

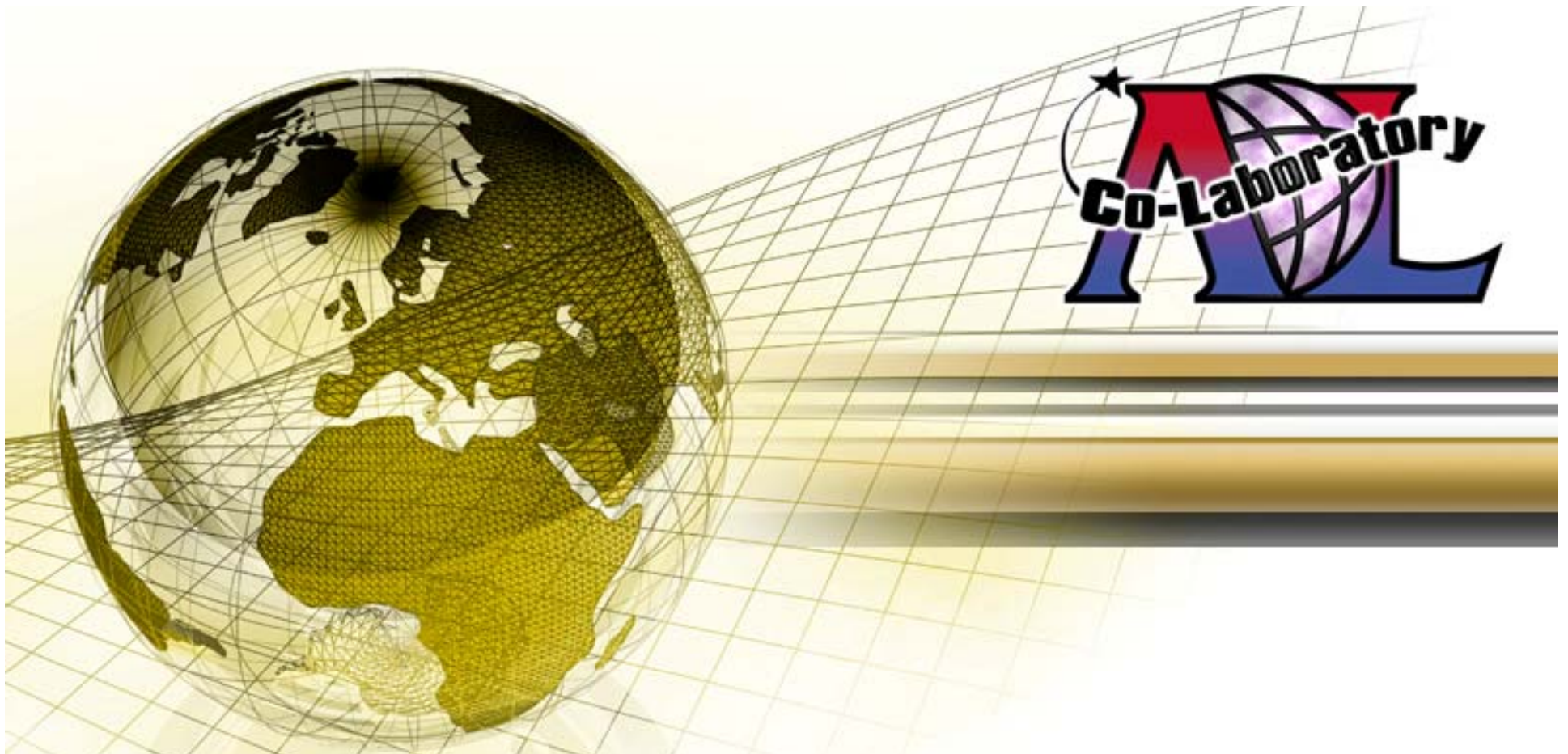
# SCORM Workshop

*S1000D International User Forum*

*21 October, Budapest, Hungary*

*Wayne Gafford, Advanced Distributed Learning*

- History of ADL and SCORM
- SCORM in Australia
- SCORM standards
- Packaging content with SCORM
- Communicating and tracking data with SCORM
- Sequencing content with SCORM
- Demo
- SCORM conformance



1

*What is Advanced Distributed Learning  
and SCORM*

# ADL Initiative

**In the 1997 Quadrennial Defense Review (QDR) the DoD determined that the traditional training framework of “right time, right place” learning, with its use of set times and places, was not effectively addressing the training requirements of highly dispersed and mobile forces.**

**In response, the DoD developed a department-wide strategy to use learning and information technologies to modernize education and training.**



## **ADL Vision:**

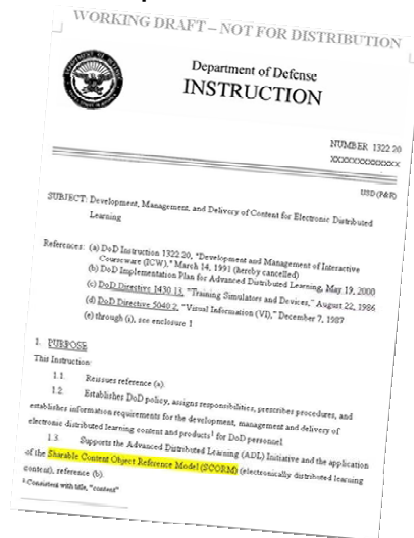
**Provide access to the highest quality learning and performance aiding that can be tailored to individual needs and delivered cost-effectively, anytime and anywhere.**

# What is SCORM?

## Sharable Content Object Reference Model

SCORM is a suite of technical standards that enable web-based learning systems to find, import, share, reuse, and export learning content in a standardized way.

Philip Dodds, ADL Chief Architect



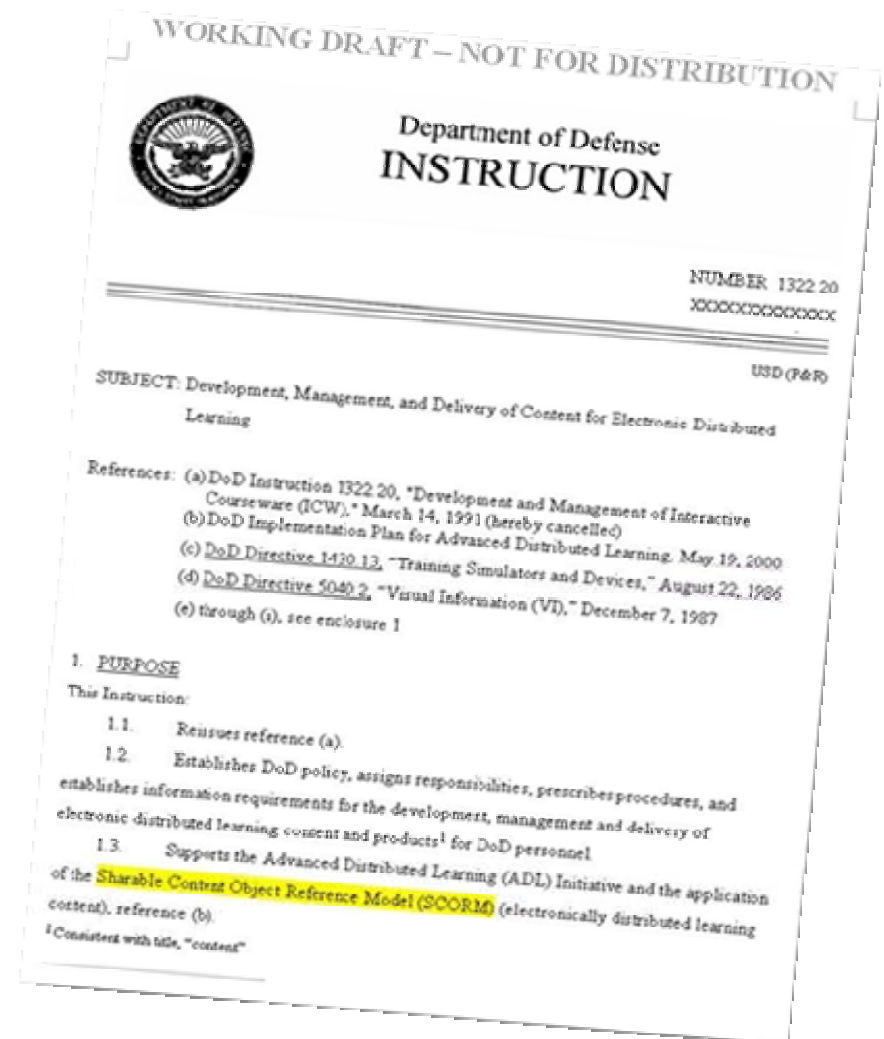
At its simplest, it is a model that references a set of interrelated technical specifications and guidelines designed to meet DoD high-level requirements for distributed learning content.

