

# The IMS Specifications to Improve Learning: From Metadata to Caliper and Beyond

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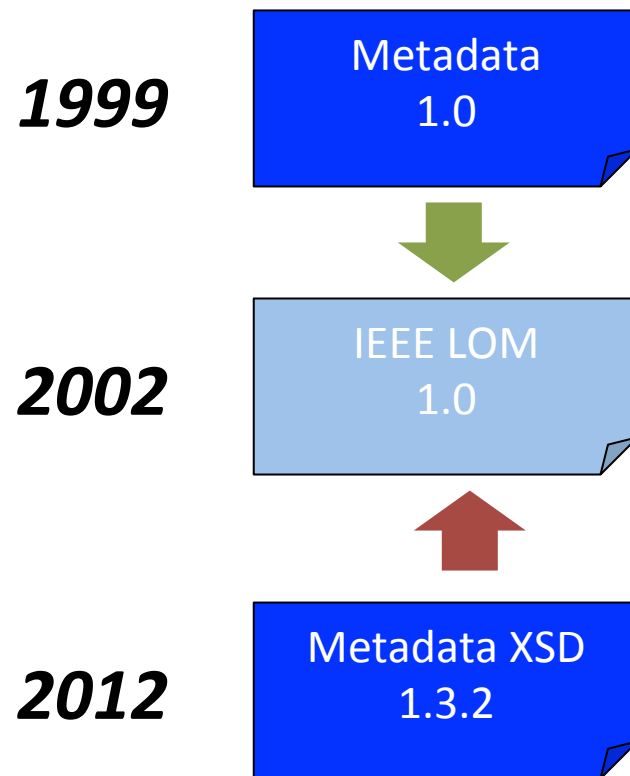
# Talk Objectives

- Introduce the IMS Standards
- Give a historic context
- What to expect over the next 24 months
- Explain the benefits of using IMS

# Biography

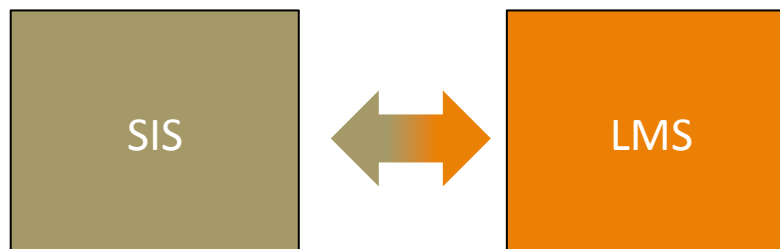
- Joined IMS in May 1999
- Responsible for the development of many IMS specifications inc. Question & Test Interoperability (QTI), Content Packaging, Accessible Portable Item Protocol (APIP), Learning Information Services (LIS), etc.
- Currently IMS Chief Architect and responsible for:
  - How the specifications fit together
  - Overseeing the technical details of the specifications
  - Supporting adoption of the specifications

## The Very Early Years (1996-1999)



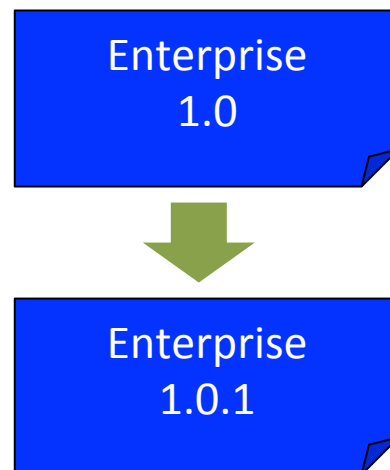
- Data to describe a Learning Object
- A Data Model
- XML-based data exchange
- IEEE 1484.12.1

