

# IMS Specifications: Creating an Education Technology Interoperability Ecosystem

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# Content

- Context for the Technical Work
- Current Specification Activity
- Technical Developments 2018/2019
- Getting Involved with IMS
- Future Meetings

# My Background

- **Role**
  - Developing the top-level architectural perspective and understanding
  - Making sure the IMS specifications fit the IMS ECOSYSTEM
  - Overseeing the range of technologies we adopt and adapt to create IMS specifications
  - Facilitating the completion of various specifications
  - Supporting the adoption of the IMS specifications
- **Current Specification Responsibilities**
  - Question & Test Interoperability
  - OneRoster

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- [Accessibility](#)
- [Accessible Portable Item Protocol](#)<sup>®</sup>
- [Caliper Analytics](#)<sup>®</sup>
- [Competency Definitions](#)
- [Content Packaging](#)
- [Common Cartridge](#)<sup>®</sup>
- [Competencies and Academic Standards Exchange](#)<sup>™</sup>
- [Course Planning and Scheduling](#)
- [Digital Repositories](#)
- [Enterprise](#)
- [Enterprise Services](#)
- [ePortfolio](#)
- [General Web Services](#)
- [Interactive WhiteBoard/ Common File Format](#)
- [Learner Information](#)
- [Learning Design](#)
- [Learning Information Services](#)
- [Learning Object Discovery and Exchange](#)
- [Learning Tools Interoperability](#)<sup>®</sup>
- [LTI Resource Search](#)
- [Meta-data](#)
- [OneRoster](#)<sup>®</sup>
- [Open Badges](#)
- [Question and Test Interoperability](#)
- [Resource List Interoperability](#)
- [Shareable State Persistence](#)
- [Simple Sequencing](#)
- [Tools Interoperability](#)
- [Vocabulary Definition Exchange](#)

A wide range of specifications published since 1999.

We have an extensive legacy responsibility.

# Published Specifications 2017/18

Specifications published (Final Release) since Aug 2017 are:

- Caliper/Sensor API 1.1
- OpenBadges 2.0
- LTI Resource Search 1.0

# Current Specification Activity

## New Specifications

- Comprehensive Learner Record
  - Extended Transcript
- Computer Adaptive Testing
- Open Video
- Proctoring

## New Versions

- Caliper 1.2 + MPs
- CASE 1.1
- Badge Connect API 1.0
- **LTI Advantage**
- OneRoster 1.2
- QTI 3.0
- Thin CC/CC 1.4
  - K-12 Profile



# Technical Activity Summary

	<b>Accessibility</b>	Accessibility, inclusive design, and personalization of online learning resources to meet the needs of all users/learners
	<b>App Sharing &amp; Integration Protocol</b>	Peer-to-peer educational app sharing catalogs and storefronts
	<b>App Vetting</b>	Vetting educational applications, to ensure that a minimum standard of privacy and security is met, provides assurance that the information gathered by these educational applications is being used responsibly.
	<b>Caliper Analytics</b>	Consistently capturing and presenting measures of learning activity and defining a common language for labeling learning data, with a standard way of measuring learning activities and effectiveness enabling designers and providers of curriculum to measure, compare and improve quality
	<b>Common Cartridge</b>	Organization, publishing, distribution, delivery, and search of a wide variety of collections of digital learning content, applications used as the basis for or in support of online learning of any type.
	<b>Competencies &amp; Academic Standards Exchange<sup>®</sup></b>	Exchange and management of information about learning standards and/or competencies in a consistent and referenceable way including machine-readable statements of what the learner will know and be able to do, explanations of relationships between standard sets and/or among individual standards or courses where applicable, and guides listing specific criteria for grading or scoring academic papers, projects, or tests.
	<b>Comprehensive Learner Record</b>	A comprehensive digital learner record that supports competency-based education, co-curricular and extra-curricular skills and achievements, employer-based learning, and other learning experiences in a verifiable, portable, and interoperable format.
	<b>Digital Credentials and Badges</b>	Capturing learner achievements that are verifiable, portable, and interoperable through Open Badges and in the future, learning pathways and Blockchain extensions.
	<b>EPUB for Education</b>	Establishing a globally interoperable, accessible, open ecosystem for e-Textbooks and other Digital Learning Materials via EPUB3, Educational Sector Standards and the Open Web Platform
	<b>Learning Tools Interoperability</b>	Integrating rich learning applications (often remotely hosted and provided through third-party services) with platforms like learning management systems, portals, learning object repositories, or other educational environments.
	<b>OneRoster and Learning Information Services</b>	Exchange and synchronization of roster information and grades which focuses on people, memberships, courses and outcomes.
	<b>OpenVideo</b>	Creation of video capture metadata to enable information from any video to be shared and searched
	<b>Privacy and Security</b>	Development of a Privacy Service which will carry privacy preferences across systems and tools
	<b>Question and Test Interoperability/Accessible Portable Item Protocol</b>	Exchange of item, test and results data between authoring tools, item banks, test construction tools, learning systems and assessment delivery systems, including accessible assessments.