DoD Instruction 1322.26, June 16, 2006

5 of 50

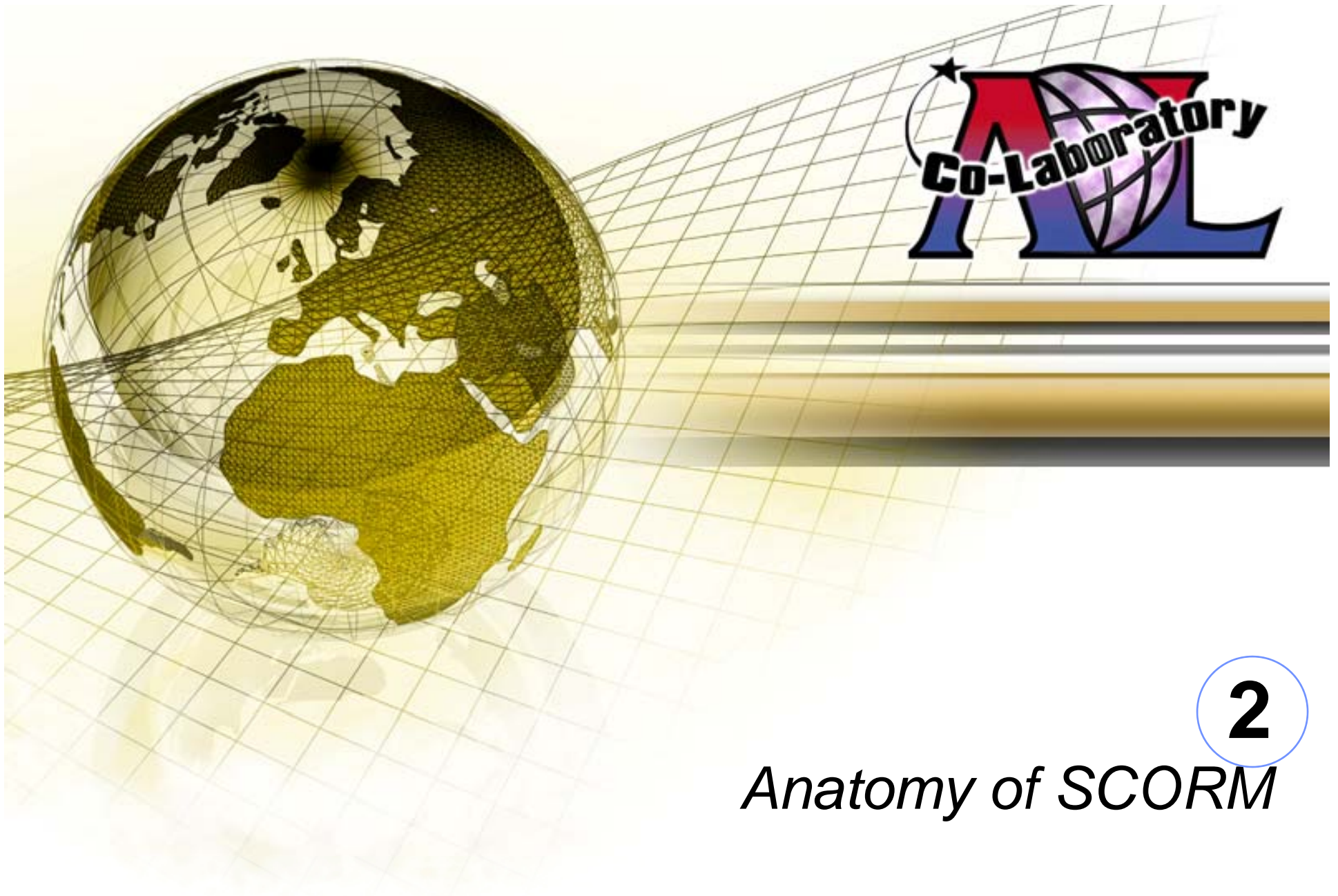
# DoD Instruction 1322.26

- DoD-developed or acquired distributed learning content and systems shall conform to SCORM
- All distributed learning content must be registered
- Emerging Guidance for S1000D:  
DODI 8000



# S1000D and SCORM

- S1000D allows you to create technical content and play it in a player
- SCORM allows you to create training content and deliver it in an LMS
- Both are intended to ensure:
  - Accessibility
  - Interoperability
  - Reusability
  - Durability

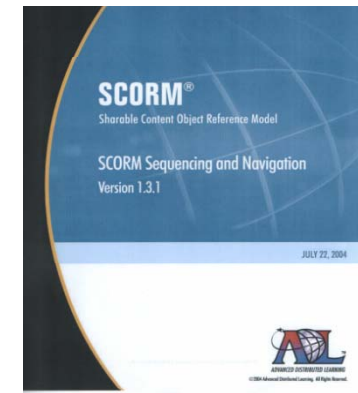
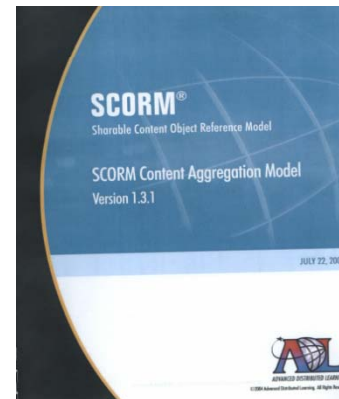
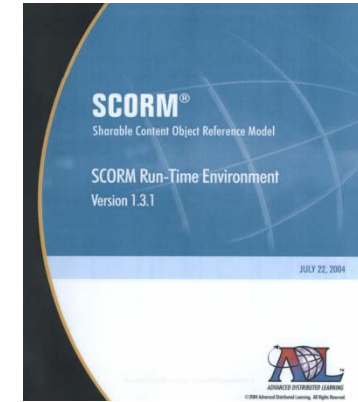
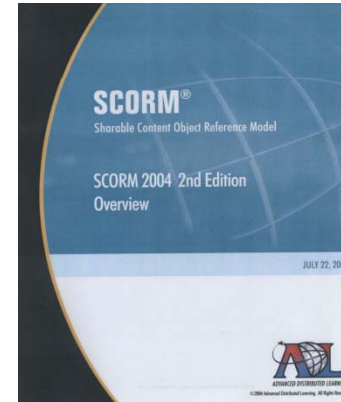