## Enterprise (1999)



- SIS/LMS Data Exchange
- Data Model
- DTDs

**1999**

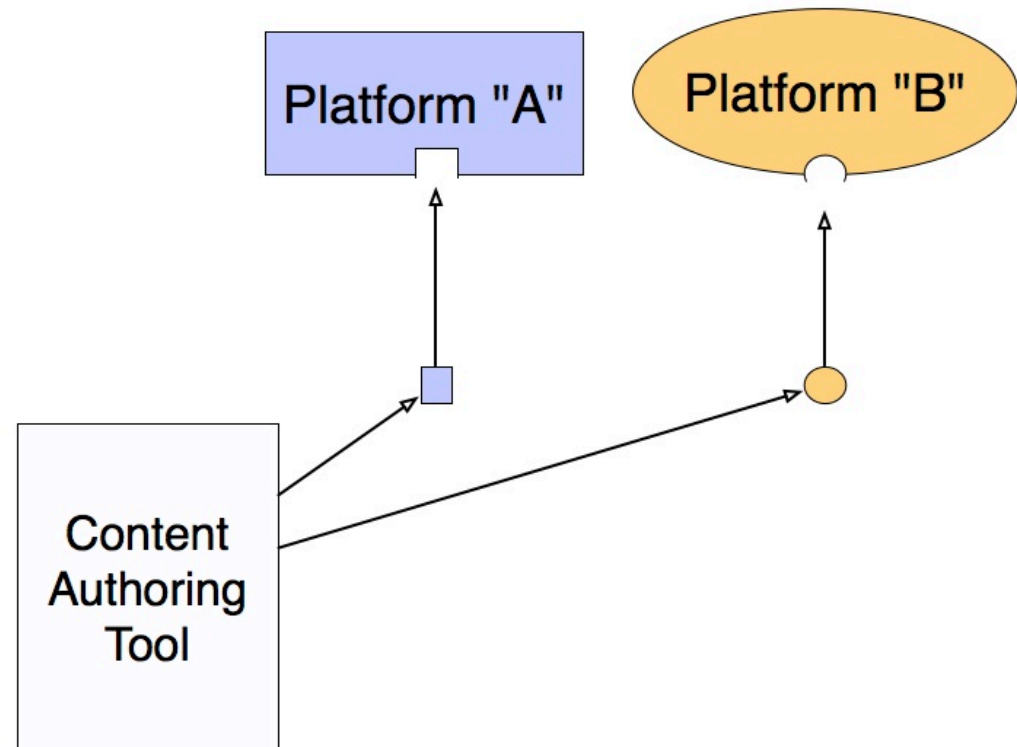


## Credibility Time (2000)

