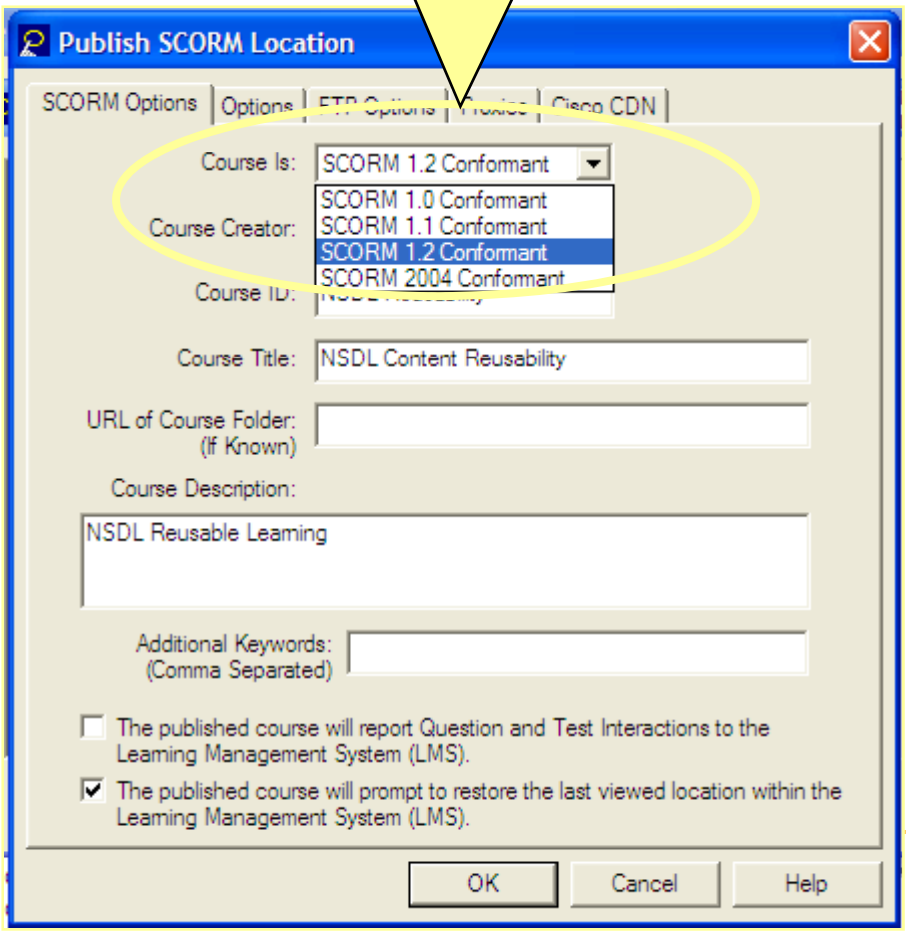
Example: Content Created in a SCORM Authoring Tool

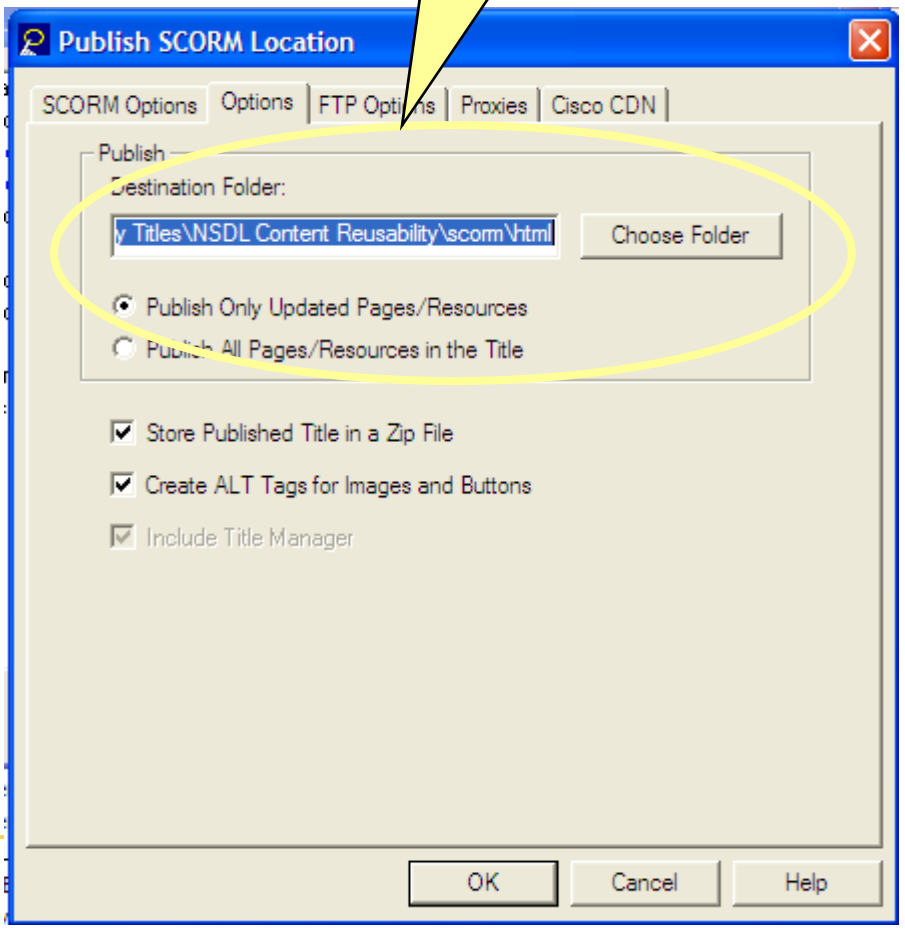


Content exported to a SCORM package

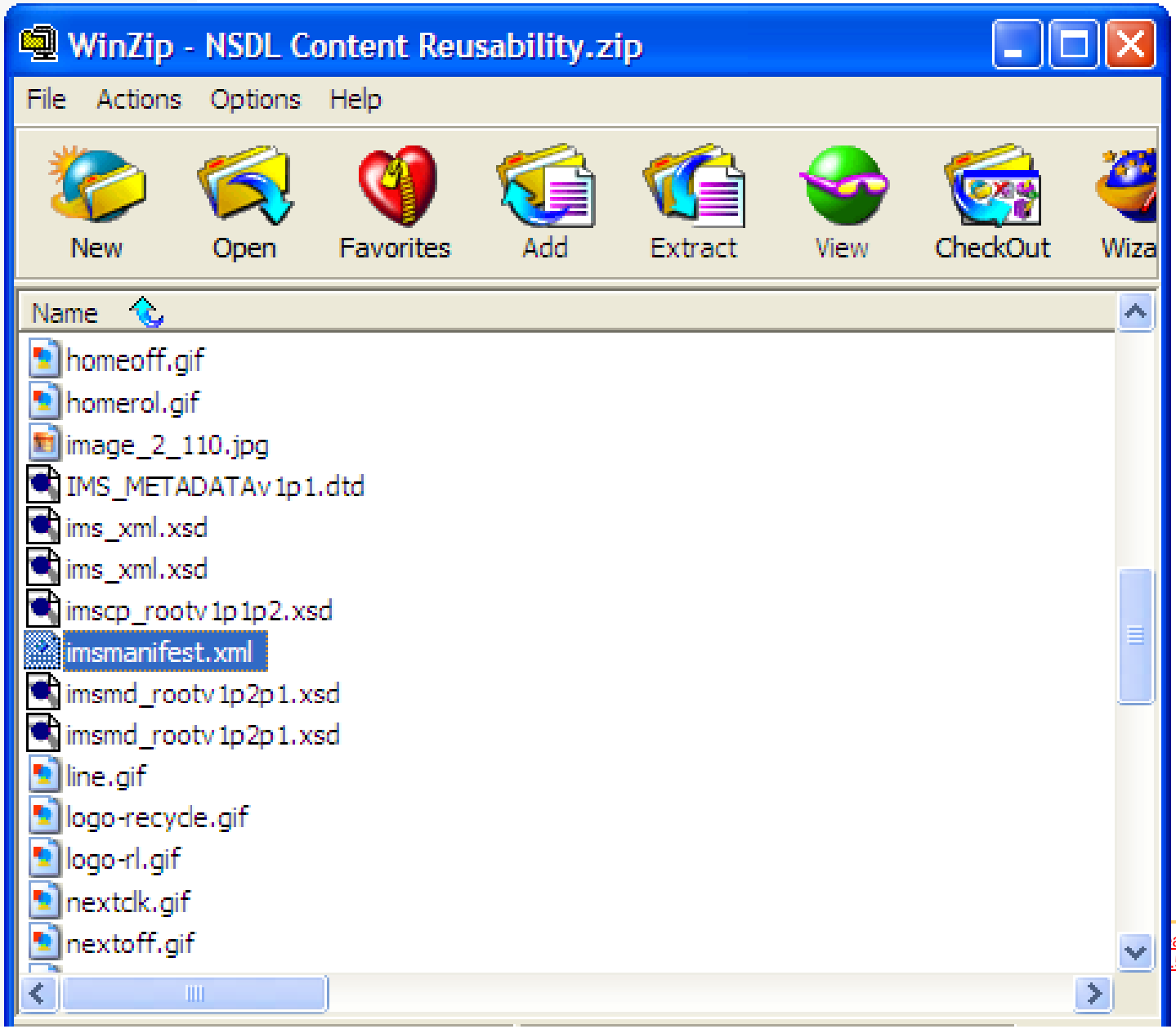
Type of content package to export

Export destination





Exported Content as a SCORM Package



Sign on to LMS and Import Content

search content

Administration

Content Display Settings

Manage Files

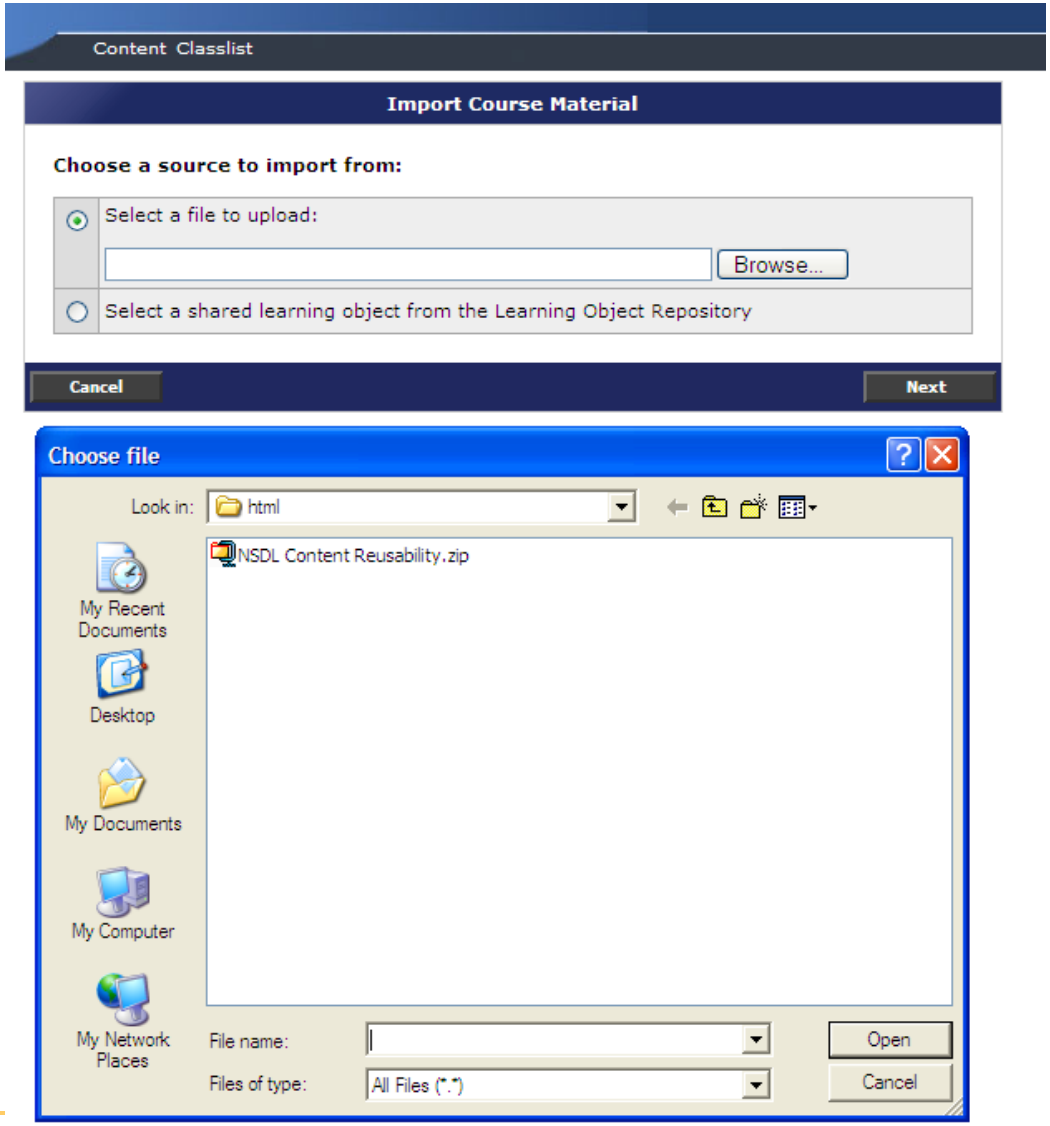
Manage Content

Add Module

Add Topic

Import Course

Scorm Reporting



RM Tu

Launch Content : Student Name Comes from LMS

Status, Score, Accesses, Time – Sent to LMS

Summary Information - Total (and %) of SCO's in Each Status Type

Status	Total	Percentage
	2/4	50.00%
COMPLETED	2/4	50.00%

Single User Single Course for DEMO STUDENT (GC)

Course	Progess	Last Accessed	Completed	Score	# Accesses	Time Spent
SCORM Samples - 206470						
SCORM Detective	Completed	May 12, 2004 5:07:23 PM		50	0	0000:00:00.00
Flash Quiz Sample						
Course	**Progess**	**Last Accessed**	**Completed**	**Score**	**# Accesses**	**Time Spent**
Flash SCORM Demonstrator - 212594						
Flash SCORM Demonstrator						
Course	**Progess**	**Last Accessed**	**Completed**	**Score**	**# Accesses**	**Time Spent**
NSDL Content Reusability - 214141						
NSDL Content Reusability	Completed	May 13, 2004 11:27:54 PM		50	2	0000:01:37.00

Back Print

Back Print

Summary

Historical Link … http://www.rhassociates.com/scorm.htm

- 5 parts of SCORM
  - Metadata (IEEE Standard)
  - Content Aggregation (IMS Specification)
  - Runtime Environment (IEEE Standards)
    - CMI Data Model
    - JavaScript API
  - Sequencing & Navigation (IMS Specification)
- Lots of functionality
- But how does it work??? *Stay tuned …*

Eduworks Corporation

A Practical Introduction to SCORM – Part 2

Details

02 – April - 2006

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Topics – Part 2

- Metadata
- Content Aggregation
- Runtime Environment
- Sequencing and Navigation

METADATA

Principles

- Metadata is …
  - An *assertion* about a resource
  - Not unique
  - Often subjective
- Metadata is for
  - Search & Discovery
  - Cataloguing
  - Describing resources
  - Processing resources
  - Adding *context* to resources

Perspectives

- Metadata standards are for communicating with arm's length partners
- The value of metadata is a network effect
- Pedagogical metadata for *learning* systems
- Rights for *distributed* systems
- Both for *distributed learning*
- Full text search is very effective*

* For text-based documents

Practicalities

- "Forms must Die" (AMG is key)
- Not required = not supported
- Requirements on *systems* are not the same as requirements on *instances*
- The network effect:
  - LMS ignore it
  - Repositories use it
  - Federations require it (CORDRA)