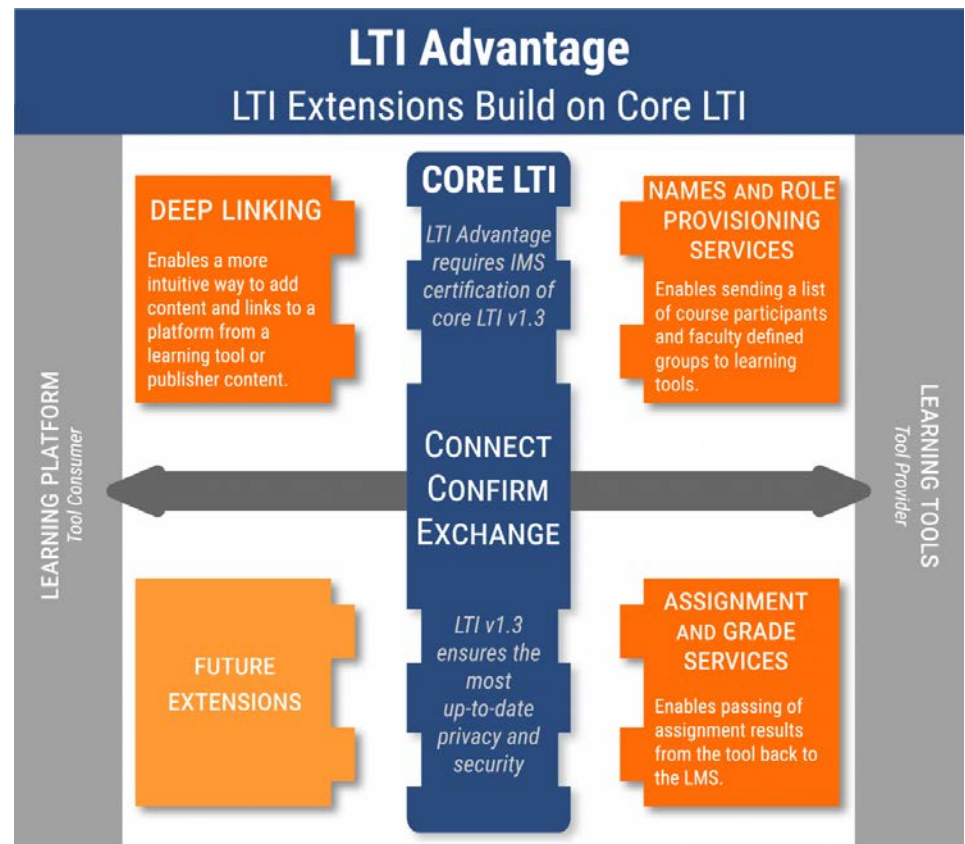
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# Learning Tools Interoperability Advantage

- LTI 1.3 Core
  - IMS Security Framework
- LTI Extensions
  - LTI Deep Linking
  - LTI Names & Role Service
  - LTI Assignment and Grade Service
- Developer Tools





# Security Framework

[www.imsglobal.org/ims-security-framework](http://www.imsglobal.org/ims-security-framework)

## IMS Security Framework

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The IMS Security Framework is currently a Candidate Final available to IMS members only. It is upon this framework that all IMS service-based specifications should make reference, including the LTI v1.3 and LTI Advantage services.