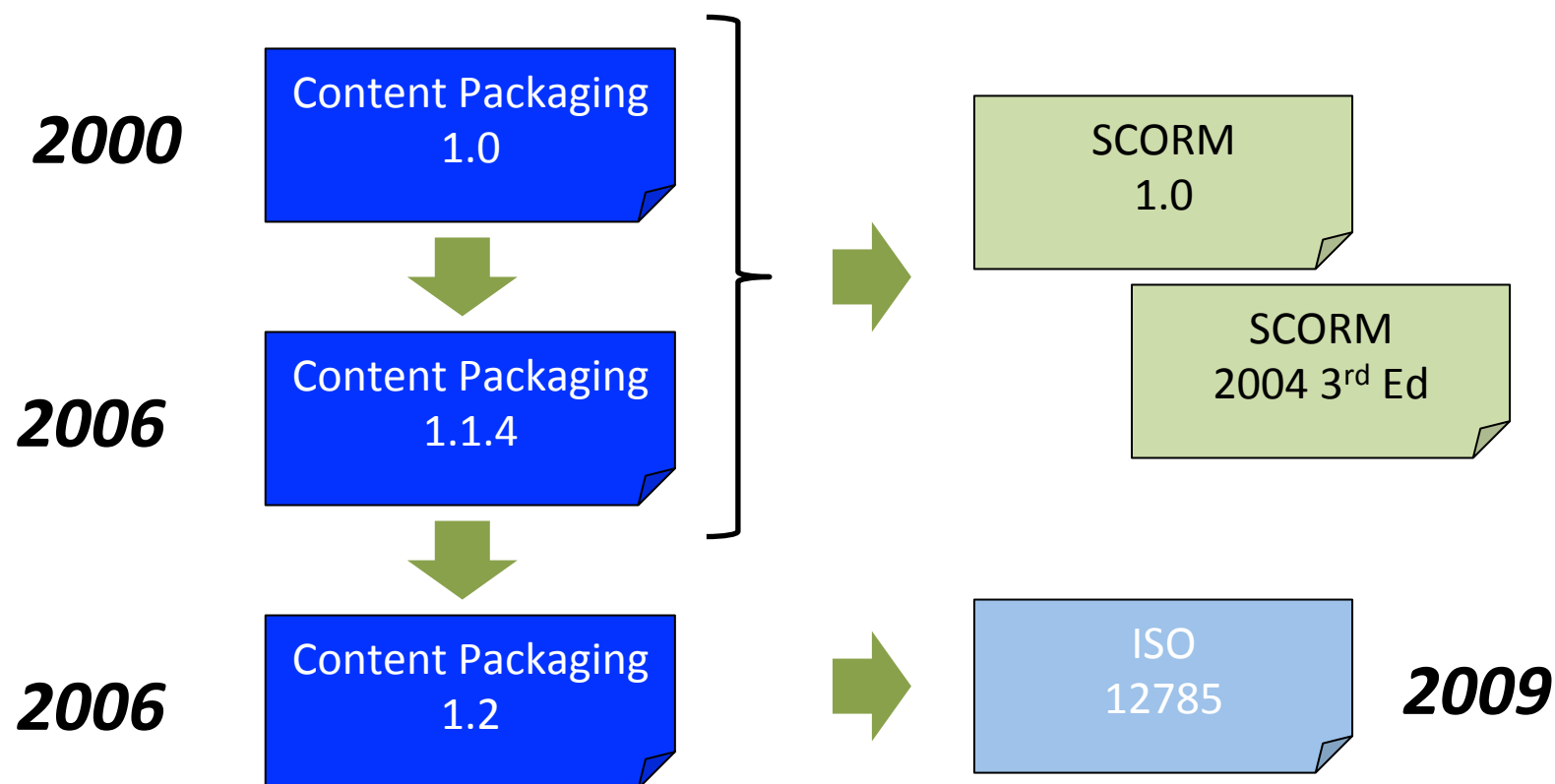
- Content Packaging
  - Moving course content around
- Question & Test Interoperability
  - Support for online tests and quizzes