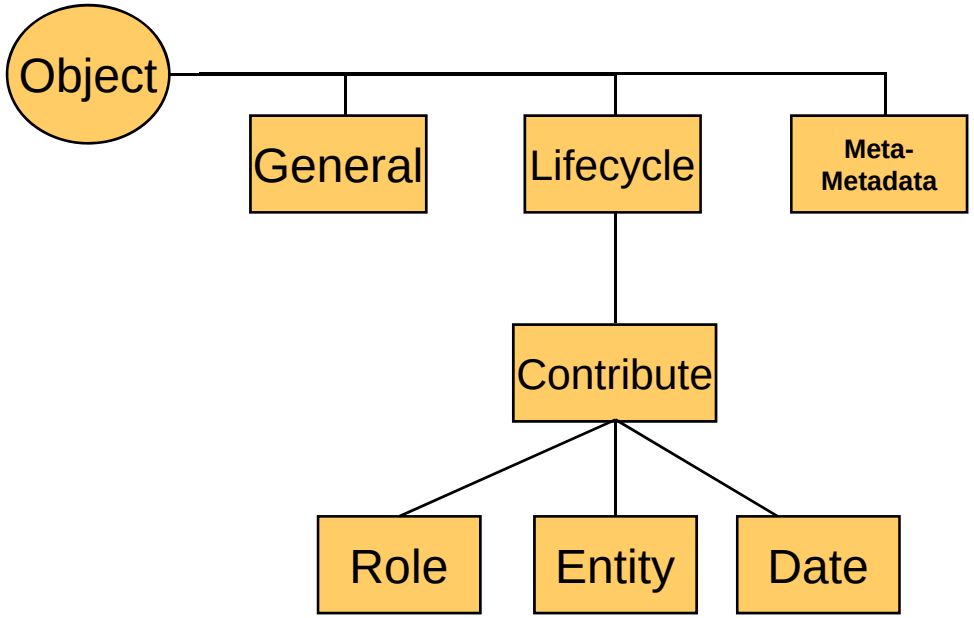
LOM Categories

- *General*: Descriptive information.
- *Life* Cycle: Provenance and current state
- *Meta-metadata*: About the metadata record itself
- *Technical*: Technical requirements and characteristics
- *Educational*: Pedagogical characteristics / intent
- *Rights:* Copyright and usage conditions
- *Relation:* Relationship to other resources
- *Annotation:* Comments
- *Classification*: Properties not specified above – classified using taxonomies

LOM is *structured* Metadata

```
1  <lifecycle>
2    <contribute>
3      <role>
4        <vocabulary>
5          <source>
6            <langstring xml:lang="x-
           none">LOMv1.0</langstring>
7          </source>
8          <value>
9            <langstring xml:lang="x-
           none">Author</langstring>
10         </value>
11       </vocabulary>
12     </role>
13     <centity>
14       <vcard>
15         begin:vcard
16         fn: Joe Author
17         end:vcard
18       </vcard>
19     </centity>
20     <date>
21       <datetime>2000-12-12</datetime>
22         <description>
23             <langstring>Date Description</langstring>
24       </description>
25     </date>
26   </contribute>
27 </lifecycle>
```

EXAMPLE



Example: SCO.XML*

*Courtesy ADL Academic Co-Lab

LOM Concepts

- Identifiers
  - Catalogue
  - Entry
- Langstrings
- Smallest Permitted Maximum (SPM)
- Controlled vocabularies
- Obligation
- Profiling Mechanisms
  - Changes in obligations (e.g. SCORM)
  - Additional vocabularies (non-conflicting)
  - Additional elements (non-conflicting)

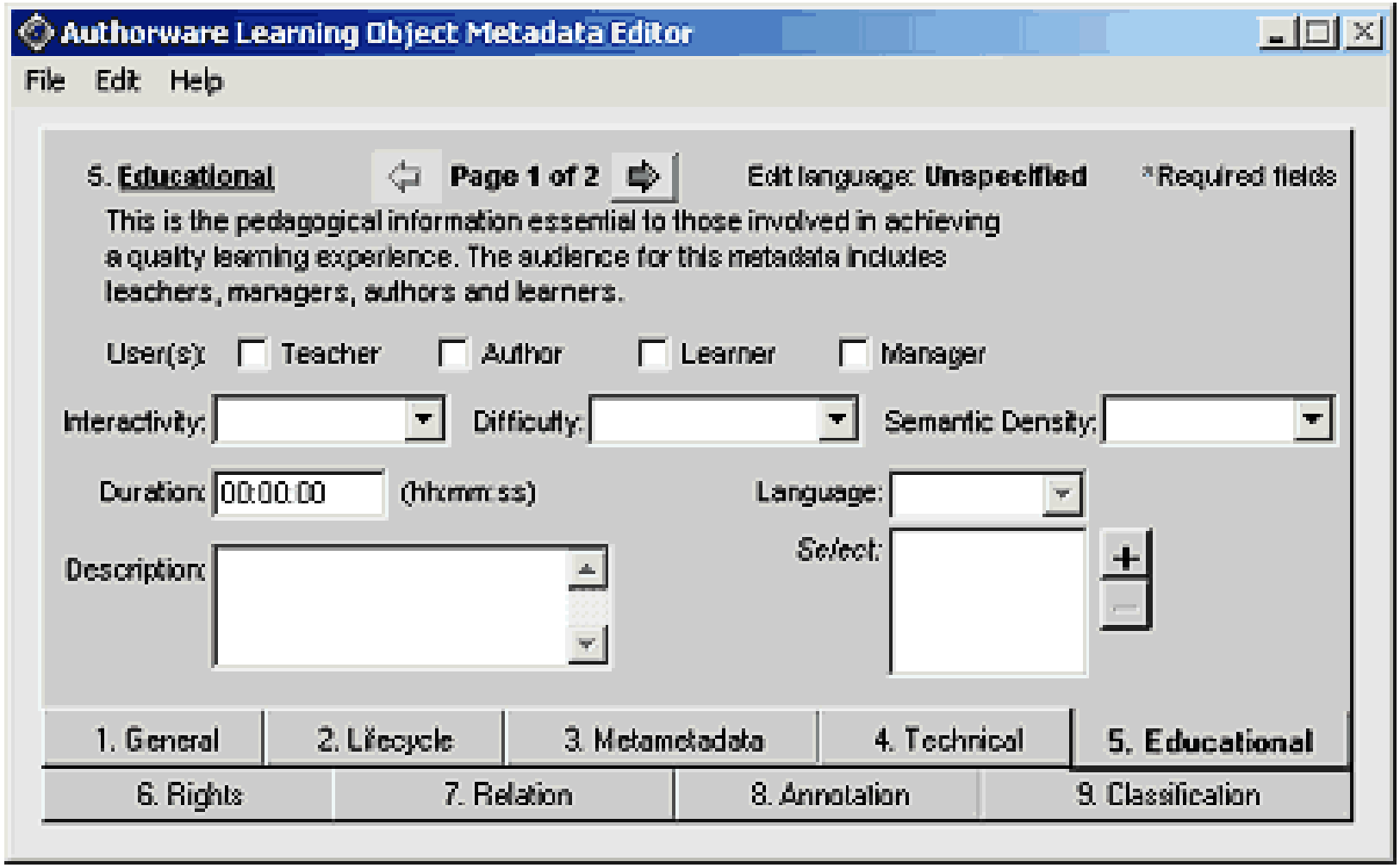
SCORM 2004 LOM Requirements

- Five levels of metadata
  - Content Aggregation Metadata
  - Activity Metadata
  - SCO Metadata
  - Asset Metadata
- Metadata is optional
- Metadata has mandatory fields *if used.*
  (See next slide)
- *Changes in SCORM 2004 Edition 3*

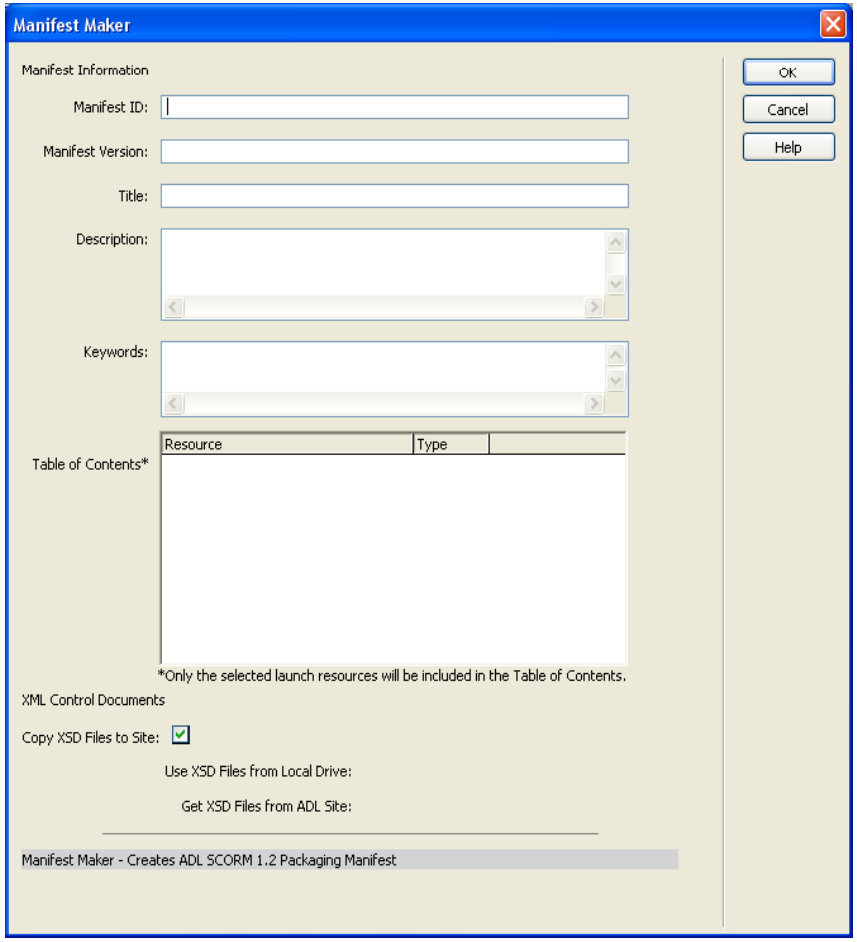
SCORM 2004 (V2) Obligatory Elements (if metadata used)

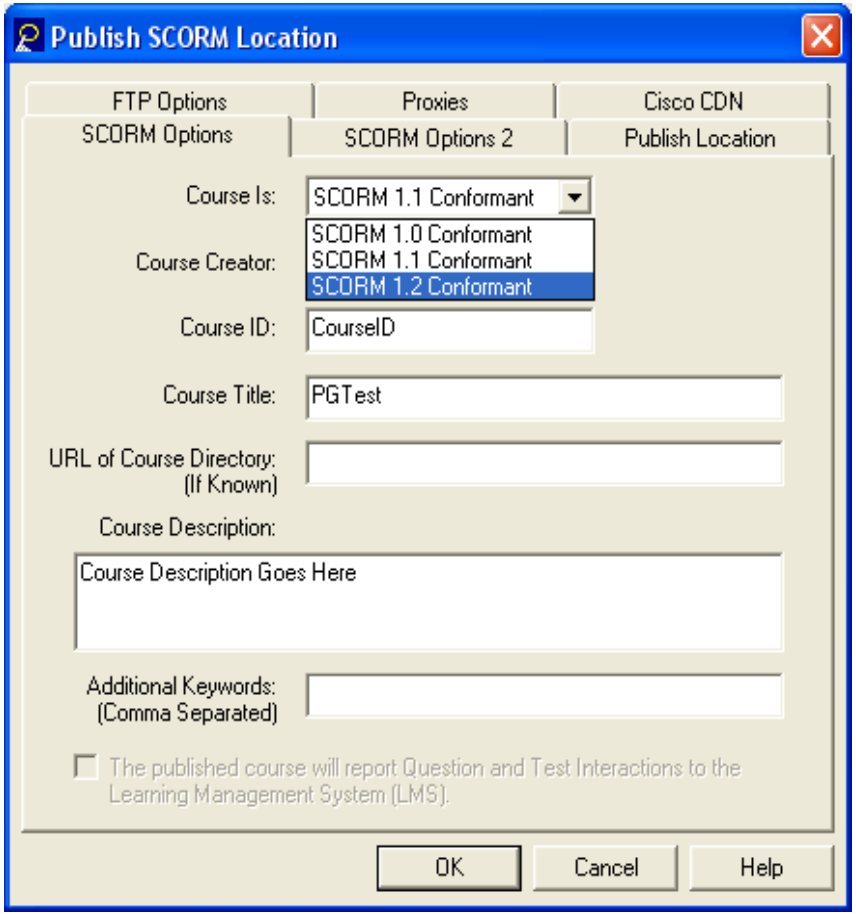
Name	Package	Content Aggregation / Activity / SCO	Asset
1.0 General	O	M	M
1.1 Identifier	O	M	M
1.1.1 Catalog	O	M	M
1.1.2 Entry	O	M	M
1.2 Title	O	M	M
1.4 Description	O	M	M
1.5 Keyword	O	M	O
2.0 Life Cycle	O	M	O
2.1 Version	O	M	O
2.2 Status	O	M	O
3.0 Meta-Metadata	O	M	M
3.1 Identifier	O	M	M
3.1.1 Catalog	O	M	M
3.1.2 Entry	O	M	M
3.3 Metadata Schema	O	M	M
4.0 Technical	O	M	M
4.1 Format	O	M	M
4.3 Location	O	M	M
6.0 Rights	O	M	M
6.1 Cost	O	M	M
6.2 Copyrights and Other Restrictions	O	M	M