2

*Anatomy of SCORM*

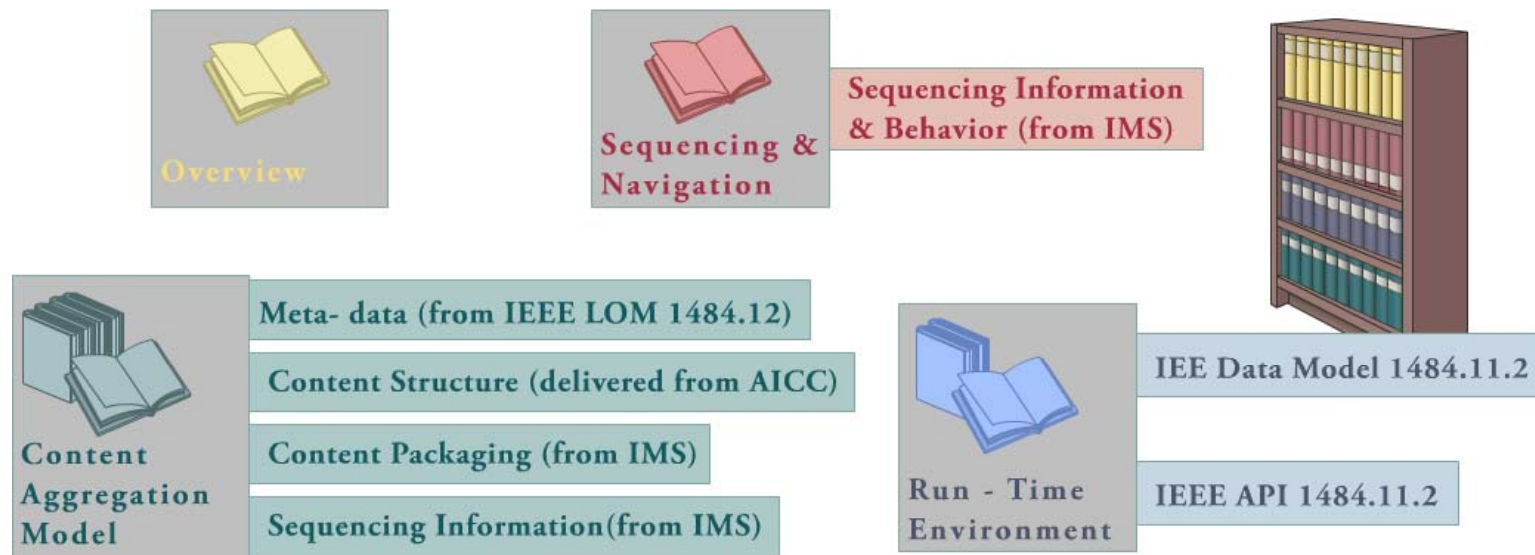
# The Anatomy of SCORM

- SCORM is a collection of specifications and standards from multiple sources described through books:
  - Content Aggregation Model
  - Run-Time Environment
  - Sequencing and Navigation (SCORM 2004)



# The SCORM Bookshelf

- SCORM is a collection of specifications and guidelines that might be thought of as books in a growing library
- Nearly all of the specifications and guidelines come from other organizations



# Standards Bodies and SCORM

- Alliance of Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE)
- Aviation Industry CBT Committee (AICC)
- Institute of Electrical and Electronics Engineers (IEEE)
- Learning Technology Standards Committee (LTSC)



# SCORM Book Overlap

SCORM Book	Concepts Covered	Key SCORM Technologies Covered	Areas of Overlap
Overview	High-level conceptual information.	Introduction to numerous high-level elements of SCORM terminology.	Covers areas of the CAM, RTE and SN books at a high level.
Content Aggregation Model (CAM)	Assembling, labeling and packaging of learning content.	SCO, Asset, Content Aggregation, Package, Package Interchange File (PIF), Metadata, Manifest, Sequencing Information, Navigation Information.	SCOs and manifests. SCOs communicate with an LMS via the RTE. Manifests contain Sequencing and Navigation information.
Run-Time Environment (RTE)	LMS's management of the RTE, which includes launch, content to LMS communication, tracking, data transfer and error handling.	API, API Instance, Launch, Session Methods, Data Transfer Methods, Support Methods, Temporal Model, Run-Time Data Model.	SCOs are described in the CAM book, are content objects which use the RTE.
Sequencing and Navigation (SN)	Sequencing content and navigation.	Activity Tree, Learning Activities, Sequencing Information, Navigation Information, Navigation Data Model.	Sequencing and Navigation affects how content is assembled in a manifest



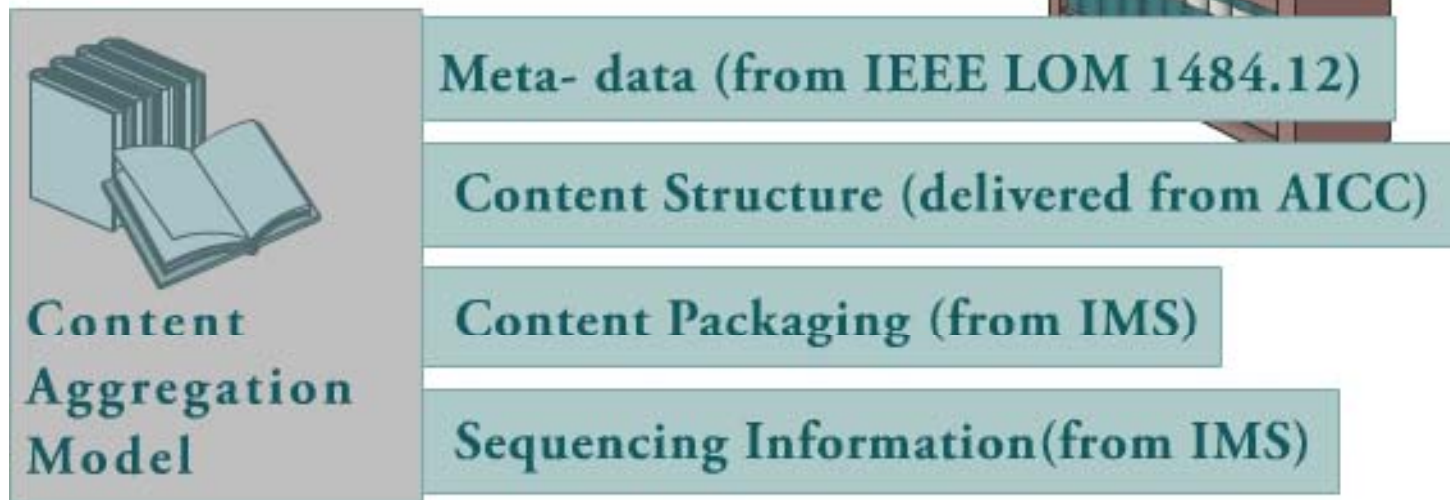
3

*Packaging Content with SCORM*

# Packaging Content

S1000D has data modules  
and publications modules

SCORM has assets, SCOs  
and a manifest



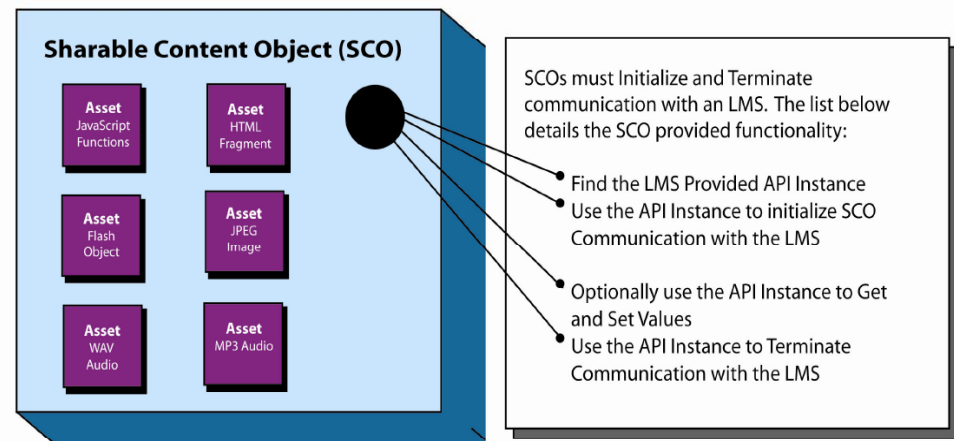
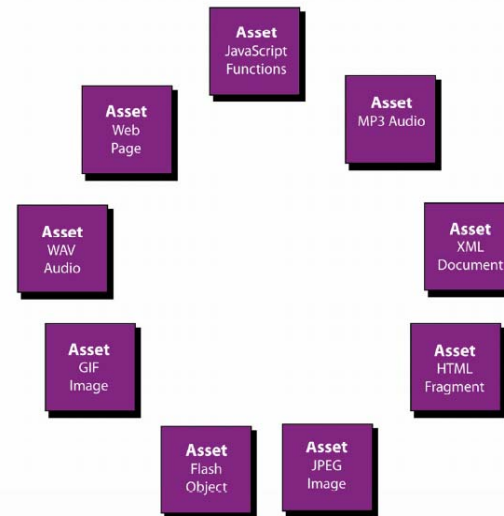
# Content Aggregation Model