IMS Global has created, is creating, and will continue to create, service-oriented and/or message-exchange interoperability specifications. These service-based specifications recommend or require a number of different security patterns: for example, the use of OAuth 1.0 based message signing, OAuth 2 based authentication and authorization, and so forth. The IMS Security Framework defines a set of patterns for security that all of its specifications should use (only in special circumstances will IMS consider exceptions). These security patterns are based on the appropriate standards and specifications published by other organizations, for example the Internet Engineering Task Force (IETF) and its Requests For Comments (RFCs). The core standards used are:

- OAuth 2.0 - RFCs 6749 and 6750 from the IETF
- JSON Web Tokens - RFCs 7515, 7516, 7517, 7518, 7519 and 7523
- Open ID Connect Core - an identity layer, from OpenID Foundation, on top of OAuth 2.0

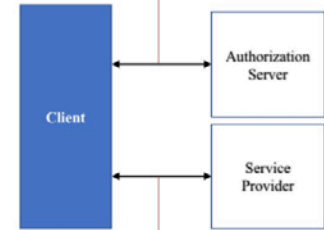
The use of the IMS Security Framework promotes consistent and compatible implementation requirements and simplifies adoption when more than one IMS specification is being implemented.

In the case where IMS has defined a web services-based standard, such as OneRoster, the specification will describe the set of web service calls that can occur between a service consumer (or Client) and a service provider (Platform). Typical service calls include when a Client 'pulls' the data from the Platform and when the Platform 'Pushes' the data to the Client. In many cases, these service calls must occur within an appropriate security framework. For IMS specifications using a web services approach, the Figure on the right shows a schematic representation of this security framework

The IMS specification will define how the Client and Platform will exchange information. This document defines how to achieve the "Authentication" and "Authorization" using a separate set of message exchanges and how the actual corresponding set of IMS service calls will use this authorization and authentication information. The authorization and authentication uses an "Authorization Server" which may be a system independent of the Platform or may be endpoints hosted by the Platform.

In the case where IMS has defined a non-web services based standard, such as Learning Tools Interoperability (LTI), the specification will describe the set of messages that can occur between a Platform and a Client. In scenarios where the message exchange is vulnerable (for example, when launching from a web browser), the messages will be signed. This signing MAY include data derived from the identity-based authentication. The IMS specification defines how a Client can transform the messages exchanged between the Platform and the Client (including a user's browser-based interaction) into a Client-based experience. This document defines how to achieve Authentication and Authorization using a separate set of message exchanges between Platform and Client and how to encode the authorization and authentication information in JWT-based message signing of these message exchanges. The authorization and authentication process uses an authorization server which may be a system independent of the Platform or may be endpoints hosted by the Platform.

Authentication and authorization based upon OAuth 2.



Data exchange as defined by the IMS service specification.

### Member Resources (login required)

#### Security Framework

- [IMS Security Framework v1.0 - Candidate Final status](#)

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# E-Assessment

- The only interoperability standard for the authoring and delivery of online tests
- Working on:-
  - Question and Test Interoperability (QTI) 3.0
  - Assessment Metric Profile for Caliper
  - Computer Adaptive Testing (CAT) 1.0
  - Proctoring 1.0 (using LTI Advantage)
  - PPARC, SBAC and CvTE Profiles

# Learning Analytics

- To enable the provision of learning analytics from, in particular, heterogeneous sources
- Working on:-
  - Promoting/supporting adoption of Caliper (Sensor) 1.1
  - New Metric Profiles (driven by Member need)
  - Separation of Metric Profiles from the core Caliper specification

# Enterprise Systems

- Exchanging information about learners and their learning activities
- Working on:-
  - Supporting OneRoster 1.1 adoption
  - OneRoster 1.2 Final Release
  - LTI Advantage integration
    - OneRoster Gradebook Service
    - OneRoster Rostering
- OneRoster 1.0 deprecation notification
  - <https://www.imsglobal.org/article/deprecation-notice-oneroster-10>

# Packaged Content & Searching

- The exchange of learning materials as a flexible coherent learning experience
- Working on:-
  - Common Cartridge/Thin Common Cartridge 1.4
    - K-12 Thin CC Profile
  - Common Cartridge/Thin Common Cartridge 2.0
  - OpenVideo 1.0
  - **LTI Resource Search 1.0**
  - EPUB for Education 1.0