Metadata in Authorware



Metadata in Lectora and Dreamweaver

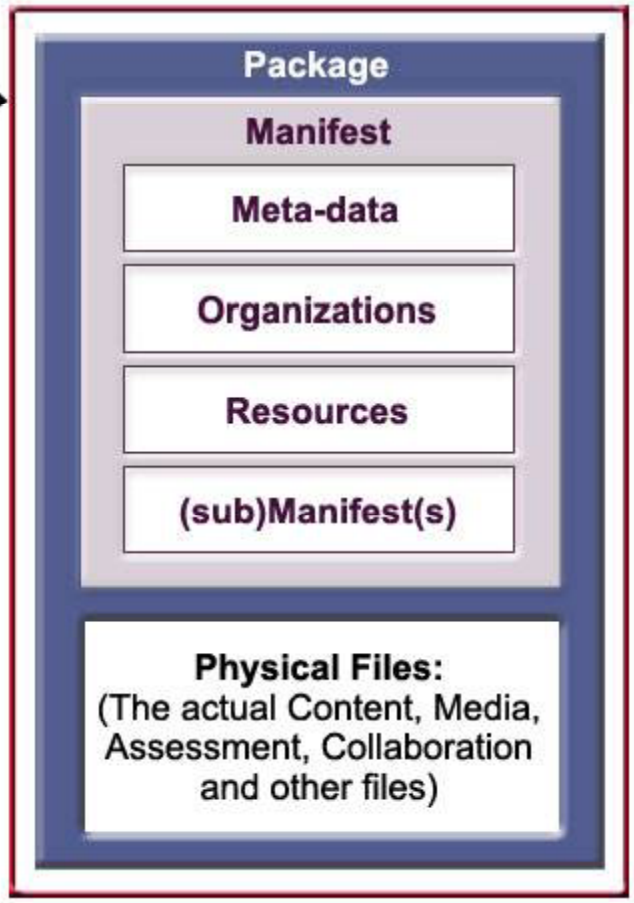




CONTENT AGGREGATION

Content Package

Package Interchange File

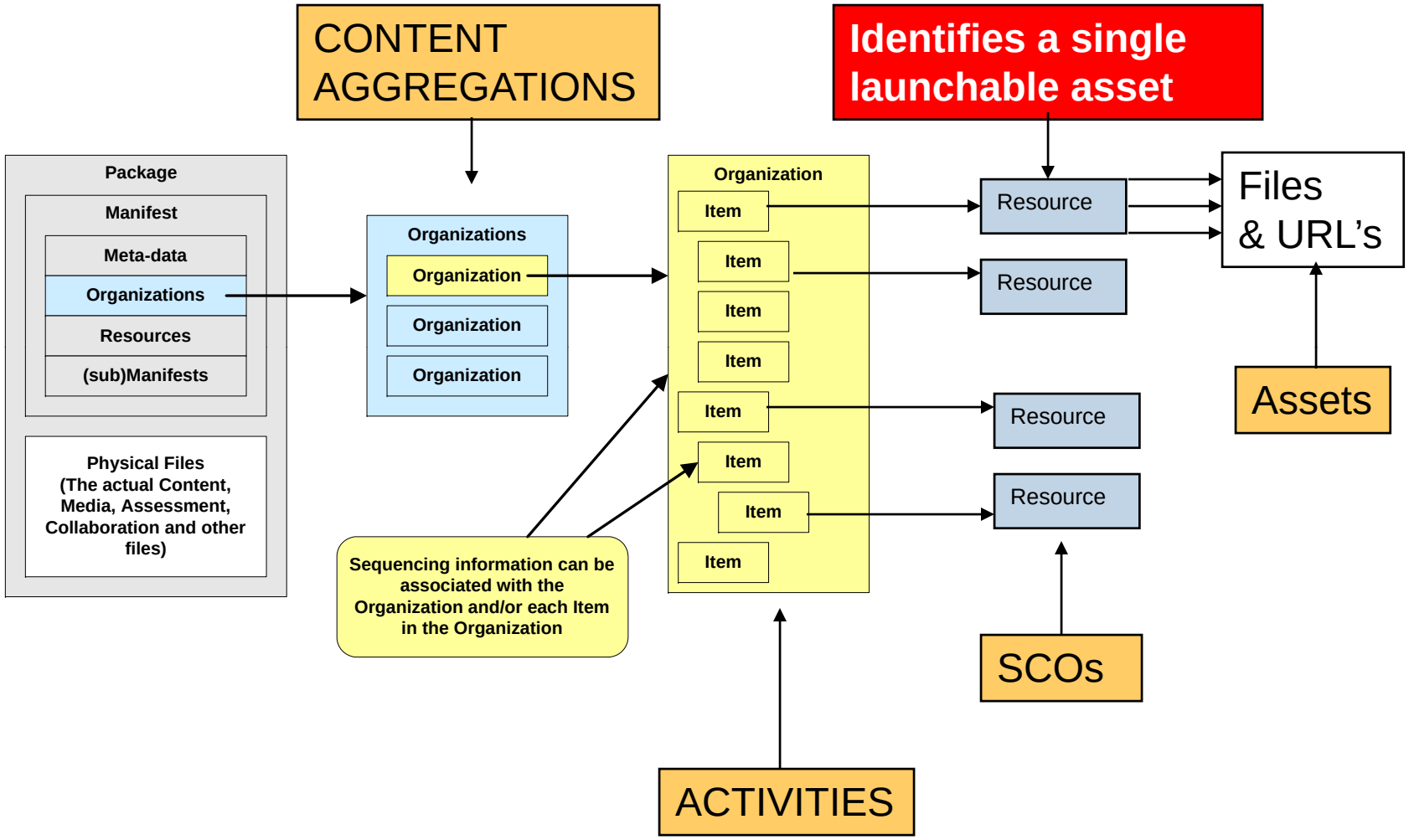


The manifest file is required to be called imsmanifest.xml – this is a good way to look for IMS content packages!

Academic Co-Lab Example
(Minimal Content Package)

Saba SCORM Detective
(More typical Content Package)

SCORM Content Packaging



Content Packaging Details

- *Resource Content Package* – for transporting files
- *Content Aggregation Content Package* – for defining / transporting SCOs (including sequencing and navigation)

No.	Elements	Resource Content Package	Content Aggregation Content Package
1	<manifest>	M	M
1.1	identifier	M	M
1.2	version	O	O
1.3	xml:base	O	O
1.4	<metadata>	M	M
1.4.1	<schema>	M	M
1.4.2	<schemaversion>	M	M
1.4.3	{Metadata}	O	O

Content Packaging Details

1.5	<organizations>	M	M
1.5.1	default	NP	M
1.5.2	<organization>	NP	M
1.5.2.1	identifier	NP	M
1.5.2.2	structure	NP	O
1.5.2.3	adlseq:objectivesGlobalToSystem	NP	O
1.5.2.4	<title>	NP	M
1.5.2.5	<item>	NP	M
1.5.2.5.1	identifier	NP	M
1.5.2.5.2	identifierref	NP	O
1.5.2.5.3	<title>	NP	M
1.5.2.5.4	isvisible	NP	O
1.5.2.5.5	parameters	NP	O
1.5.2.5.6	<item>	NP	O
1.5.2.5.7	<metadata>	NP	O
1.5.2.5.7.1	{Metadata}	NP	O
1.5.2.5.8	<adlcp:timeLimitAction>	NP	O
1.5.2.5.9	<adlcp:dataFromLMS>	NP	O
1.5.2.5.10	<adlcp:completionThreshold>	NP	O
1.5.2.5.11	<imsss:sequencing>	NP	O
1.5.2.5.12	<adlnav:presentation>	NP	O

Content Packaging Details

1.5.2.6	<metadata>	NP	O
1.5.2.6.1	{Metadata}	NP	O
1.5.2.7	<imsss:sequencing>	NP	O
1.6	<resources>	M	M
1.6.1	xml:base	O	O
1.6.2	<resource>	O	O
1.6.2.1	identifier	M	M
1.6.2.2	type	M	M
1.6.2.3	href	O	O
1.6.2.4	adlcp:scormType	M	M
1.6.2.5	xml:base	O	O
1.6.2.6	<metadata>	O	O
1.6.2.6.1	{Metadata}	O	O
1.6.2.7	<file>	O	O
1.6.2.7.1	href	M	M
1.6.2.7.2	<metadata>	O	O
1.6.2.7.2.1	{Metadata}	O	O
1.6.2.8	<dependency>	O	O
1.6.2.8.1	identifierref	M	M
1.7	<manifest>	O	O
1.8	<imsss:sequencingCollection>	NP	O

Content Packaging Notes

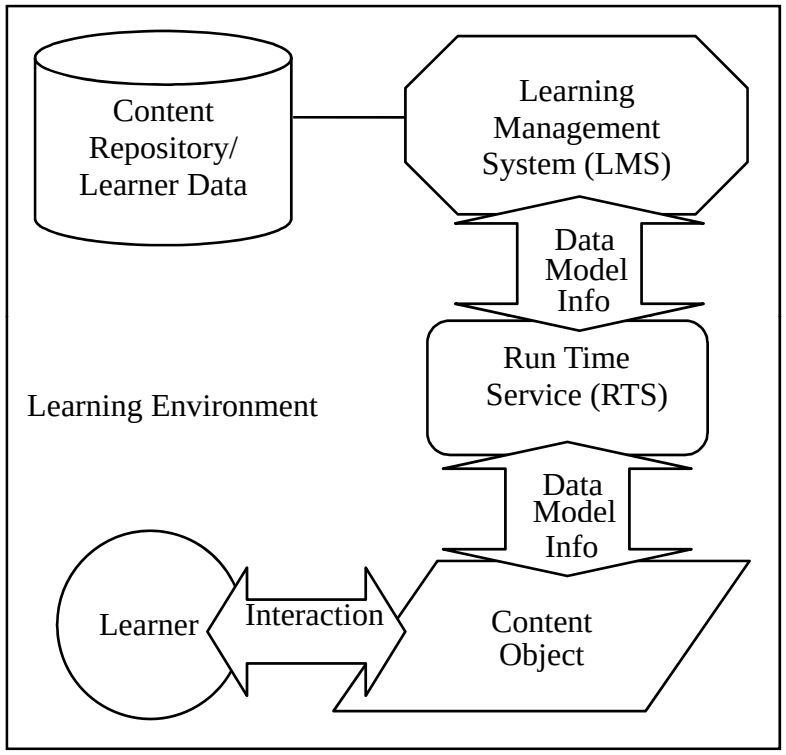
- Sub-manifests: Not recommended in SCORM 2004 Edition 3
- References can be to files in the package or external files (through a URL)
- All physical files should be declared (using <file> element)
- Un-packing requires working local references

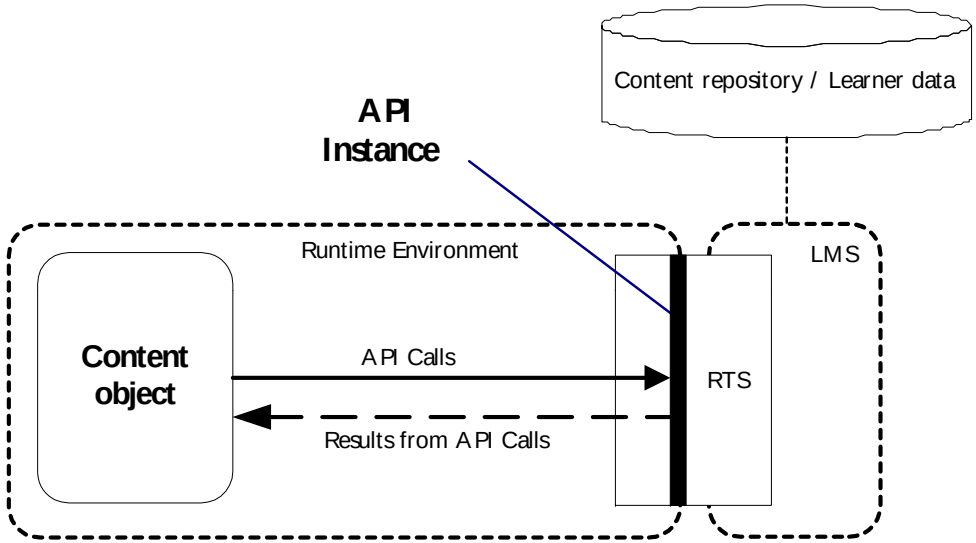
Interoperating in the Larger World

- There ARE other metadata standards and specifications and standards
  - Dublin Core
- There ARE other content aggregation specifications and standards
  - MPEG 21 Part 2
  - METS
- There ARE systems that use IMS Content Packaging but do *not* use SCORM

RUNTIME COMMUNICATION

Runtime Conceptual Model

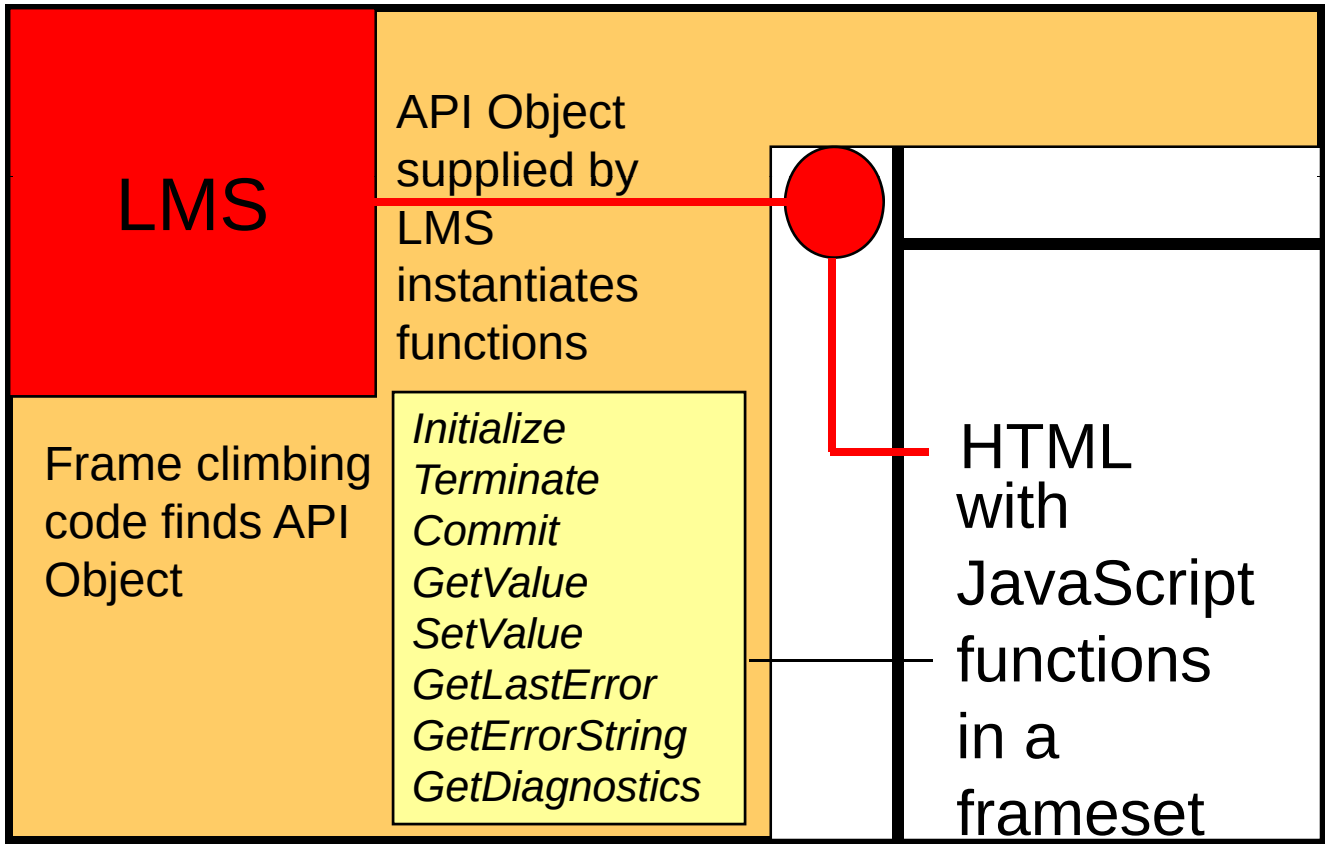




RUNTIME COMMUNICATION (LMS)

API Finder Example

SCO Functions Example



Runtime Data Model

- Learner Information
  - Learner_id
  - Learner_name
  - Learner_preference
  - Comments_from_learner
- Launch Information
  - Location (e.g. URL)
  - Comments_from_LMS
  - Max_time_allowed
  - Mode (e.g. credit, browse)
  - Launch_data
  - Suspend_data
  - Entry (ab_initio, resume, _nil_)
  - Exit (timeout, suspend, logout, normal, _nil_)
- Pedagogic Data
  - Objectives
  - Progress_measure (0 to 1)
  - Scaled_passing_score [-1.0,1.0]
  - Score (scaled, raw, min, max)
  - Success_status (passed, failed,unkown)
  - Completion_status (completed, incomplete, not_attempted, unknown)
  - Completion_threshold
  - Credit (credit,no credit)
  - Session_time
  - Time_limit_action (what to do)
  - Total_time
  - Interactions [Next Slide]

Interactions

- Type: T/F, FIB, etc.
- Objective_IDs: Objectives associated with interaction
- TimeStamp: Time when first available
- Correct Responses: Correct response pattern
- Weighting: For “roll up”
- Learner Response: Actual response
- Latency: Time between availability and first response
- Result: Evaluation of correctness
- Description

This is different from the QTI model!