- A way to aggregate learning resources to deliver the desired learning experience:
  - Content Model
    - Types of content objects in a package
  - Content Packaging
    - How to package content to ensure interoperability
  - Metadata
    - How to describe content for ensure search and discovery
  - Sequencing and Navigation
    - How to define the order of the content objects



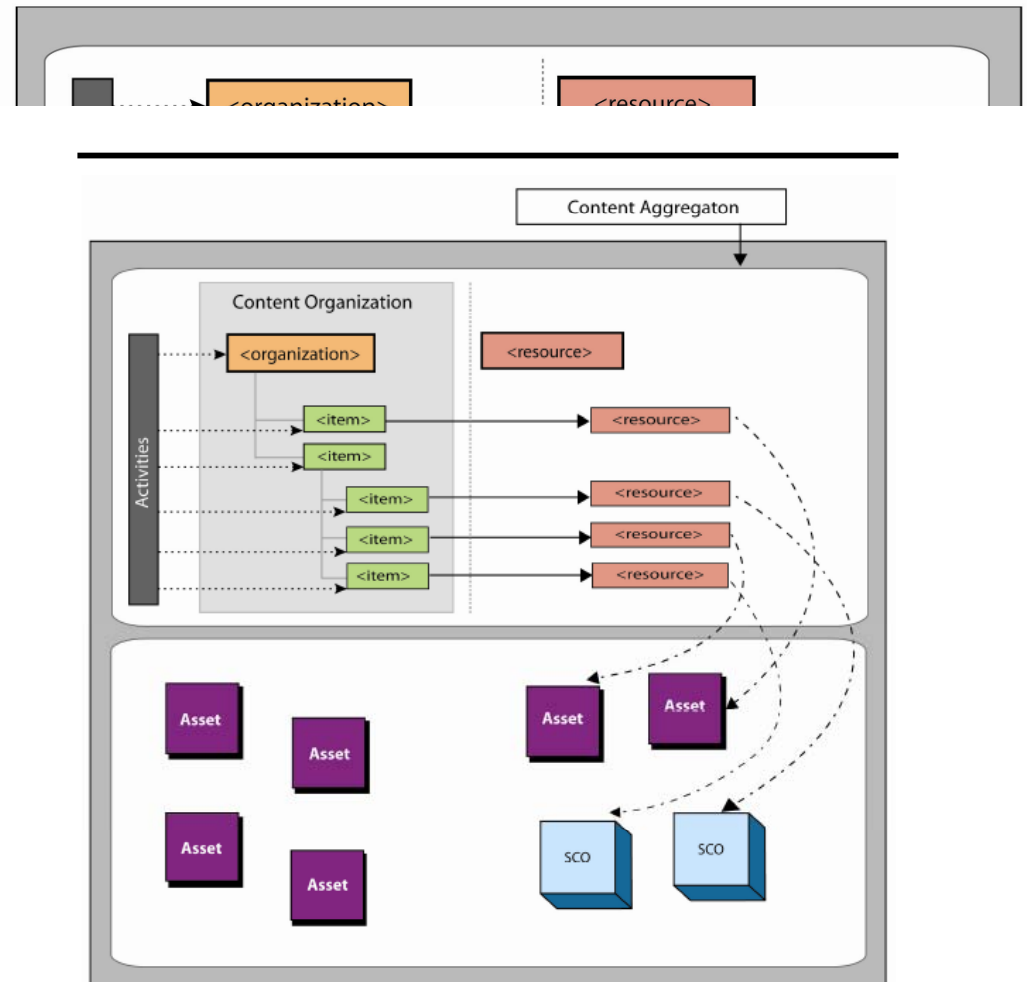
# Content Model Components

- Asset
  - Digital content that is viewable in a web browser
- Sharable content object (SCO)
  - One or more assets that represent a single launchable learning resource
- There are no constraints on SCO size. SCO size factors include:
  - Tracking by LMS
  - Reuse requirements
  - Learning outcomes
  - Branching decision points
- WHY?



# Content Model Components (cont.)

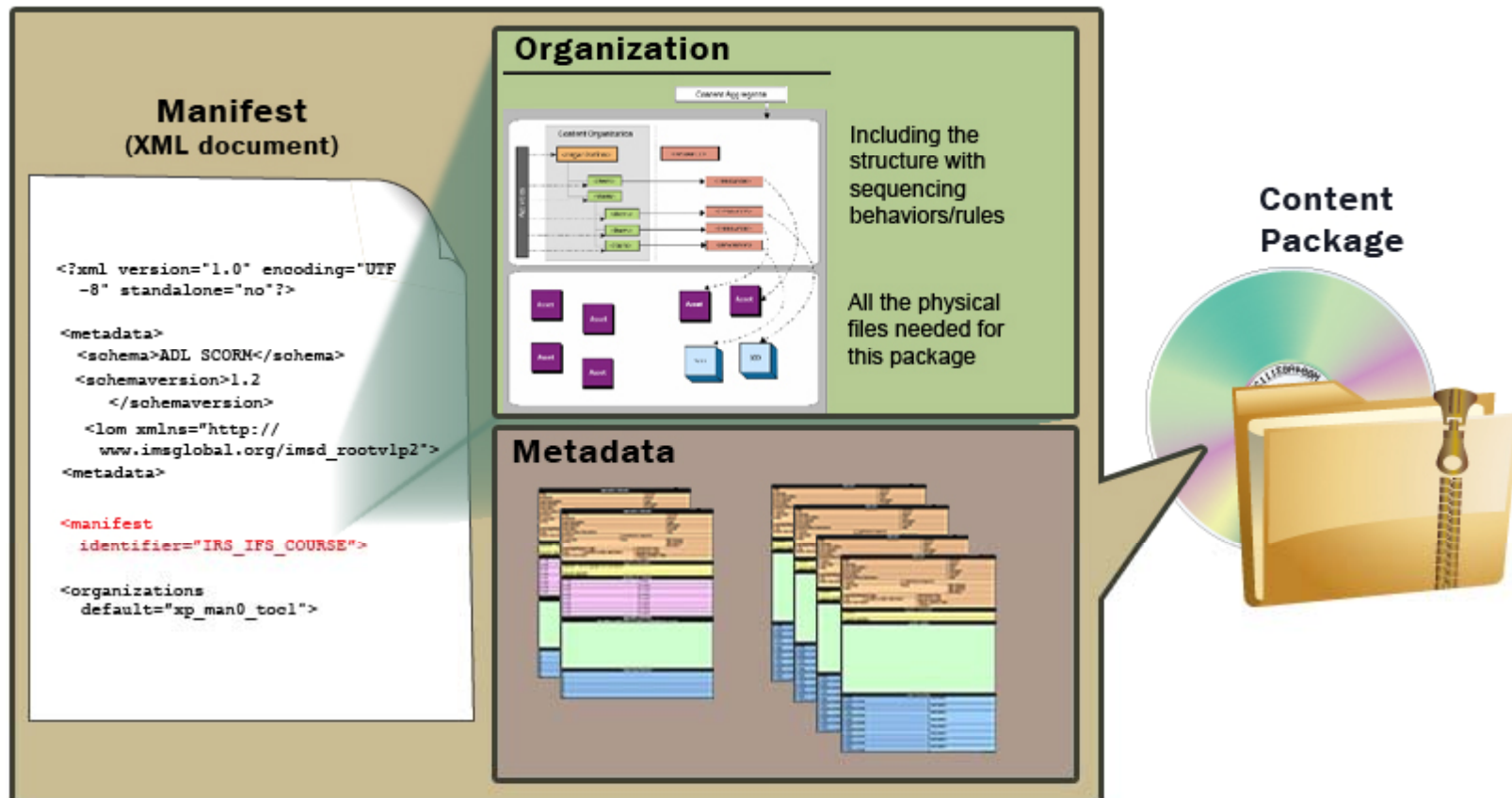
- Activities
  - Meaningful unit of instructions
- Content organization
  - Defines the intended use of the content through structured units
- Content aggregation
  - The overall action of composing a set of functionally related content objects that fits the intended activity