# Competency Framework & Badging

- Competency-based learning supported by evidence of achievement
- Working on:-
  - Comprehensive Learner Record 1.0 (previously known as eTranscript)
  - Badge Connect API Base Document
  - Supporting deployment/adoption of CASE 1.0
  - Scope definition for CASE 1.1



# Accessibility

- Establishing a common accessibility framework for the delivery of accessible content. Primary effort is driven by E-Assessment (QTI/APIP)
- Working on:-
  - Access For All Digital Resource Description (AfA DRD) 3.0 Candidate Final 2.0
  - Access For All Personal Needs and Preferences (AfA PNP) 3.0 Candidate Final 2.0

# Security & Privacy

- Guidance and best practices for informing users on how PII is used by tools conforming to IMS standards, specifically LTI, Caliper Analytics and Learning Information Services
- IMS Security Framework
- Announced deprecation notification of use of SHA-1
  - <https://www.imsglobal.org/security-bulletin-deprecation-notice-sha-1-hash-algorithm>
- Planning full deprecation of OAuth 1.0.

- Communities of Practice
- Product Steering Boards
- App Sharing
- xAPI/Caliper Next Generation
- 1EdTech
- CASE Registry
- HED APIs (Edu-APIs)
- 1EdTech
- Japanese OneRoster Profile
- SBAC QTI 3.0 Profile
- Results, Assessments & Gradebooks
- Common Information Model/Data Model/Vocabularies

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# Specification Development Team

Lisa Mattson

Technical

- Markus Gylling
- Dereck Haskins\*
- Phil Nicholls\*
- James Rissler\*
- Colin Smythe

Product

- Jeff Bohrer
- Jill Hobson
- Mark Leuba
- Mark McKell
- Leslie McCafferty\*

Support

- Matt Pasiewicz\*
- Chris Coleman\*
- *DevOps Support*

# Technical Developments 2018/19

- Adoption of OpenAPI 3.0
- Improved conformance testing for Consumers
- Publish Security Framework
- Unique Identifiers Best Practices
- Improve conformance reporting to the Product Directory
- Next Generation Validator

# Specification Development Technical Issues

- When to support HTTP 2?
- When to support Transport Layer Security (TLS) 1.3 (RFC 8846)?
- How to realize Consumer Test Interface API?
- Adoption of Web Components?
- Expansion of adoption of OAuth 2.0?
- When to formally deprecate OAuth 1.0a?

## LTI

Resource	OneRoster	CASE	CAT	CLR	QTI	AfA	OpenVideo
Search 1.0	1.1/1.2	1.0	1.0	1.0	2.x/3.0	2.0/3.0	1.0

## Modelling Tool

### Service Bindings

- OpenAPI 2.0/3.0
  - ❖ JSON
  - ❖ YAML
- WSDL/XSD

### Documentation

- HTML 4.2
- Respec

### Test Systems

- Provider

### Data Bindings

- XSD
- Context Files
- JSON Schema



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# Getting Involved

- Establish localization/profiling activities to tailor the IMS specifications to your local needs
- Provide use-cases to help IMS identify the ‘pain-points’ for deployments in your country
- Tell us how we can help your organization adopt the IMS specifications

# Test Systems Internationalization

- We want to provide language-specific web-site landing pages to our conformance test systems
- In particular for:
  - LTI Advantage
  - OneRoster
- We need your organization to help us provide the language translations

# APIs for Higher Education (Edu APIs)

- Start from LMS/SIS interaction perspective
- Build upon the IMS specifications
  - Learning Information Services (LIS)
  - OneRoster
  - Course Planning & Scheduling
- Reflect international requirements
  - What are the HED institutional needs in your country?
  - What APIs are already used by HED in your country?
- **More tomorrow!**

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# Upcoming Events

- **12<sup>th</sup>-15<sup>th</sup> November, 2018**  
IMS Quarterly in Suwanee, Georgia, USA
- **4<sup>th</sup>-7<sup>th</sup> February, 2019**  
IMS Quarterly in Tempe, AZ, USA
- **20<sup>th</sup>-23<sup>rd</sup> May, 2019**  
LILI 2019 in San Diego, CA, USA

# Questions & Comments