Boeing Presentation from February: Using SCORM to Store Student Interactions

SetValue(cmi.interactions.0.id,onRunway)
SetValue(cmi.interactions.0.type,performance)
SetValue(cmi.interactions.0.time,13:54:54.66)
SetValue(cmi.interactions.0.latency,00:02:15.88)
SetValue(cmi.interactions.0.correct_responses.0.pattern, true)
SetValue(cmi.interactions.0.student_response,false)
SetValue(cmi.interactions.0.result,wrong)

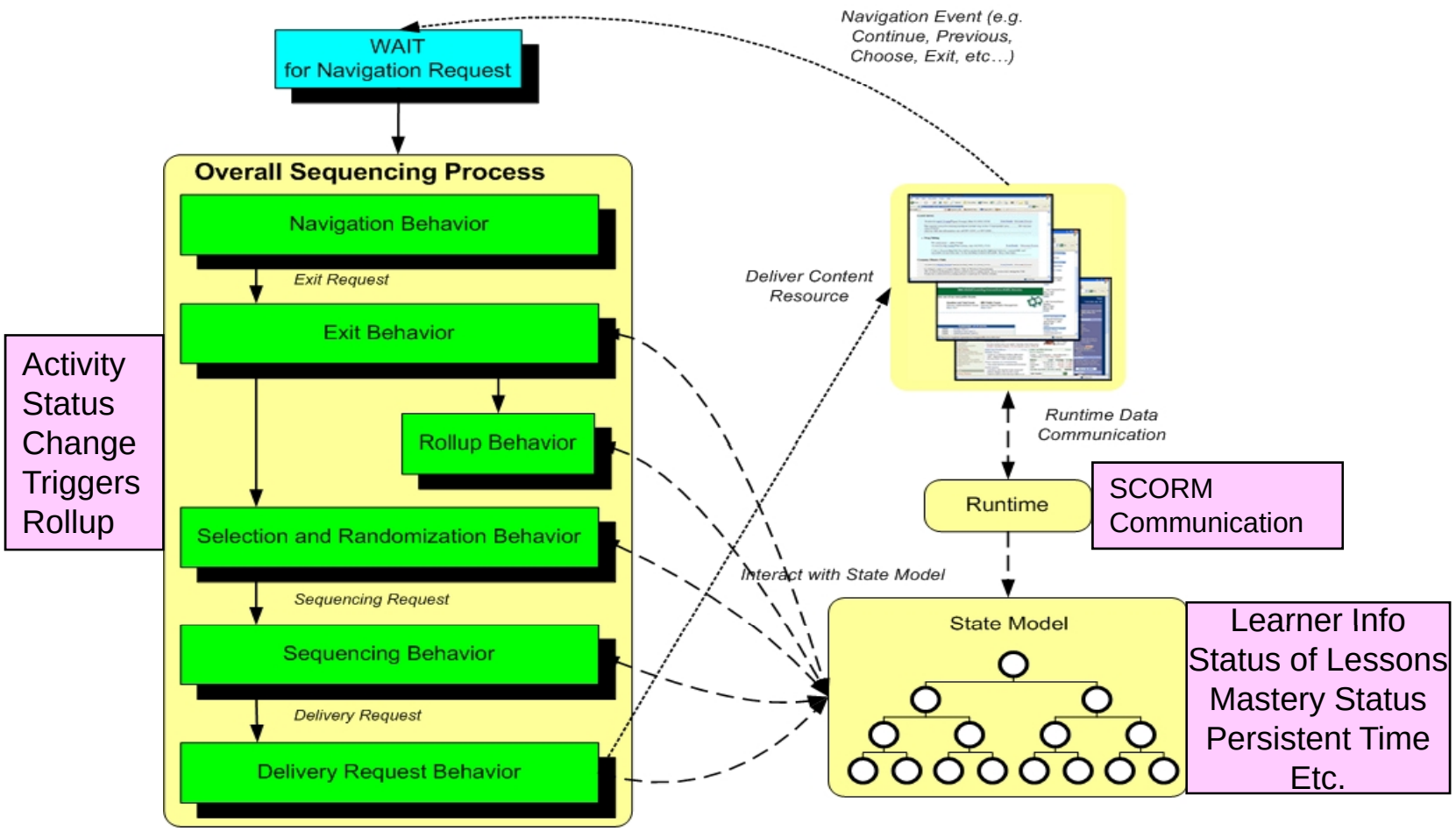
SetValue(cmi.interactions.1.id,wire)
SetValue(cmi.interactions.1.student_response,0)
SetValue(cmi.interactions.2.id,speed)
SetValue(cmi.interactions.2.correct_responses.0.pattern, 125)
SetValue(cmi.interactions.2.student_response,0)
SetValue(cmi.interactions.2.result,wrong)
SetValue(cmi.interactions.3.id,flightPath)
SetValue(cmi.interactions.3.student_response,-4)
SetValue(cmi.interactions.4.id,missDistance)
SetValue(cmi.interactions.4.student_response,-941.3)

Sequencing and Navigation

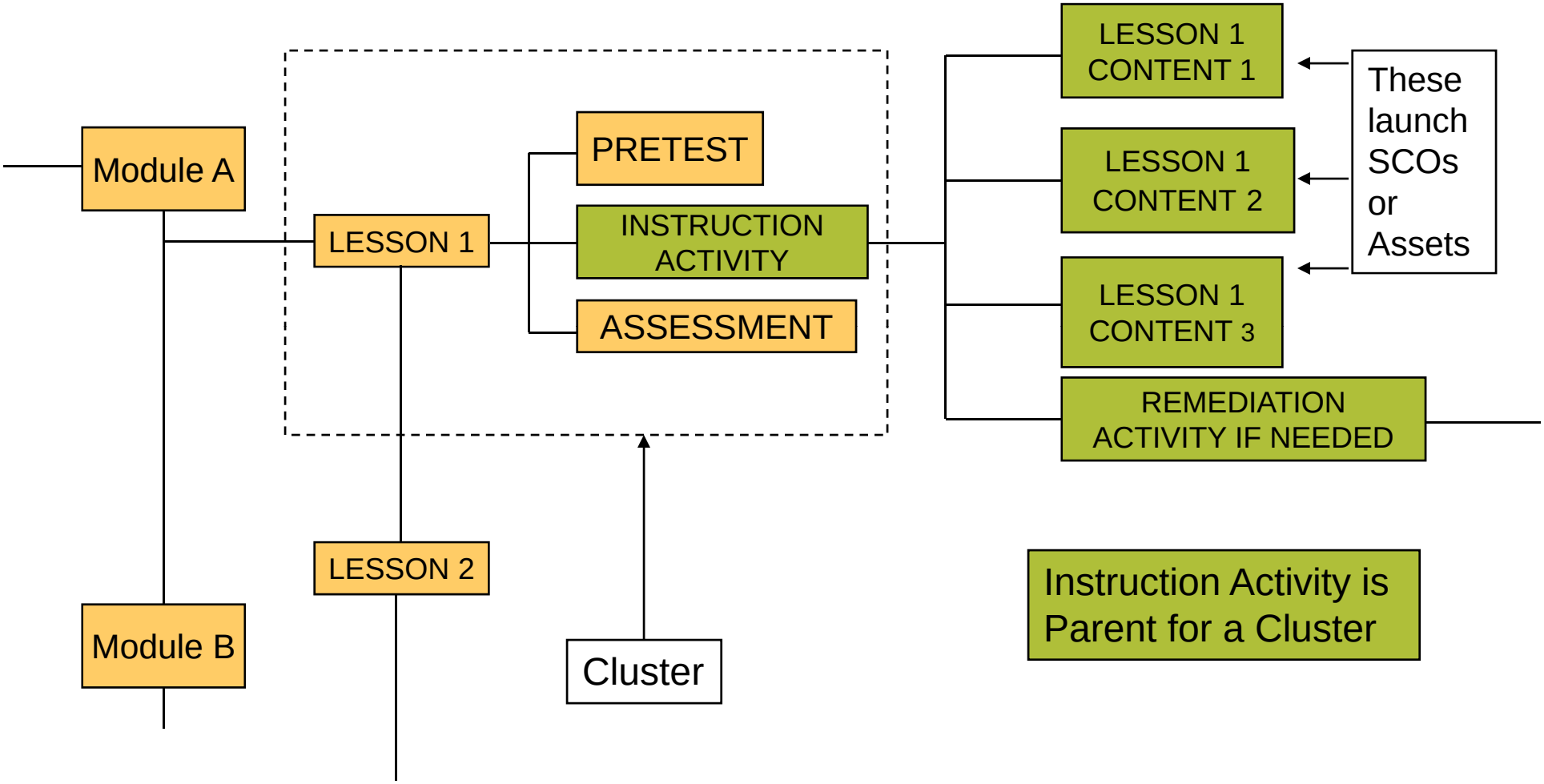
SCORM 2004 – IMS SIMPLE SEQUENCING

- Activity Tree
  - Activities can contain learning resources and other activities
  - Each activity has unique identifier within tree
  - Maps to *items* in Content Packaging
- Navigation triggered by *navigation requests*
  - Applies to whole tree or *clusters*.
  - *Clusters* have one level of children, but children could be clusters
  - Default behavior is *choice* (user chooses)
  - *Flow* defines linear or adaptive sequencing
  - *Forward only* prevents “previous” behavior
- State Model
  - Maintained by LMS (RTS)
  - Includes *completion status, duration* and *objectives* associated with activities and with each *attempt* at an activity
  - Objectives have *status* and *measure.* (Completion versus a score.)
- Objectives
  - Objectives are local or global
  - Activities can affect and use multiple objectives

Simple Sequencing Conceptual Model



Typical Activity Tree



Sequencing Model Parts

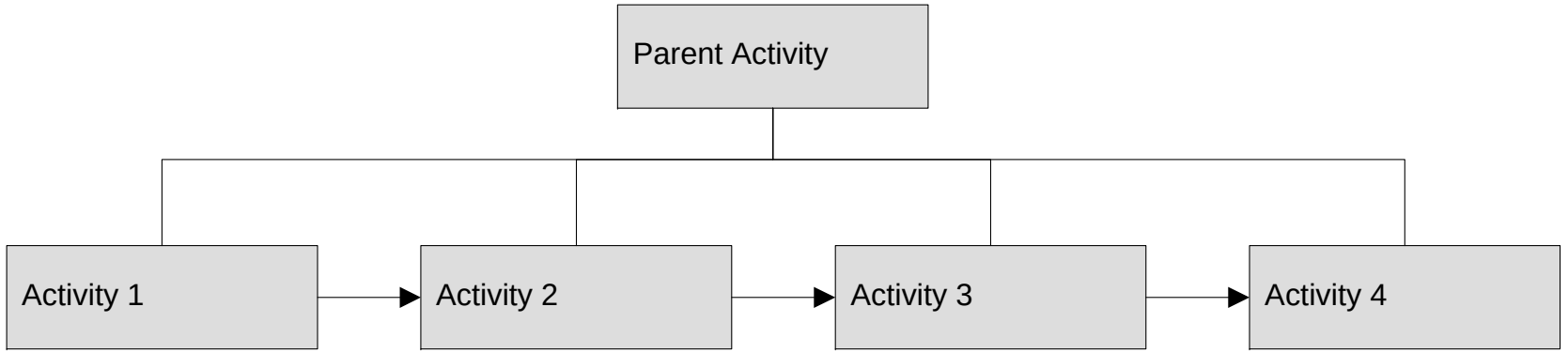
- Navigation Requests and Actions
- Sequencing
- Objectives
- Tracking
- Rollup
- Auxiliary Resource

Navigation Requests

- Triggered by environment or content
- Allowable Requests:
  - *Start*
  - *Resume All*
  - *Continue*
  - *Previous*
  - *Choice*
  - *Exit*
  - *Exit All*
  - *Suspend All*
  - *Abandon*
  - *Abandon All*
- If LMS issues a continue, previous or choice request while an activity is being attempted, it causes an exit.

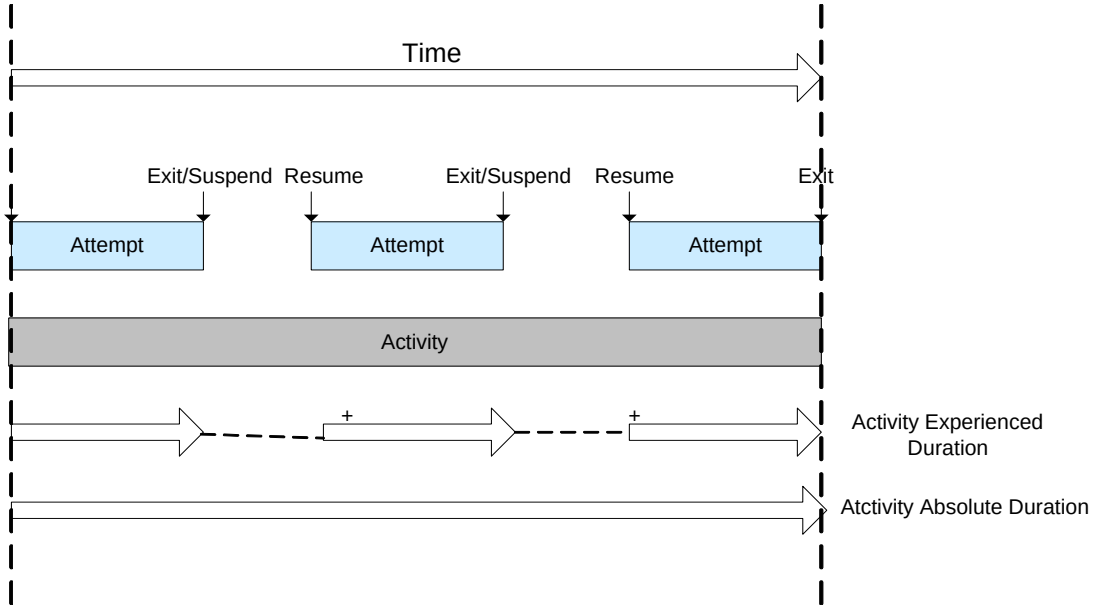
Sequencing: Control Modes

- Choice (Table of Contents)
- Flow (Linear Progression)
- Forward Only
- Exit



Sequencing: Limit Conditions

- Attempts
- Duration
  - Attempt Absolute Duration
  - Attempt Experienced Duration
  - Activity Absolute Duration
  - Activity Experienced Duration
- Availability Time
  - End
  - Begin

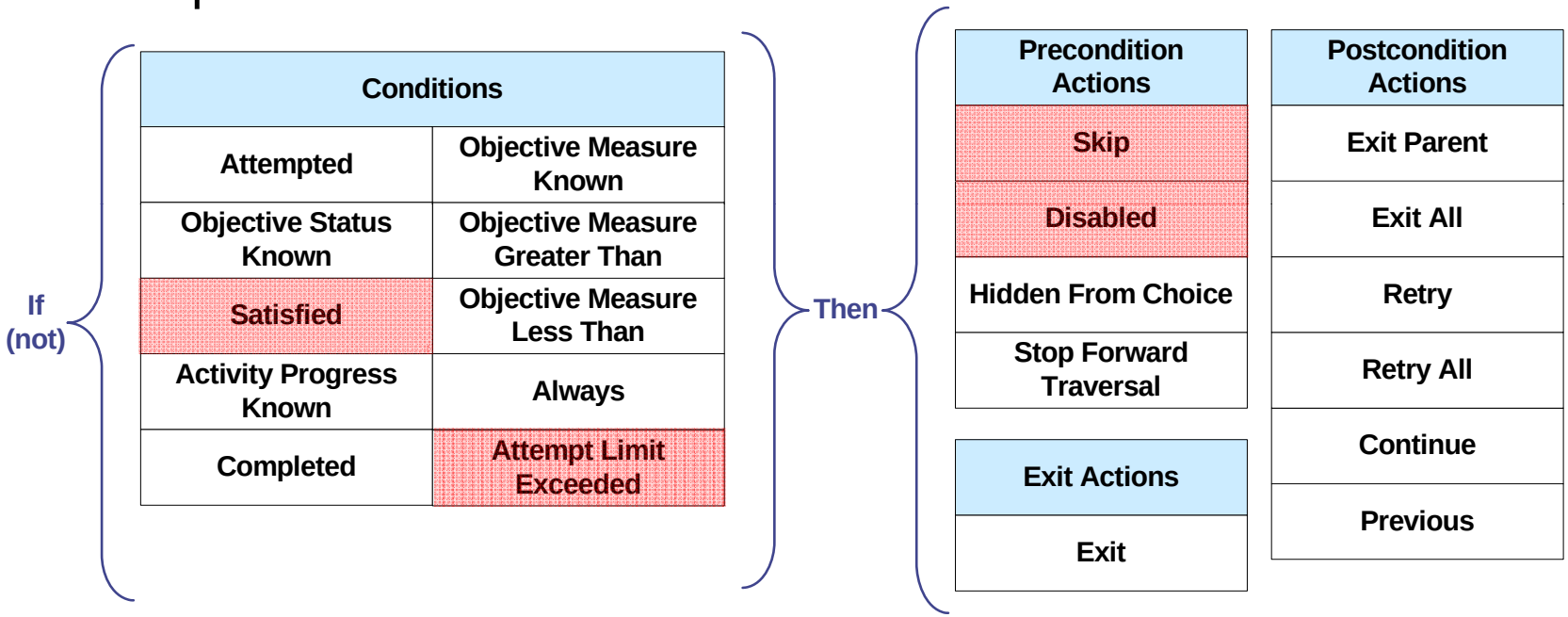


Sequencing: Selection and Randomization of Child Activities

- Can select a given number of child activities
- Can randomize order of child activities
- Selection or Randomization can be applied
  - Never (all child activities selected)
  - Once (first time attempted)
  - On each new attempt