# What is a Content Package?

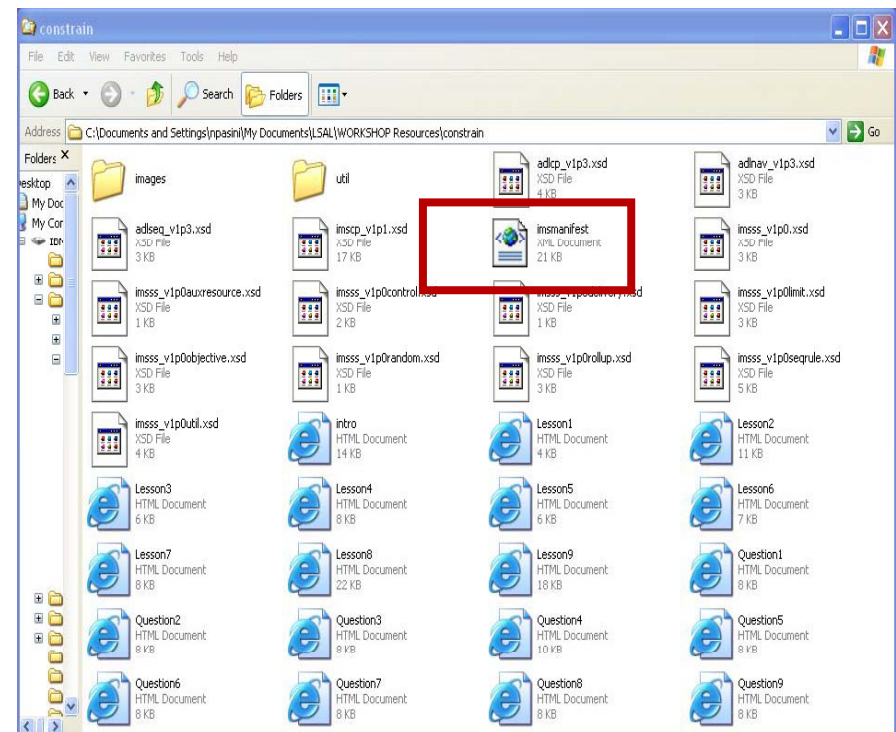
Content model components are gathered into a content package. A content package is:

- A standardized way to exchange collections of digital resources
- Everything needed to deliver the course, module, lesson, etc. to the learner



# What is in a Content Package?

- Manifest: a structured inventory formatted as an XML document describing content structure and resources
  - Named imsmanifest.xml
  - Sits at root of the package
- Content: the physical files making up the content package



# Definition of a Manifest

- A detailed, machine-readable set of instructions, structured in XML, that organizes a content package and tells the LMS when, how, and what content to deliver

## Manifest

(XML document)

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>

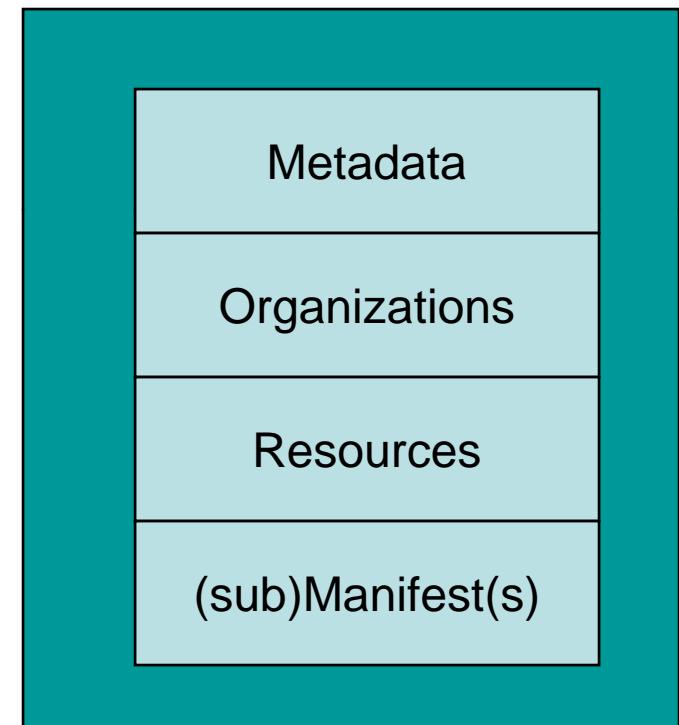
<metadata>
  <schema>ADL SCORM</schema>
  <schemaversion>1.2
    </schemaversion>
  <lom xmlns="http://www.imsglobal.org/imsd_rootv1p2">
</metadata>

<manifest
  identifier="IRS_IFS_COURSE">

<organizations
  default="xp_man0_toc1">
```

The manifest is composed of four major sections:

- Metadata
  - Data describing the content package as a whole
- Organizations
  - Dictates the TOC and organization of the learning resources making up a stand-alone unit or units of instruction
- Resources
  - Defines the learning resources bundled in the content package
- (sub)Manifest(s)
  - Describes any logically nested units of instruction (which can be treated as stand-alone units)



# <metadata> Wrapper

## Attributes:

- None

## Elements:

- <schema>
- <schemaversion>
- {Metadata}

## Example: *Inline Metadata Use of XML Prefix*



```
<manifest xmlns:lom = "http://ltsc.ieee.org/xsd/LOM">
  <metadata>
    <schema>ADL SCORM</schema>
    <schemaversion>2004 3rd Edition</schemaversion>
    <lom:lom>
      <lom:general>
        <lom:title>
          <lom:string language="en-US">Title for the Package</lom:string>
        </lom:title>
      </lom:general>
      <lom:metaMetadata>
        <lom:metadataSchema>LOMv1.0</lom:metadataSchema>
        <lom:metadataSchema>ADLv1.0</lom:metadataSchema>
      </lom:metaMetadata>
    </lom:lom>
  </metadata>
</manifest>
```

# <organization> Wrapper

- <title>
- <item>
- <metadata>
- <imsss:sequencing>



## Example:

```
<organizations>
  <organization identifier="TOC1">
    <title> Introduction to SCORM for LMS Vendors </title>
    <item identifier="ITEM1" identifierref="RESOURCE1" isvisible="true">
      <title>SCORM Run-Time Environment Requirements</title>
    </item>
    <item identifier="ITEM2" identifierref="RESOURCE2" isvisible="true">
      <title>LMS Conformance Requirements</title>
    </item>
  </organization>
</organizations>
```

*Code Illustration 3-9: <organization> Element*

# <resources> Wrapper



## Elements:

- <resource>

## Example:

```
<manifest>
  <metadata/>
  <organizations/>
  <resources>
    <resource identifier="RESOURCE1" adlcp:scormType="sco" type="webcontent"
      href="lesson1.htm">
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE2" adlcp:scormType="sco" type="webcontent"
      href="introl.htm">
      <file href="introl.htm"/>
    </resource>
    <resource identifier="RESOURCE3" adlcp:scormType="asset"
      type="webcontent" href="content1.htm">
      <file href="content1.htm"/>
    </resource>
    <resource identifier="RESOURCE4" adlcp:scormType="sco" type="webcontent"
      href="summary1.htm">
      <file href="summary1.htm"/>
    </resource>
  </resources>
</manifest>
```

# Manifest and Content Hierarchy

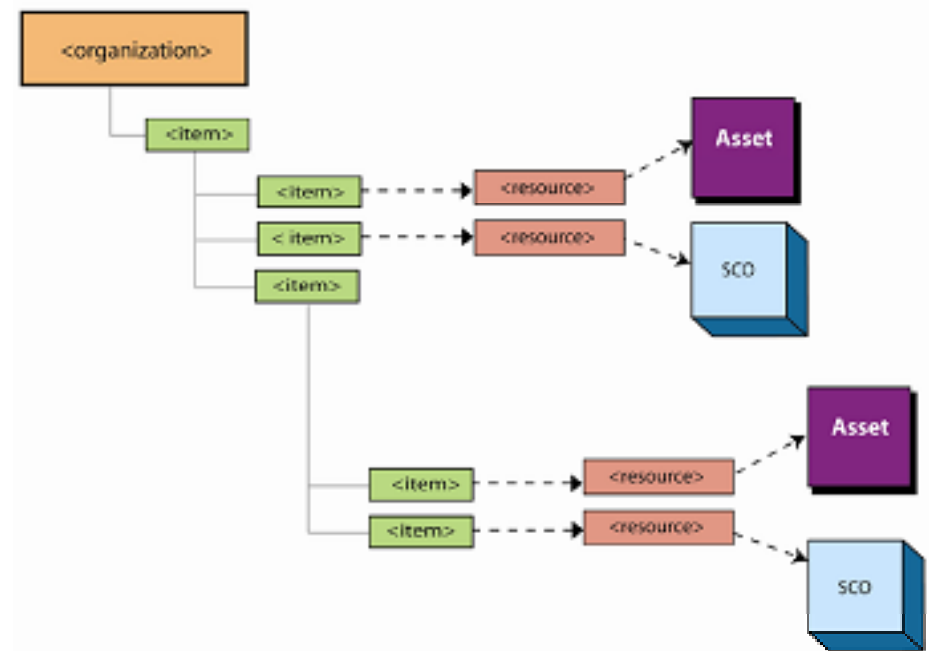
- The scope of the manifest is elastic.

It can describe:

- Part of a course
  - An entire course
  - A collection of courses
    - WHY?
- 
- SCORM does not specify:
    - Any one hierarchy in the manifest
    - Any one learning taxonomy
      - WHY?

- **Content Hierarchy Example w/ Terminology**

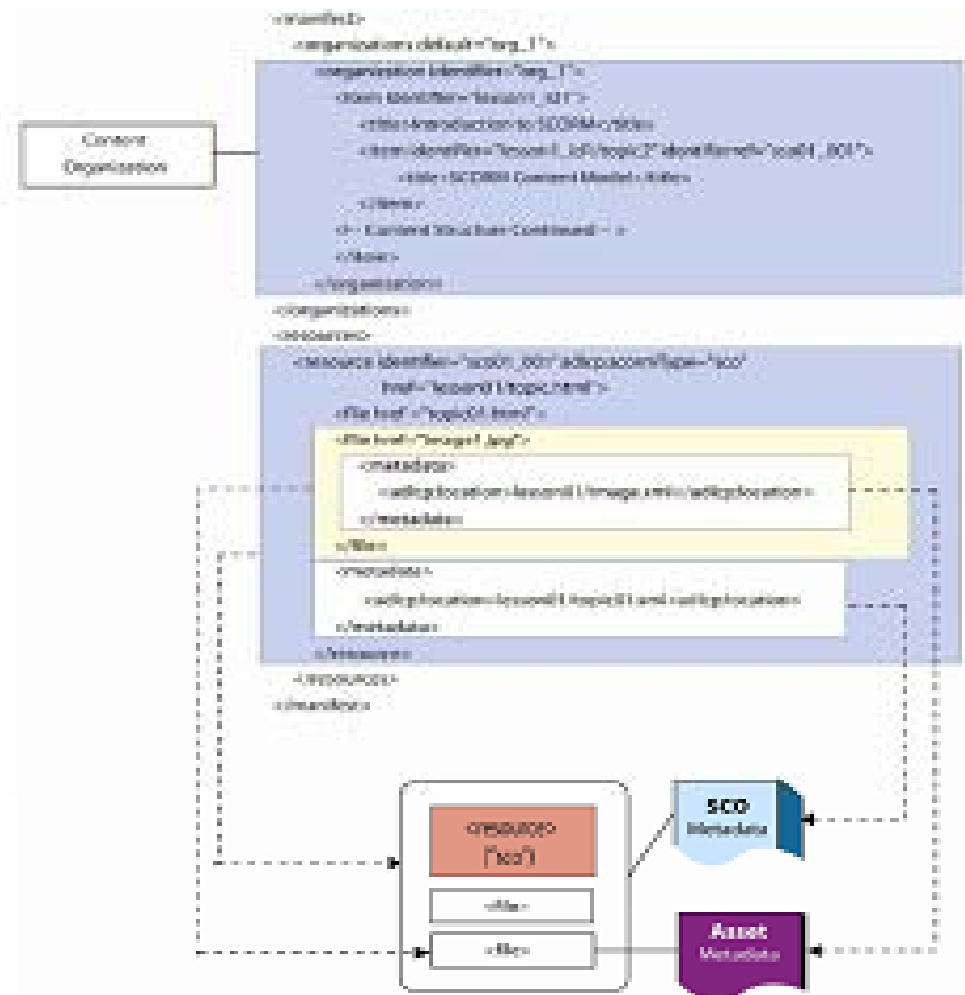
- Manifest specifies hierarchy in terms of organization and items
- Items are associated with resources
- Resources are linked as assets and SCOs



25 of 50

# Metadata

- Each level of aggregation has its own metadata
- Purpose of this metadata is to:
  - Facilitate search and discovery
  - Provide information about the content organization
  - Help determine what content model component to deliver at run-time
- At the SCO level there is the Learning Object Metadata (LOM) Model (part of the IEEE standard)



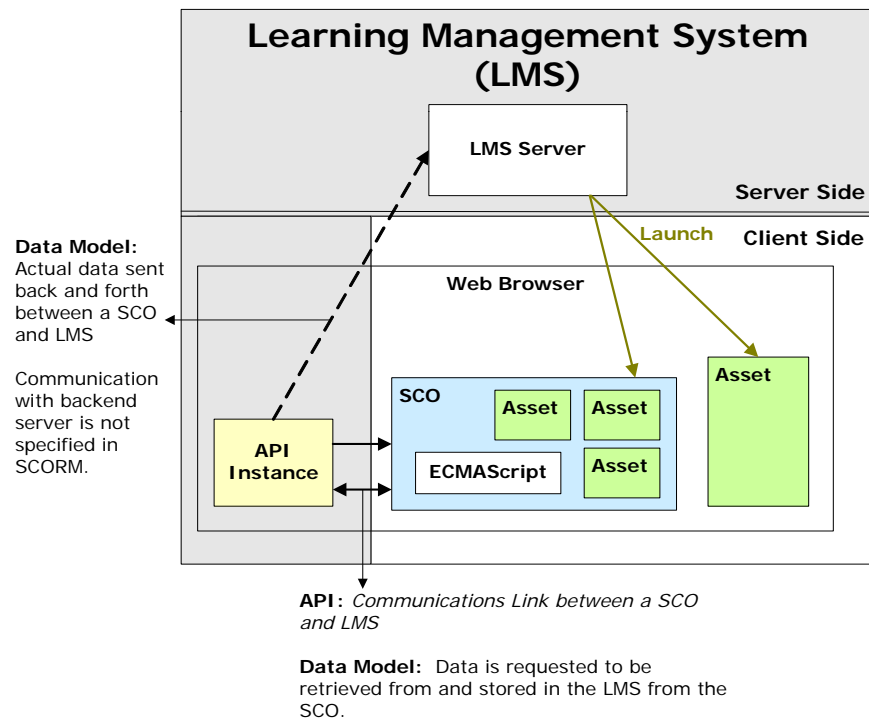


4

*Communicating and Tracking  
Data with SCORM*

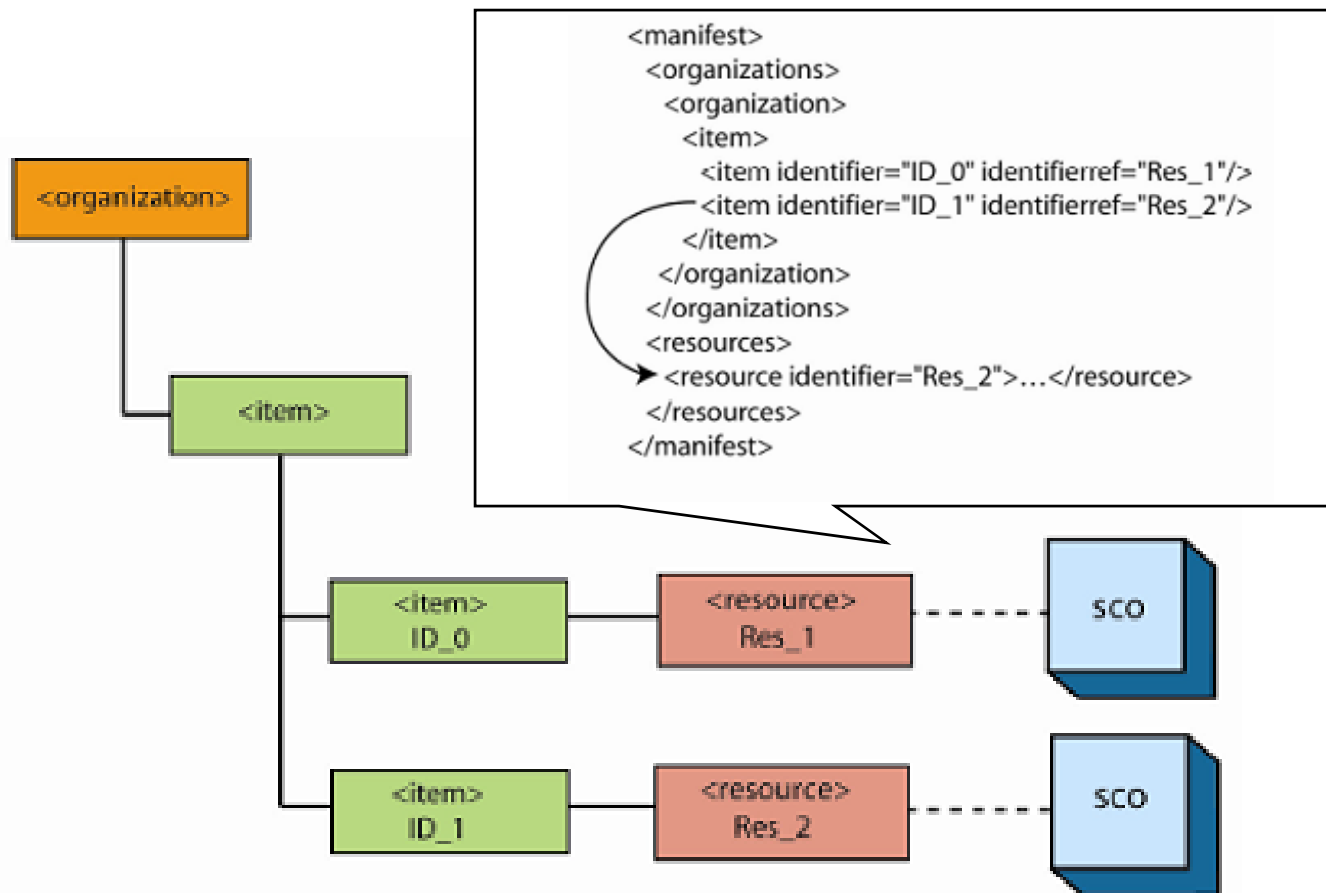
# Launching Communication with the LMS

- SCO initiates communication with LMS