Sequencing Rules

Sequencing rules specify what action should occur under a particular condition



For example:

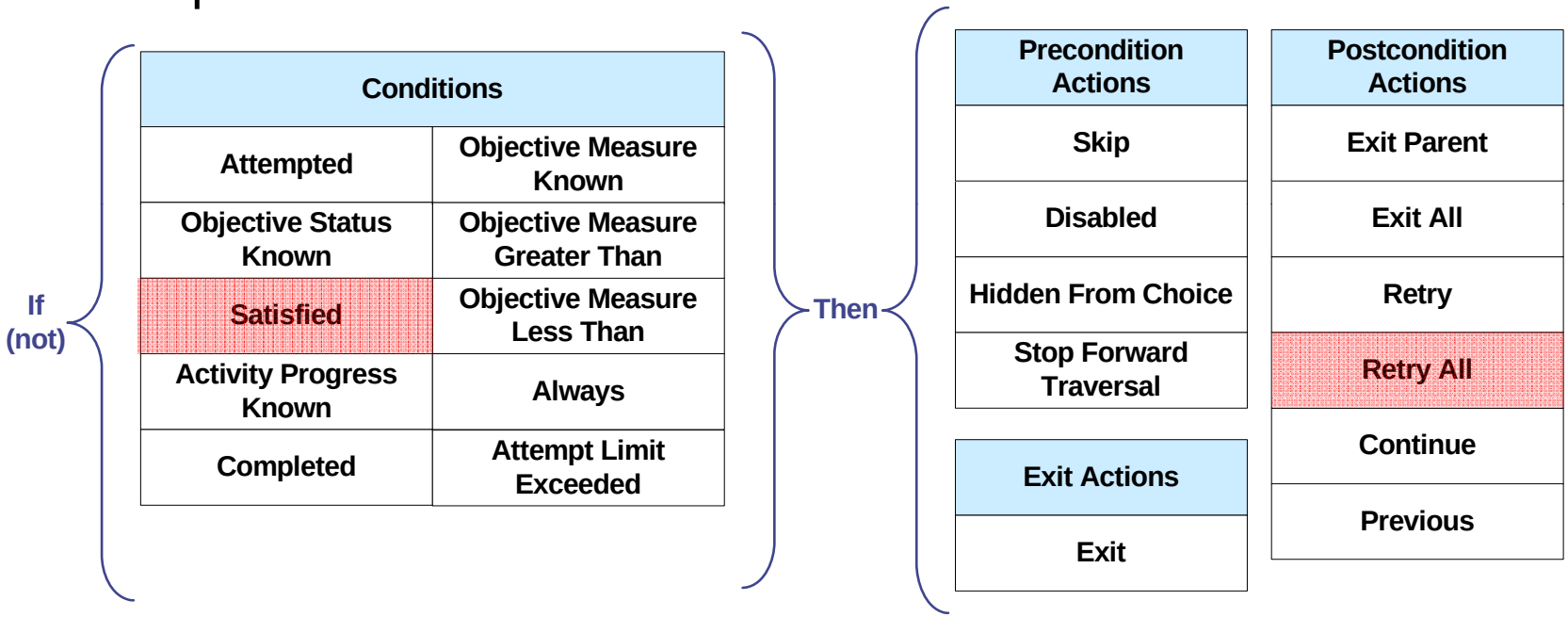
Two combinations of conditions allowed: *all* or *any.*

IF {Satisfied} THEN {Skip}

IF {Attempt Limit Exceeded} THEN {disabled}

Sequencing Rules

Sequencing rules specify what action should occur under a particular condition



For example:

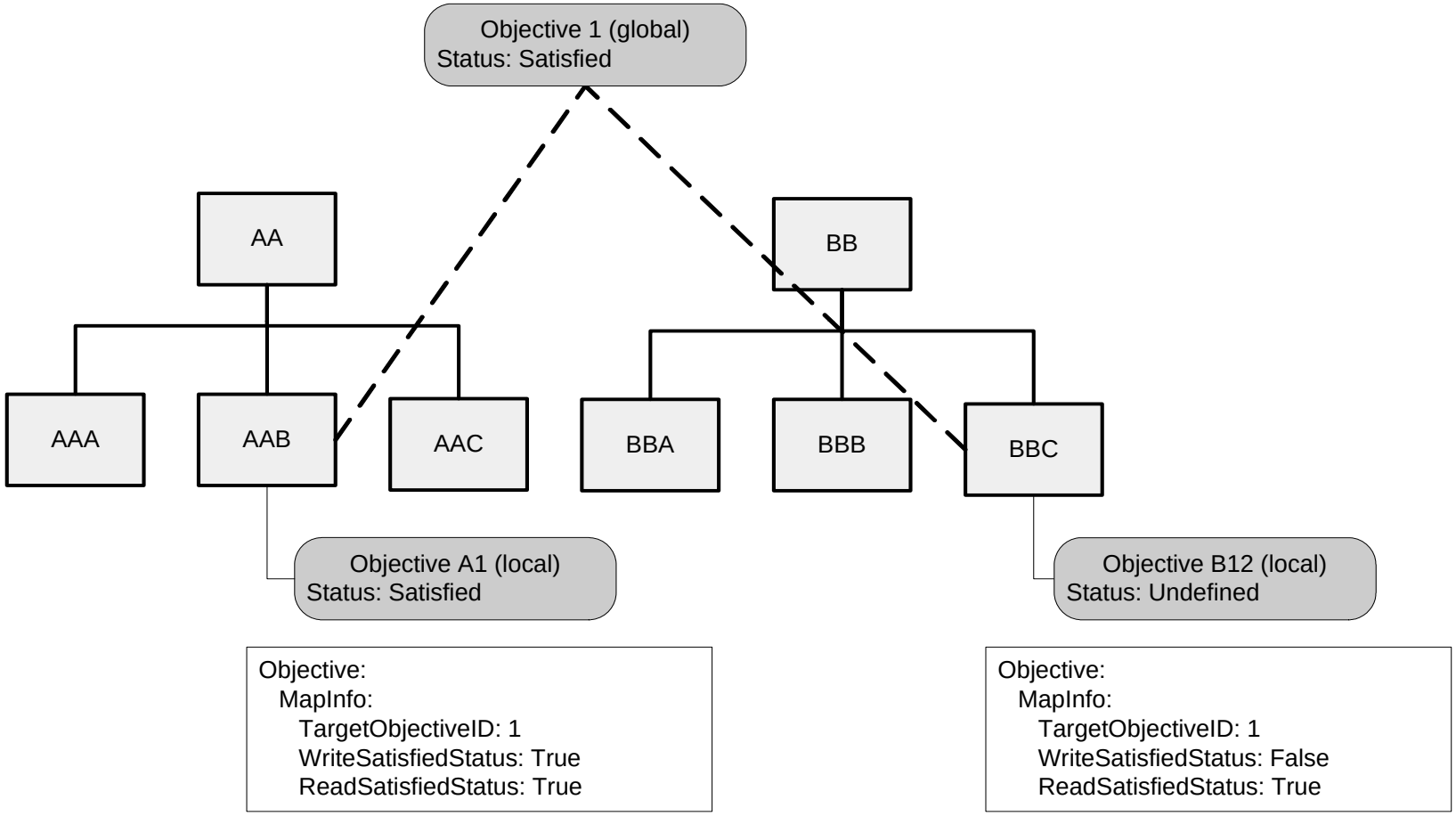
Two combinations of conditions allowed: *all* or *any.*

IF NOT ALL {Satisfied} THEN {Retry All}

Objectives

- "Learning objectives" but really just tokens
- Objectives are *satisfied* or *not satisfied*
- Objectives have *normalized measures* (-1 to 1)
- Global objectives are stored by LMS
- Local objectives are
  - Defined within an activity tree
  - Can point to global objectives via *objective maps*
  - Can read from and write to global objectives
- Objectives have *minimum satisfied normalized measures* for satisfaction.
- Objectives can be included or excluded from rollup

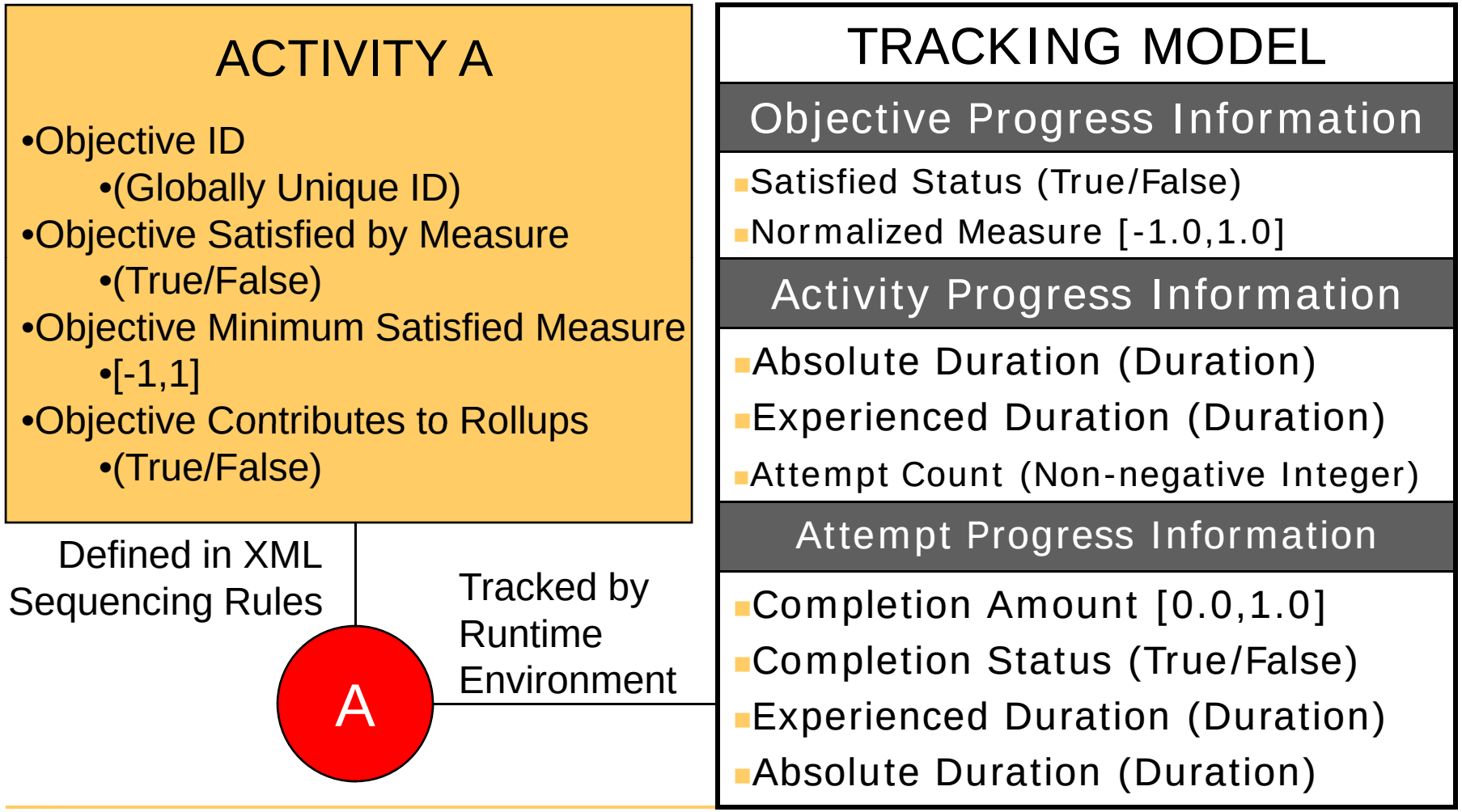
Objective Mapping



Tracking and State Model

- Sequencer must track
  - Activity Progress (duration, count)
  - Attempt Progress (duration, count, completion amount and completion status)
  - Objective Progress (satisfaction, normalized measure
- Sequencer must maintain
  - Activity state
    - Current activity
    - Is an attempt being made in the current activity
    - All suspended activities
  - Activity available children

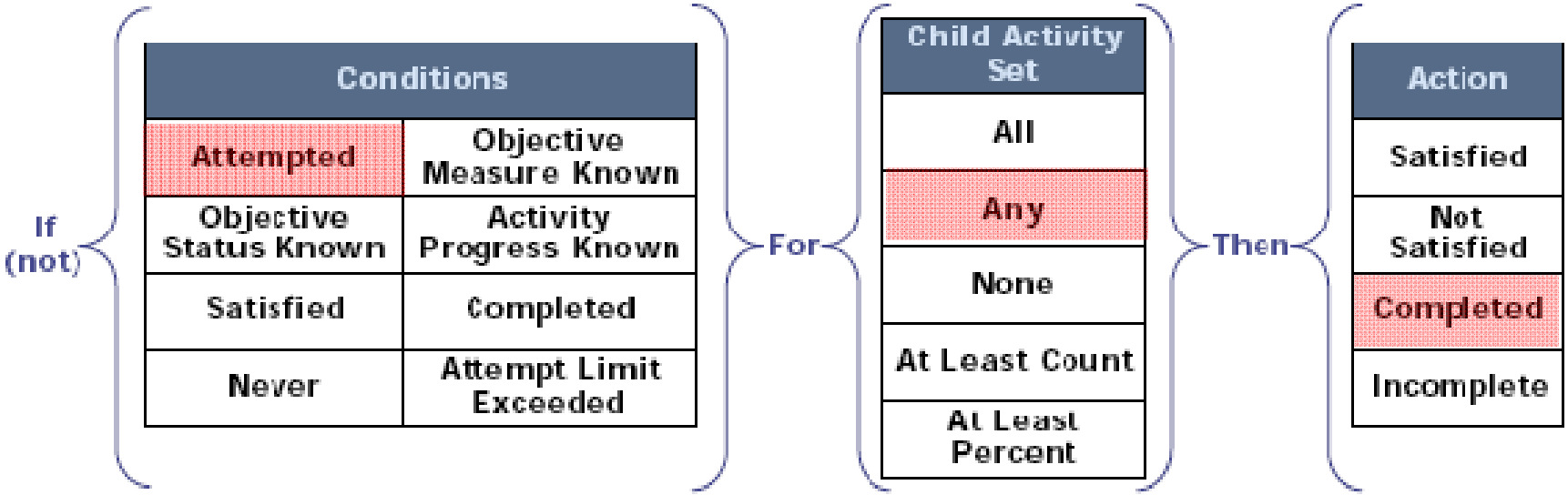
Tracking



Roll-up

- Determines whether
  - An *objective* has been *satisfied*
  - An *activity* has been *completed*
- Child activities can contribute to values
- Child activities can be weighted
- Child activities can be excluded
- Satisfaction and completion can depend on a selected number of child activities being satisfied or complete

Roll-up Rule Summary*

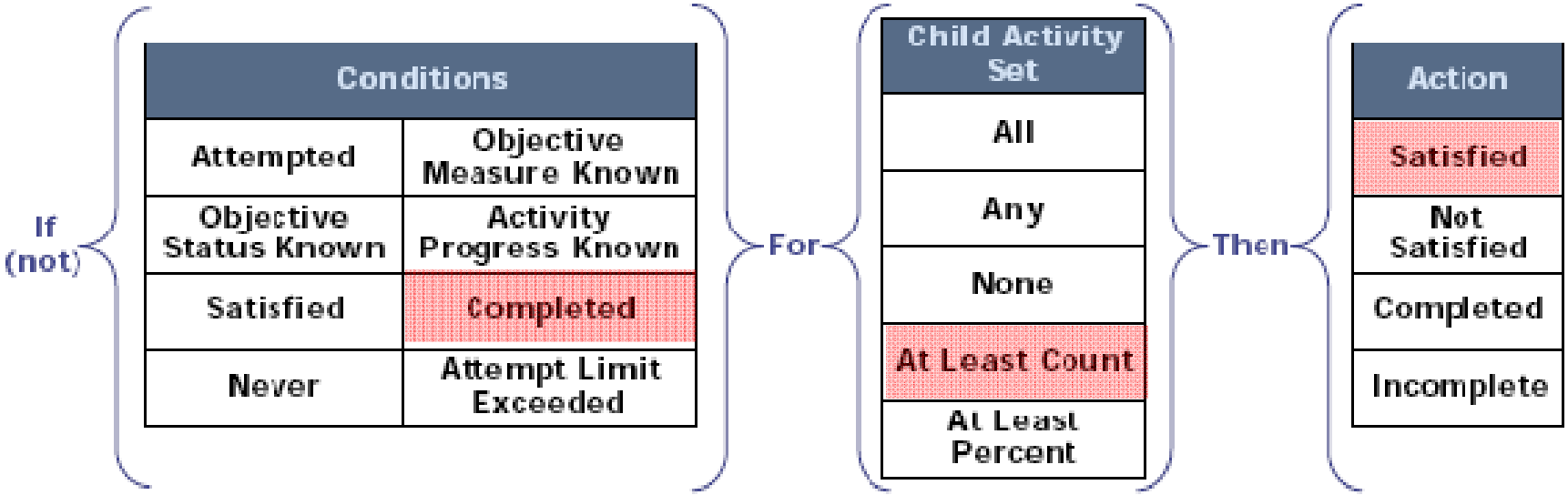


For example:

IF ANY {Attempted} THEN {Completed}

*From SCORM 1.3.2 Public Draft, February, 2006

Roll-up Rule Summary*

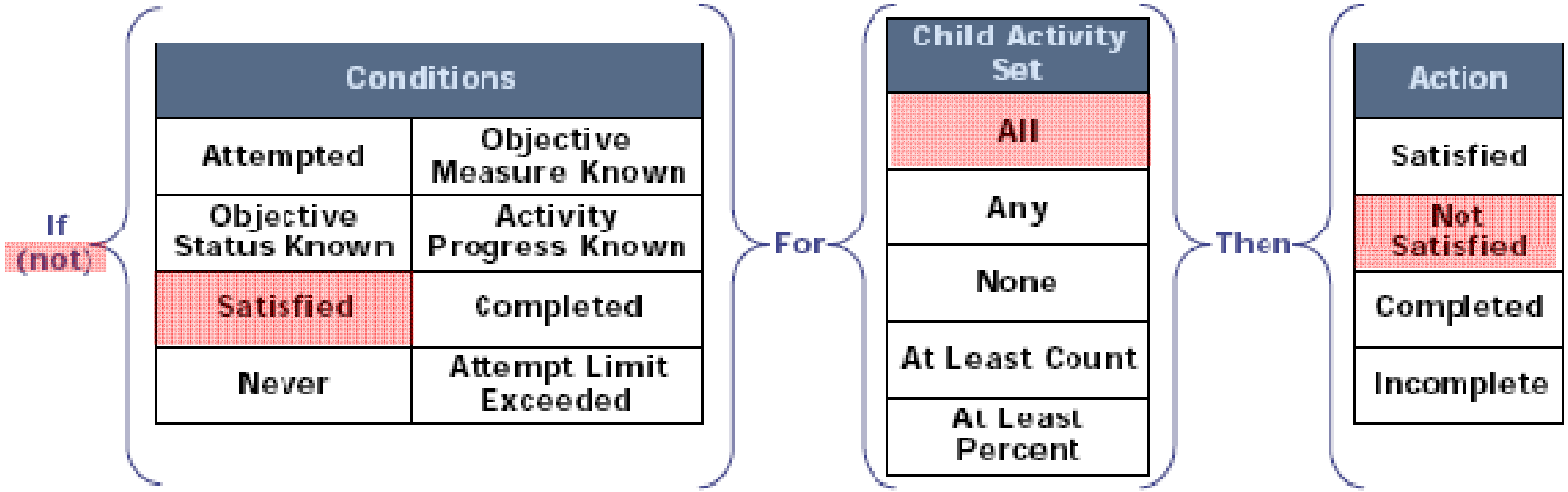


For example:

IF AT LEAST 3 {Completed} THEN {Satisfied}

*From SCORM 1.3.2 Public Draft, February, 2006

Roll-up Rule Summary*

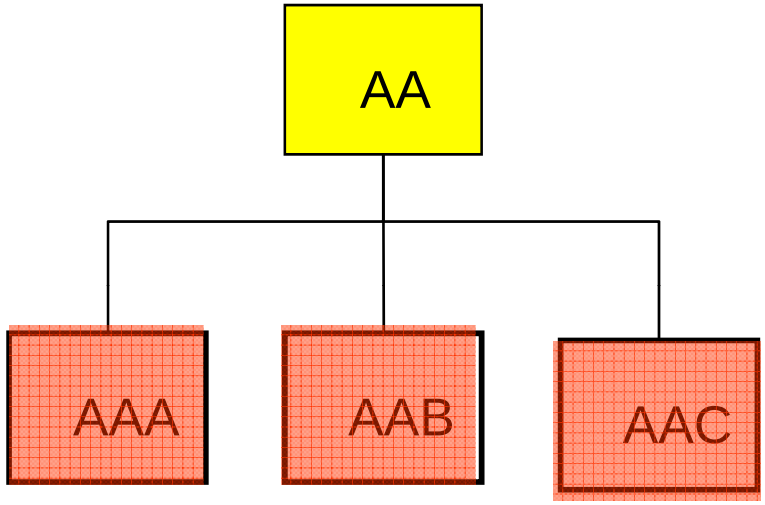


For example:

IF NOT ALL {Satisfied} THEN {Not Satisfied}

*From SCORM 1.3.2 Public Draft, February, 2006

Rollup Rule: ChildActivitySet=All

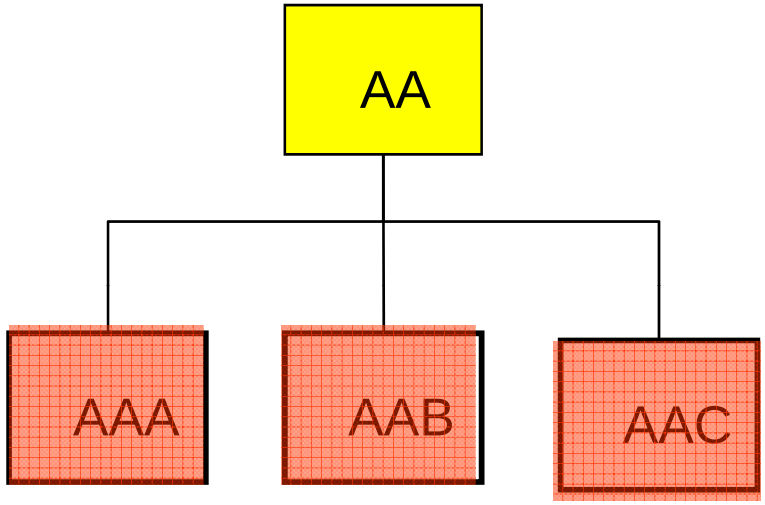


Rollup Rule

ChildActivitySet	= All
RollupCondition	= Satisfied
Action	= Satisfied

AA: Satisfied

Rollup Rule: ChildActivitySet=AtLeastCount



Rollup Rule

ChildActivitySet = At Least Count

RollupMinimumCount = 2

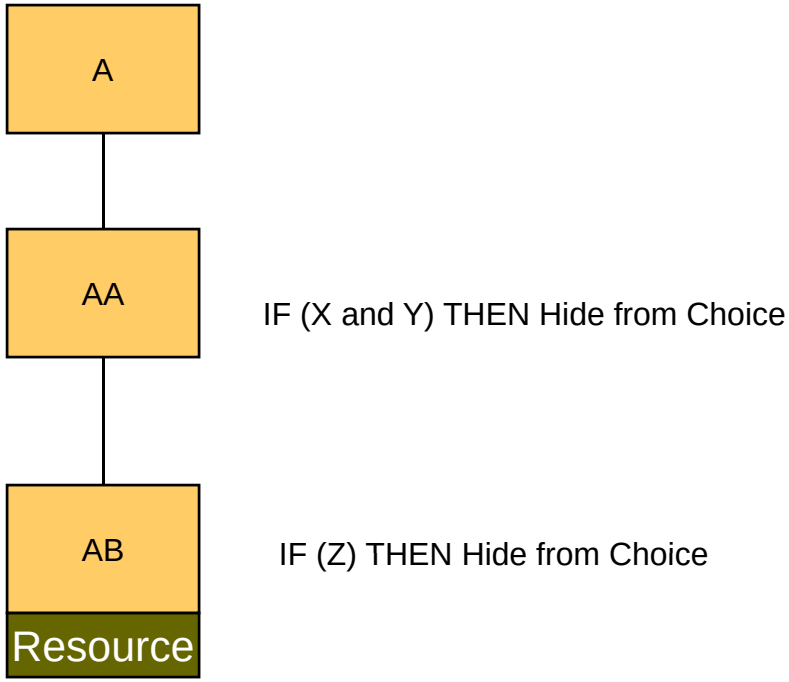
RollupCondition = Satisfied

Action = Satisfied

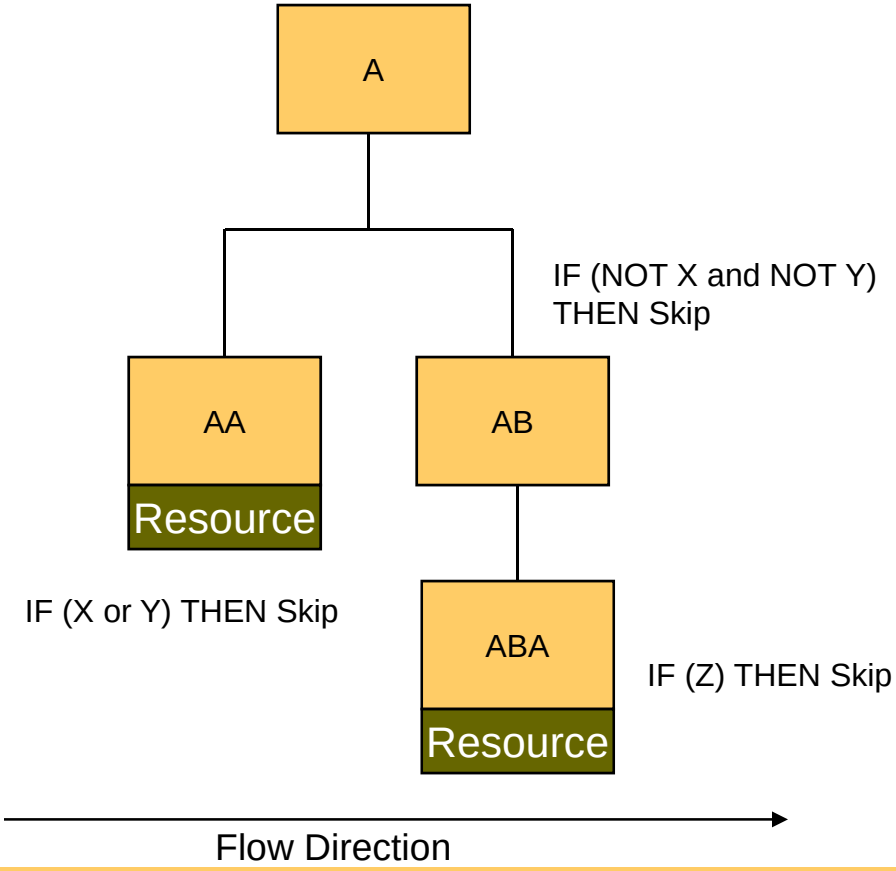
AA: Satisfied

Building More Complex Combinations of Conditions

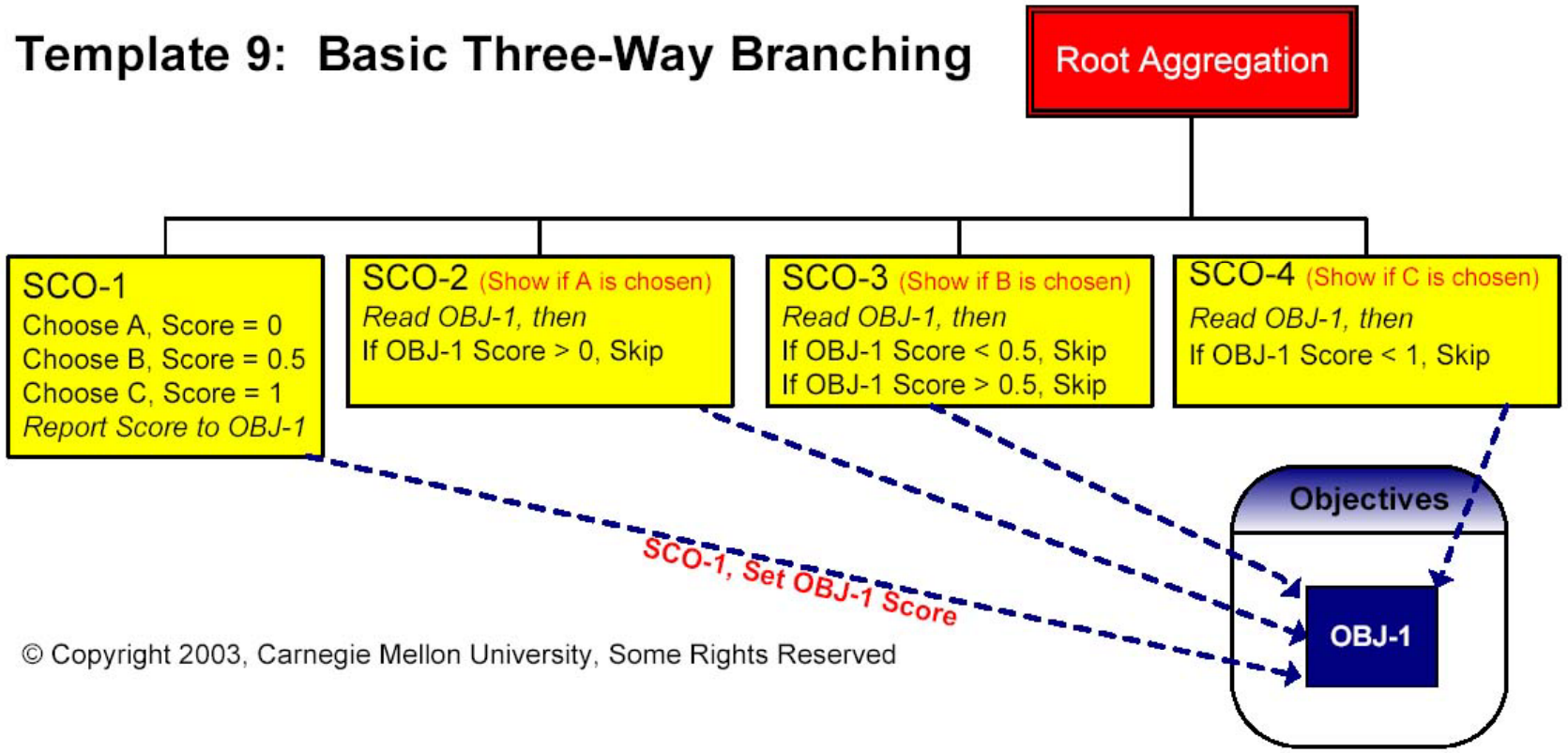
Desired: IF ((X and Y) or Z) THEN Hide from Choice