- SCO asks LMS for information
- LMS sends information back to the SCO



# Determining What Content to Launch

The RTE must evaluate any sequencing and navigation requests and determine what content to launch. The manifests provides instructions on which resources to launch in the web browser.



# Application Programming Interface

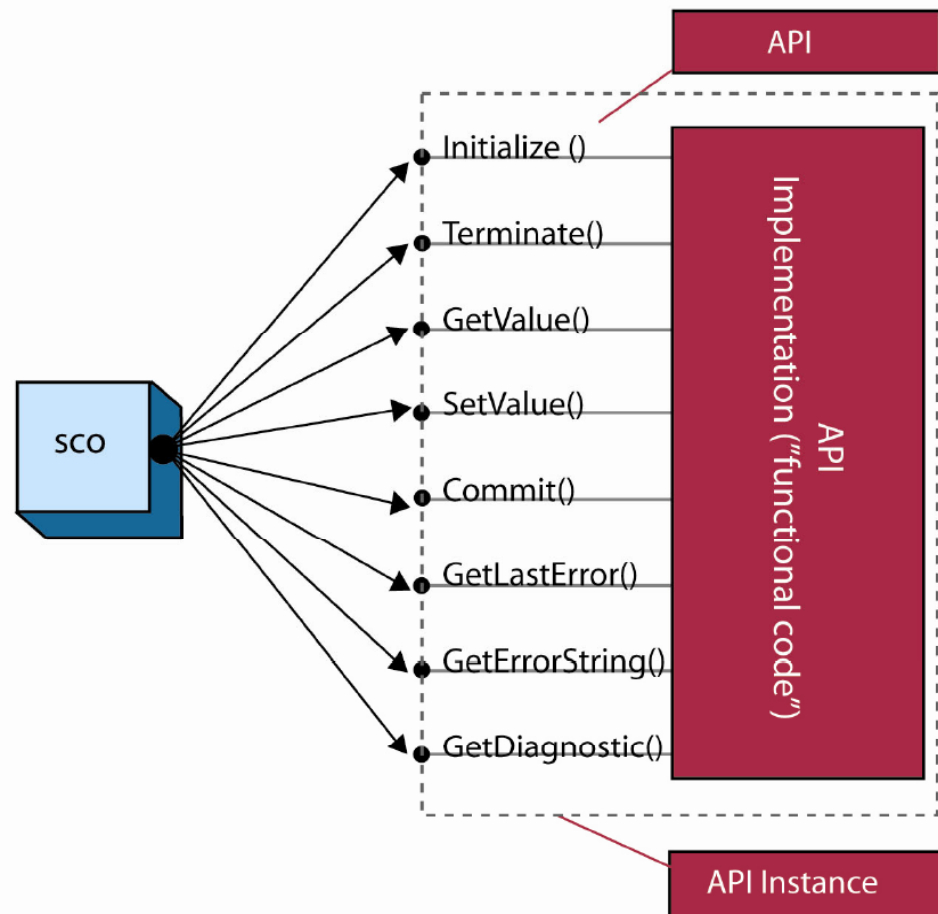
- These are the eight functions a SCO uses to communicate with the LMS.

The API is an abstraction that protects the SCO from a specific implementation.

The API implementation is the software that channels functionality through each function.

The API instance is an individual execution of the implementation.

All communication between SCO to API instance to LMS is initiated by the SCO.



# SCORM Data Tracking Elements

- Technical Initialization
  - Launch Data
  - Entry
  - Location
  - Mode
  - Credit
  - Suspend Data
- Content Initialization
  - Maximum Time Allowed
  - Learner ID
  - Learner Name
  - Learner Preference
  - Completion Threshold
  - Time Limit Action
- Score Reporting
  - Score
  - Progress Measure
  - Scaled Passing Score
  - Success Status
  - Objectives
  - Interactions
  - Completion Status
- Comments
  - Comments from Learner
  - Comments from LMS
- Exit Data
  - Exit
  - Session Time
  - Suspend Data
  - Total Time

**The SCORM 2004 mandatory data that the functions can pass back and forth. The data model ensures interoperability.**

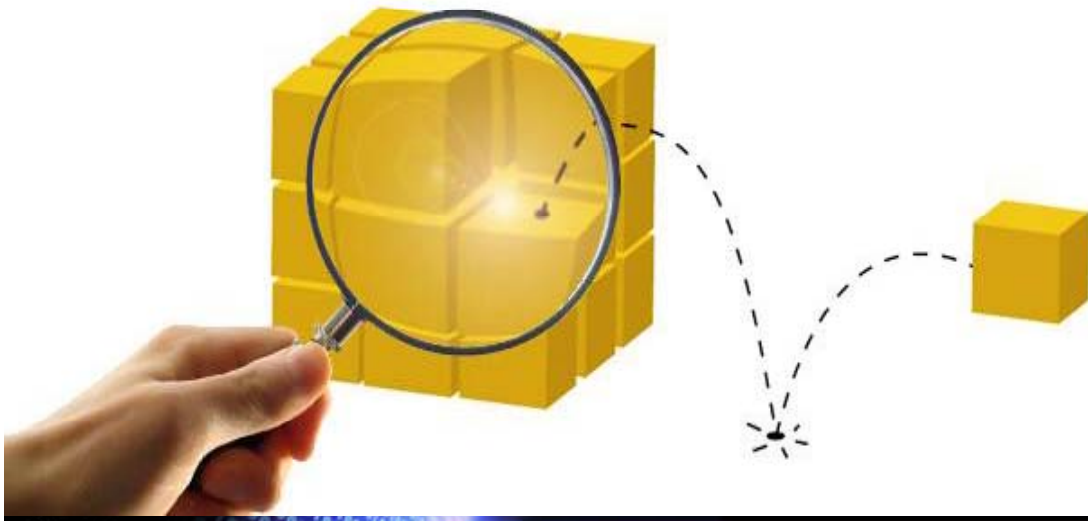
*31 of 50*



# Why Track Data?

- Use the Data Model Elements to achieve the desired learner experience
- For more information about the Data Model Elements, visit:

<http://www.adlnet.org/index.cfm?fuseaction=SCORMDown&listing=Examples>





5