Desired: IF ((X or Y) and Z) THEN Skip

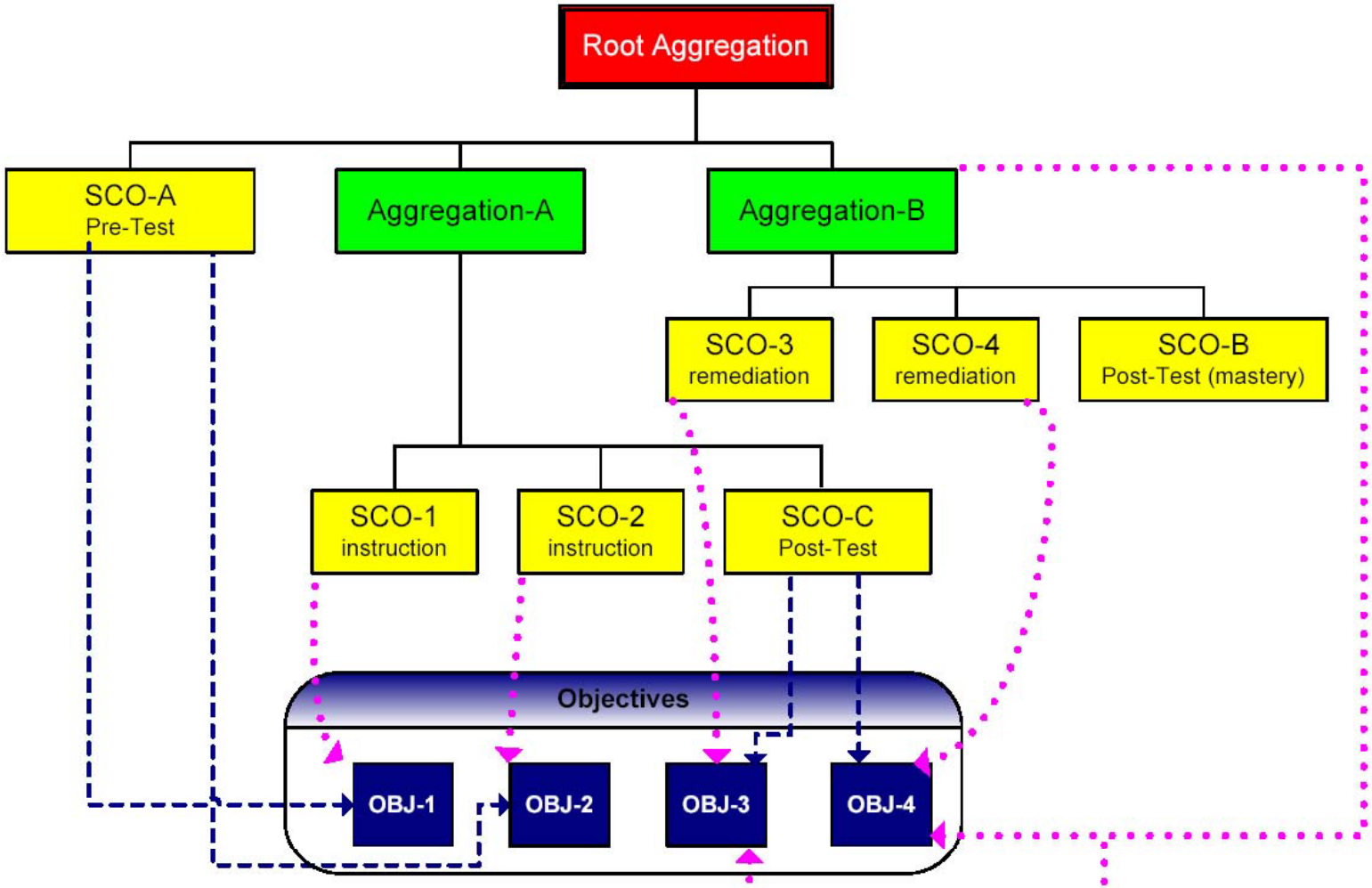


LSAL Template: Three-Way Branching



LSAL Template: Pre & Post-Test with Remediation

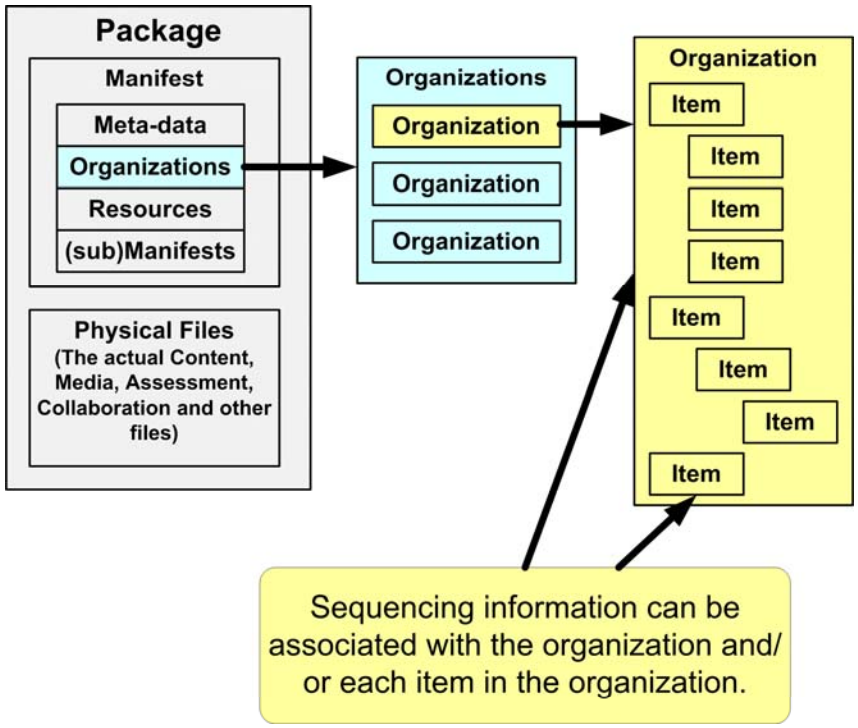
TEMPLATE 10: Pre- and Post-Test Sequencing With New Content for Remediation

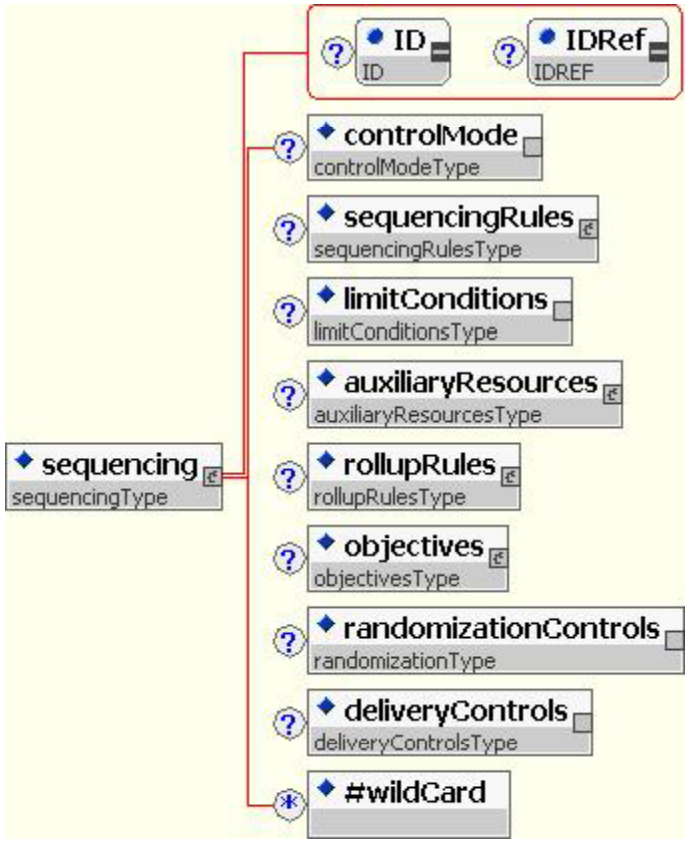


Auxiliary Resources

- Allows references to be included in activities (e.g., a manual)
- Behavior is out of scope
- *May play a role in integration with simulations*

SCORM CONTENT AGGREGATION AND SIMPLE SEQUENCING





Design & Development

Effect of SCORM on Design / Development Process

- Changes little in the *overall* process (ADDIE)
- Requires awareness of
  - Reuse
  - Granularity
  - Communication possibilities
  - LMS / Content separation
- Adds time *initially*
- Is supposed to save time via reuse
- Is hopeless without tools

Real World Experiences

- LMS products do not all interpret SCORM the same way
- Issues include:
  - *Semantic* interoperability. E.G.
    - *Interpreting* scores
    - Metadata crosswalks
  - Not required = not supported
  - Implicit expected or undefined behaviors. E.G.
    - What happens to state data when you “walk off” an activity tree?)
    - No requirement to reference files in manifest – how does the importing system know they are there?

Summary

- 5 parts of SCORM
  - Metadata (IEEE Standard)
  - Content Aggregation (IMS Specification)
  - Runtime Environment (IEEE Standards)
    - CMI Data Model
    - JavaScript API
  - Sequencing & Navigation (IMS Specification)
- Lots details
- Lots of functionality
- Some pitfalls
- Lots of tools??? *Stay tuned …*

Eduworks Corporation

A Practical Introduction to SCORM – Part 3

Tools and Adoption

April 2, 2006

Robby Robson
robby@computer.org

Topics – Part 3

- ADL provided tools
- Open source and commercial SCORM tools
- Conformance testing
- Adoption trends

ADL – Provided Tools

- Sample RTE
- RELOAD (demo)
- Conformance Self-test
- Lists of third-party tools
- ADL Prototype Projects
  - SCORE Prototype (→ XML SCORM Studio)
  - LSAL Design Templates

Open Source & Commercial Tools

- Types of tools:
  - LMS / LCMS
  - Authoring tools
  - Software libraries / SCORM “retrofitters”
  - Widgets
    - SCORM testers
    - API adopters
- Certified tools: See ADL site (www.adlnet.org)

Tools Links …

http://www.jointadlcolab.org/capabilities/pnplab/tools/
http://www.conform2scorm.com/

*The appearance of a tool in this presentation does **not** constitute an endorsement, recommendation or warrantee of any type.*

LMS / LCMS

- Open Source Examples
  - Moodle (SCORM 1.2)
  - Atutor (SCORM 1.2)
  - DotNetScorm (SCORM 1.2)
- Commercial Examples
  - Lots
- Status
  - Working well
- Caveats
  - Lack of *competency* management
  - Don't do much with metadata
  - Content integration may still require tweaks
  - SCORM has inherent limitation

Authoring

- Open Source Examples
  - Atutor
  - ILIAS
- Commercial Examples
  - Lots
  - Many common Adobe tools (e.g. Dreamweaver™ / Authorware™ / Flash™)
- Korean Example (functionality explained)
- Status
  - OK
- Caveats
  - Metadata not automatically generated
  - Most don't integrate with repositories or an LMS
  - Not that easy to use

Libraries & Retrofitters

- API Adapters – see ADL Site
- SCORM Players – see ADL Site
- Retrofitters
  - Rustici (software approach)
  - Recombo (middleware approach)
- Widgets – see ADL Site (e.g. SCORM Detective)
- Status
  - More and more of these
- Caveats
  - Can save time / effort but not magic bullets
  - May be unsupported software
  - May be interim solution

TOOL (slide from ADL)	CONFORMANCE LABEL
Avilar's WebMentor	SCORM 1.2 LMS
Blackboard	SCORM 1.2 LMS
Giunti's Learn eXact	SCORM 1.2 LMS
Granada's LearnWise	SCORM 1.2 LMS
KMSI's KMx	SCORM 1.2 LMS
Meridian's KSI Knowledge Center	SCORM 1.2 LMS
OutStart's Evolution LCMS	SCORM 1.2 LMS
SumTotal's Aspen	SCORM 1.2 LMS
SumTotal's TotalLCMS v. 7.0	SCORM 1.2 LMS
D2L Learning Platform	SCORM 1.2 LMS
Meridian KSI v. 5.0	SCORM 2004 LMS
Meridian's Player v. 3.0	SCORM 2004 LMS
Rustici Software's SCORM Engine	SCORM 2004 LMS
Techniques KnowledgeWorks	SCORM 2004 LMS
DCI's MetaSoft Metadata Registry	N/A
HarvestRoad's Hive – Repository	N/A

Free and Open Source Tools (Slide from ADL)

	Search	LMS	MD Editor	SCORM CP	SCORM S&N	Content Authoring	Aggregator	Player
Aloha (uses Reload)**			✓	✓			✓	✓
ATutor**	✓	✓	✓	✓		✓	✓	✓
Burrokeet**	✓			✓		✓	✓	
Claroline**				✓		✓	✓	✓
ILIAS**	✓	✓	✓	✓		✓	✓	✓
Mine Labs*			✓	✓	✓	✓	✓	✓
Moodle**	✓			✓		✓	✓	
Reload 1.2**			✓	✓			✓	✓
Reload 2004**			✓	✓	✓		✓	
Scormisizer*			✓	✓				

*Free, **Open Source

SCORM Conformance / Certification

SCORM ***conformance*** can be claimed if a product

- Has passed the SCORM Conformance Test Suite (Self Test)
- Conforms to the latest version of SCORM as outlined in the SCORM Conformance Requirements

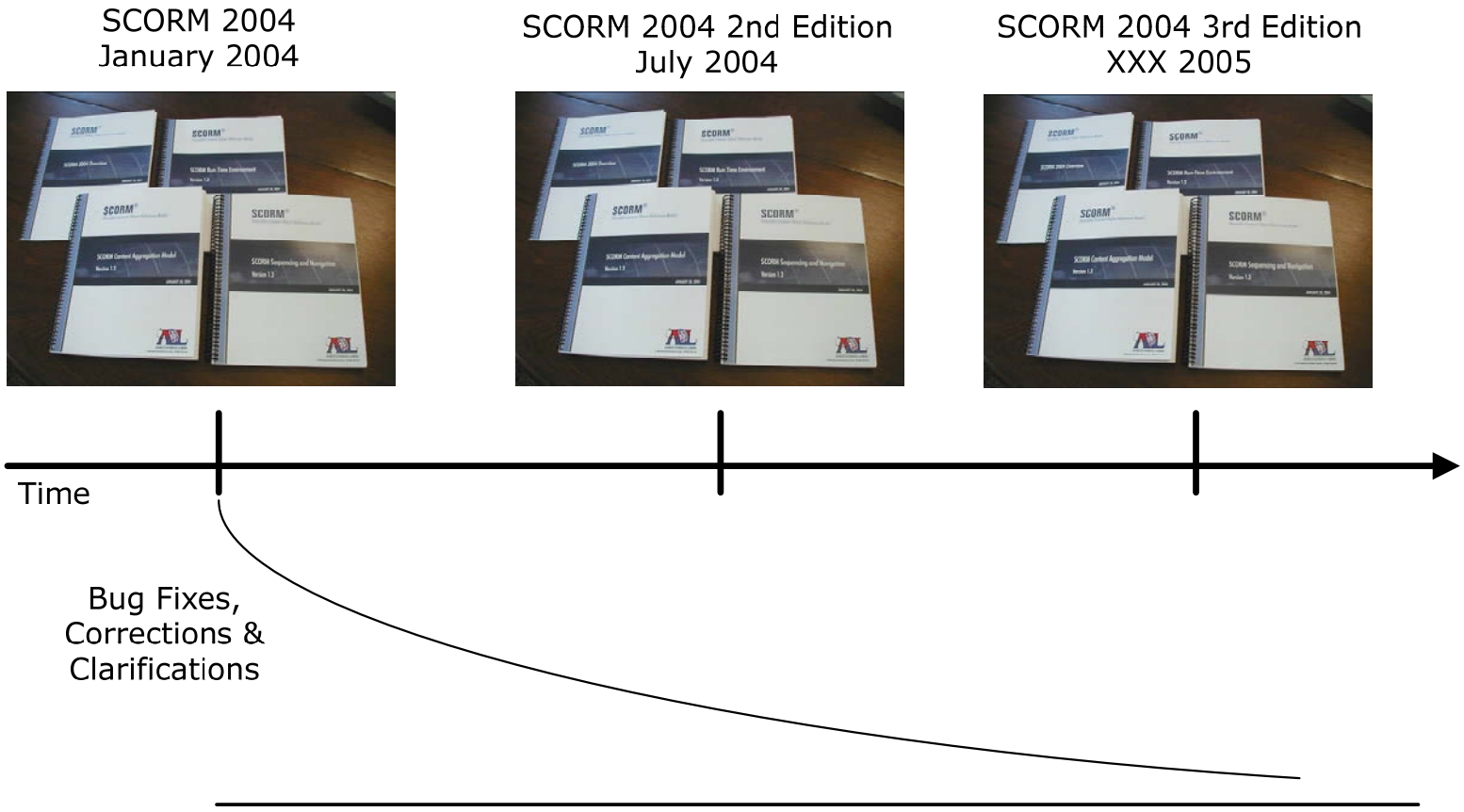
Certification requires independent testing:

- Wisconsin Testing Organization
  - Madison, Wisconsin
  - www.witesting.org
  - Process flow chart
- Naval Undersea Warfare Center (NUWC) Division Keyport
  - Keyport, Washington
  - www.keyport.kpt.nuwc.navy.mil
  - SCORM 1.2 RTE Certificate

Is conformance / certification and interoperability guarantee?

- No
  - Tests do not have complete coverage
  - Some issues cannot be addressed. E.G.
    - Optional elements
    - Semantic interoperability
    - Undefined behaviors
- But Yes
  - Seeing fewer problems as time goes on
  - Often only minor tweaks required

Stabilization / Clarification / Issue Resolution (From ADL presentation)



AICC & SCORM Adoption (April 2004)

Sources: Various Brandon-Hall Reports (Excepting Last Column)	1997/8 LMS	2000 LMS	2001 LCMS	2003 LMS	2003 LCMS	2004 Authoring Tools	Current Course Management Systems
Number of Systems	**27**	**56**	**29**		**23**	**43**	**23**
AICC Support	41%	52%	83%		87%	65%	26%
Certified	*	*	7%		13%	9%	*
Compliant	*	*	76%		74%	56%	*
Support Planned	*	23%	*		4%	0%	*
No AICC Exists / Planned	***59%***	***25%***	***17%***		***9%***	***35%***	***74%***
SCORM Support	*	17%	83%		87%	72%	43%
1.2	*	*	*		83%	63%	39%
Other	*	*	*		4%	9%	4%
Support Planned	*	2%	7%		13%	5%	*
No SCORM Exists / Planned	***100%***	***80%***	***10%***		***0%***	***23%***	***52%***
IMS Metadata	*	34%	*		*	*	43%
IMS Metadata Planned	*	25%	*		*	*	*
IMS Content Packaging	*	*	*		*	*	61%
IMS QTI	*	*	*		*	*	22%
IMS (not specified)	*	*	*		*	*	9%

Adopters (From ADL presentation)

- SCORM 1.2
  - 134 Adopters
- SCORM 2004
  - 9 Adopters
- Adoption of SCORM 2004 is following the same pattern as happened with 1.2

Certified Products (from ADL presentation)

- SCORM 1.2
  - LMS: 47
  - Content: 25
- SCORM 2004
  - LMS: 2
  - Content: 0
- Certification of SCORM 2004 is following the same pattern as happened with 1.2

Home | About ADL | News & Events | Plugfest | Forums | Resource Center | Help & Info

Site Search

Focus Areas > SCORM® ADL Technologies Developer ADL Co-Labs

SCORM History
SCORM Downloads
SCORM Adopters
3rd Party Tools
ADL Technical Team
Certified Products
Levels - SCORM 2004
Levels - SCORM 1.2
Resource Links

Certified Products Search Results

Certified Products >>> All Certified Products

Results are in reverse chronological order.

viewing 1 through 15 of 72 < previous | next >

Product Name	Vendor	SCORM Version
NOLP-LMS	NSTDA Online Learning Project	SCORM 1.2
eLearner	Cognita	SCORM 1.2
NETg Learning Studio	Thomson NETg	SCORM 1.2
NIJ Guide produced by iKe(tm) version 2.2	Advanced Systems Technology, Inc.	SCORM 1.2
SMILE LMS	SMILE Technologies Ltd.	SCORM 1.2
knowledgeWorks	techniques.org LLC	SCORM 2004
CAISI Level II SSR	Battelle Memorial Institute, Pacific Northwest Division	SCORM 1.2
CAISI Training - Army	Battelle Memorial Institute, Pacific Northwest Division	SCORM 1.2
Pachelbel	Battelle Memorial Institute	SCORM 1.2
ILIAS	ILIAS open source, Universität zu Köln	SCORM 1.2
GVA XT LMS	Youngsan Info-Communications Co. Ltd. ("Vendor")	SCORM 1.2
learn eXact	Giunti Interactive Labs	SCORM 1.2
Enterprise Knowledge Platform	NetDimensions Limited	SCORM 1.2
E-C@MPUS	CONSORZIO INTERUNIVERSITARIO FOR.COM	SCORM 1.2
Sample Content Produced by IMAT Explore	Naval Surface Warfare Center Carderock Division	SCORM 1.2

< 1 | 2 | 3 | 4 | 5 >

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Snap Shots From The Field

- The following are adopted from slides
  - Created by Paul Jesukiewicz (ADL CoLab Director)
  - Presented at International Plugfest 2
  - Based on data from latter part of 2005

Service LMS Implementation

	Current	Planned
Army	ALMS (Saba version 3.4.1) ILMS (Aspen v 1.1 w/Build 7.0.1173) Aspen v2.0 Core v2.3.8 Meridian KSI Blackboard mGen	ALMS (Saba 5.2) (Spring 05)
Navy	THINQ	THINQ 5.2 (Jan 05)
Air Force	No single LMS (currently 7) Meridian KSI (9 out of 16 AF orgs)	Meridian V 3.0 (Dec 04)
Marine Corps	THINQ Training Server 4.6	THINQ

SCORM Content Implementation

Army

- There are 43 fielded courses that are SCORM compliant; 13 SCORM v1.1 and 32 SCORM v1.2.
- There are 14 SCORM v1.1 compliant courses still under development and 107 SCORM v1.2 compliant courses under development.
- One completed common critical task (for the 2005 common tasks tests) is SCORM v1.2 compliant and 38 common critical tasks under development/update will be SCORM 1.2 compliant.

Navy

- All of their WBT content is 1.2 SCORM conformant as long as the LCMS publishes it to SCORM 1.2.

Air Force

- 80% of the WBT Content is SCORM 1.2

Marine Corps

- 20% of the ADL content is SCORM 1.2 and 80% is AICC

LCMSs and Authoring Tools

Army

- Does not specify a specific development tool or LCMS; they require that courseware comply with specific standards regardless of the authoring tool used. Currently they have courseware being developed using Flash, ToolBook, Dreamweaver, HTML editors, and Contractor produced productivity tools. This list is not all inclusive.

Navy

- All "A" school content being developed in Outstart Evolution

Air Force

- HTML, XML, Flash

Marine Corps

- None specified. Some of the USMC's commercial content developers use Outstart Evolution LCMS and some use a proprietary toolset called DOMS

SCORM 2004 Migration

Army

- The Army plans to start requiring SCORM 2004 conformance in their courseware development contracts in about 6-9 months (after they receive a SCORM 2004 conformant LMS, develop their business rules, and develop their contract requirements.) Also as existing courses are updated, the plan is to convert them to be SCORM 2004 conformant.

Navy

- LMS plans to be SCORM 2004 by Jan 05
- LCMS sometime during early CY05. Navy plans to do some experimentation to determine the efficacy of exploiting certain SCORM 2004 features; in particular sequencing.

Air Force

- As soon as LMS vendor is SCORM 2004 - currently planned for Jan 05

Marine Corps

- Q1 FY06

Major DoD Acquisition Programs

- Major DoD programs requiring SCORM
  - F-35 Joint Strike Fighter (JSF)
  - Future Combat Systems (FCS)
  - Joint Tactical Radio System (JTRS)
  - V-22 Osprey

SCORM Adoption Outside DoD

- U.S. Government Agencies
  - IRS, CDC, DoL, NGB, NSA, USPS, TSA, VA, NASA, TSWG, others
- Industry
  - Daimler Chrysler, IBM, Microsoft, Boeing, LG, Verizon, Delta Airlines, Oracle, Cisco, McDonalds, Home Depot, others.
- Regions
  - Australia, Canada, Asia, Europe, Latin America

Summary

- Lots of tools … but still need work on the authoring side
- Conformance and certification programs in place
- Adoption is high
- But what about the future? *Stay tuned …*

Eduworks Corporation

A Practical Introduction to SCORM – Part 4

Future Trends and Issues

April 2, 2006

Robby Robson
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Topics – Part 4

- Advanced Issues
- Limitation of the model
- Relevant standards initiatives

Advanced Issues – Context

- SCORM was designed to solve specific problems
- SCORM adopted AICC and IEEE work done in the late 1990's
- SCORM has solved the basic problems well enough to launch an industry
- But there is still the matter of the "A" in ADL – not to mention the "D" and the "L"

Limitations of the Model

- No SCO – to – SCO communication
- “Global” objectives are local to LMS
- Dynamic content is a problem
- Teams not part of the pedagogical model
- Assumes Browser / Dynamic HTML environment
- Security not part of the model
- Model does not address content development / deployment *workflow*
- Reuse / repurposing depends on more than interoperability (e.g. XML formats)

Example: Cross-domain Issue
(Consequence of Browser Framework)

ADL whitepaper with solutions Proxy Server Solution

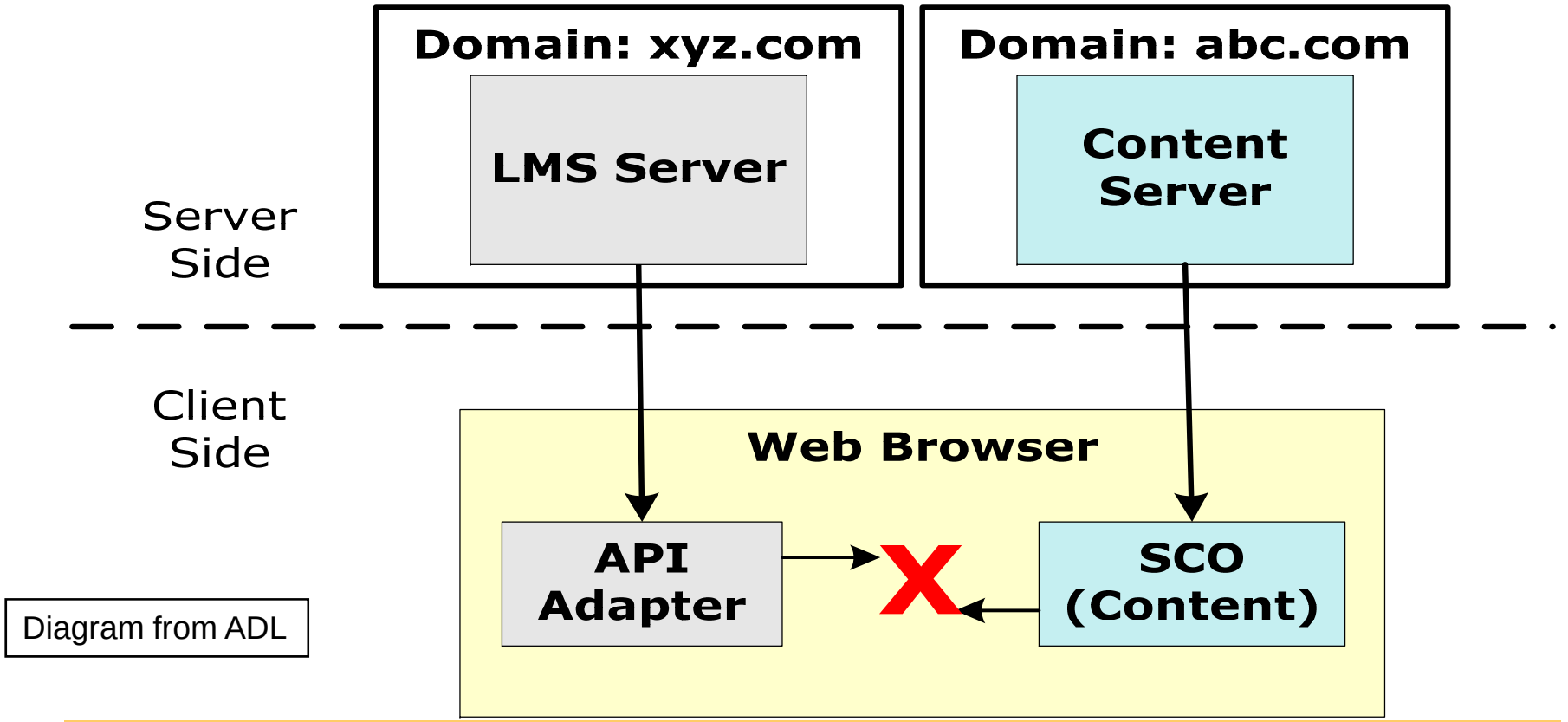

Diagram from ADL

Consequences ...

- Simulations
  - SCORM systems deal best with summarized data (e.g. completion status)
  - State persistence is an issue for launching simulations from within SCOs
  - Managing multiple learners is an issue
- Experiential Training
  - Competency models are limited
  - Global objectives required
  - Rules-based processing is unsophisticated

Relevant Standards Initiatives

- Sharable State Persistence (SSP)
  - IMS specification
  - Allows SCOs to remember state of external object
  - Envisioned for use with simulations
  - Practice?
- Package Exchange Notification Services (PENS)
  - Authoring tool / Repository notifies LMS when content is available or has been updated
- Competency
  - IMS / (IEEE) Reusable Competency Definitions
  - Ontology mapping (W3C)

More Relevant Standards Initiatives

- Learner Information Package
  - IMS Specification (BSI standard)
  - Applications to learner records
- XML Content Formats
  - Many tools use internal XML representations of learning content
  - ADL Prototype has proposed “ODF+”
- Rights Management / Security
- SCORM – SIM Interoperability
  - Meeting on Wednesday

Summary

- SCORM has been successful
- Working in an ADVANCED and DISTRIBUTED environment with multiple forms of LEARNING requires new ideas
- That's what we will be exploring (on Wednesday)!