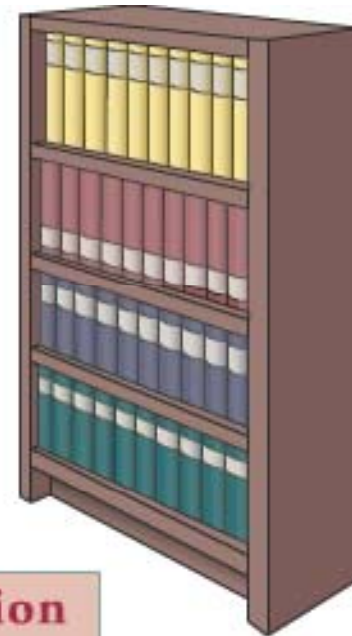
*Sequencing content with SCORM*

# Sequencing and Navigation



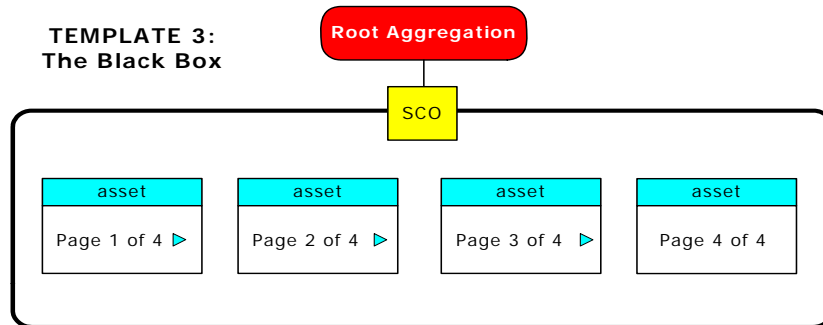
**Sequencing &  
Navigation**

**Sequencing Information  
& Behavior (from IMS)**



# What is Sequencing?

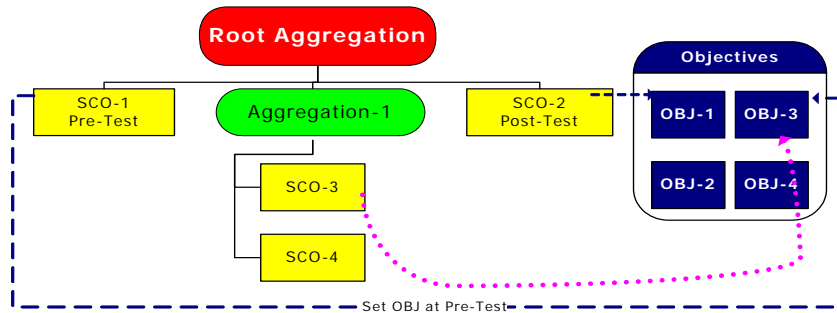
TEMPLATE 3:  
The Black Box



All remediation occurs as intra-SCO branching, so there is no impact to inter-SCO sequencing.

© Copyright 2004, Learning Systems Architecture Lab, Some Rights Reserved (CC: by-nc-sa/2.0)

TEMPLATE 7: Pre- and Post-Test Sequencing (2)



NOTE: Not all links between SCOs and objectives are shown here.

---Set OBJ---      .....Read OBJ.....

© Copyright 2004, Learning Systems Architecture Lab, Some Rights Reserved (CC: by-nc-sa/2.0)

An **interoperable** way of describing and prescribing how learners receive SCORM-conformant content

# Sequencing

- Designers may specify sequencing behaviors at authoring stage
- Activities may be sequenced at time of delivery based on a learner's actions or performance
- Sequencing behaviors are external to the content to facilitate reuse



5

*Comparing S1000D and SCORM Functions*

# Functional Comparisons

Function	S1000D	SCORM
Aggregation	PubModule, scormContentPackage	IMS Manifest
Sequencing	Process Data Module	IMS Simple Sequencing
“Granularization”	Data Modules	Sharable Content Objects
Meta Data	<idStatus>, <pmStatus>, <scormContentPackageStatus>	Learning Object Metadata (Institute for Electronics and Electrical Engineers, LOM)
Content	Learning Data Modules	<b>No</b> reference to content and format
Reporting and Interfacing	Data and communication protocol <b>not</b> specified	IEEE ECMA Script API for Content-to-Runtime Services Communication

# Questions?

- Contact information:  
Wayne Gafford  
wayne.gafford@adlnet.gov