# The Problem for Content Packaging

Because learning platforms and authoring tools are all different, there is a need for a standard interoperable format.

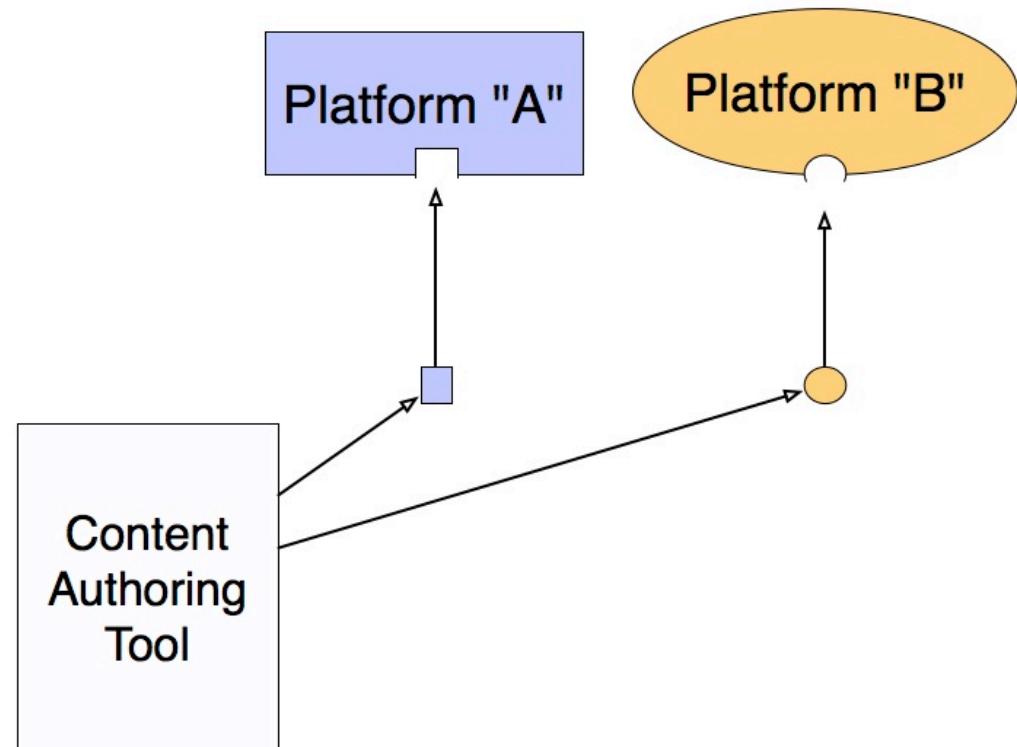


# Content Packaging

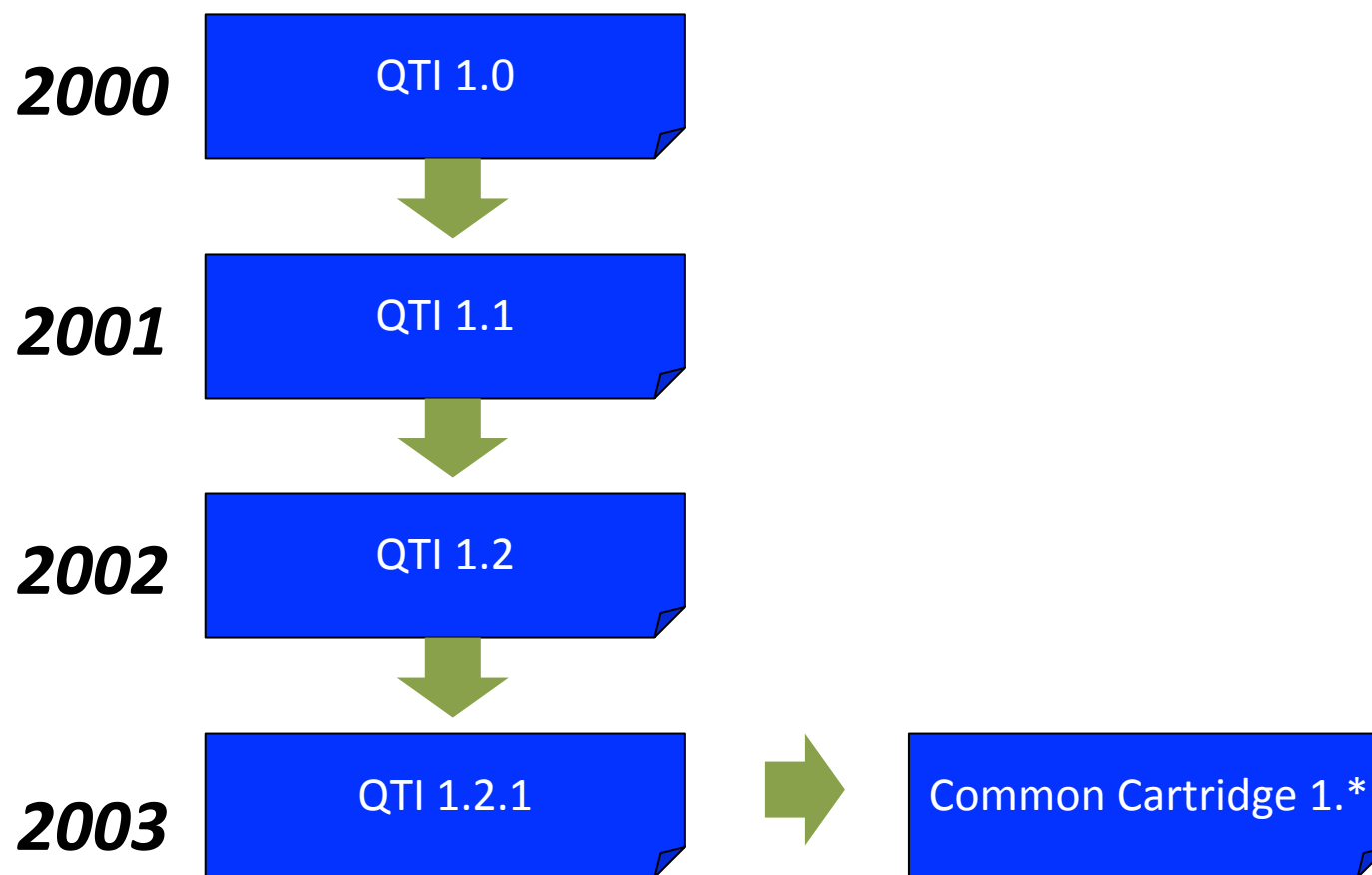


# The Problem for QTI

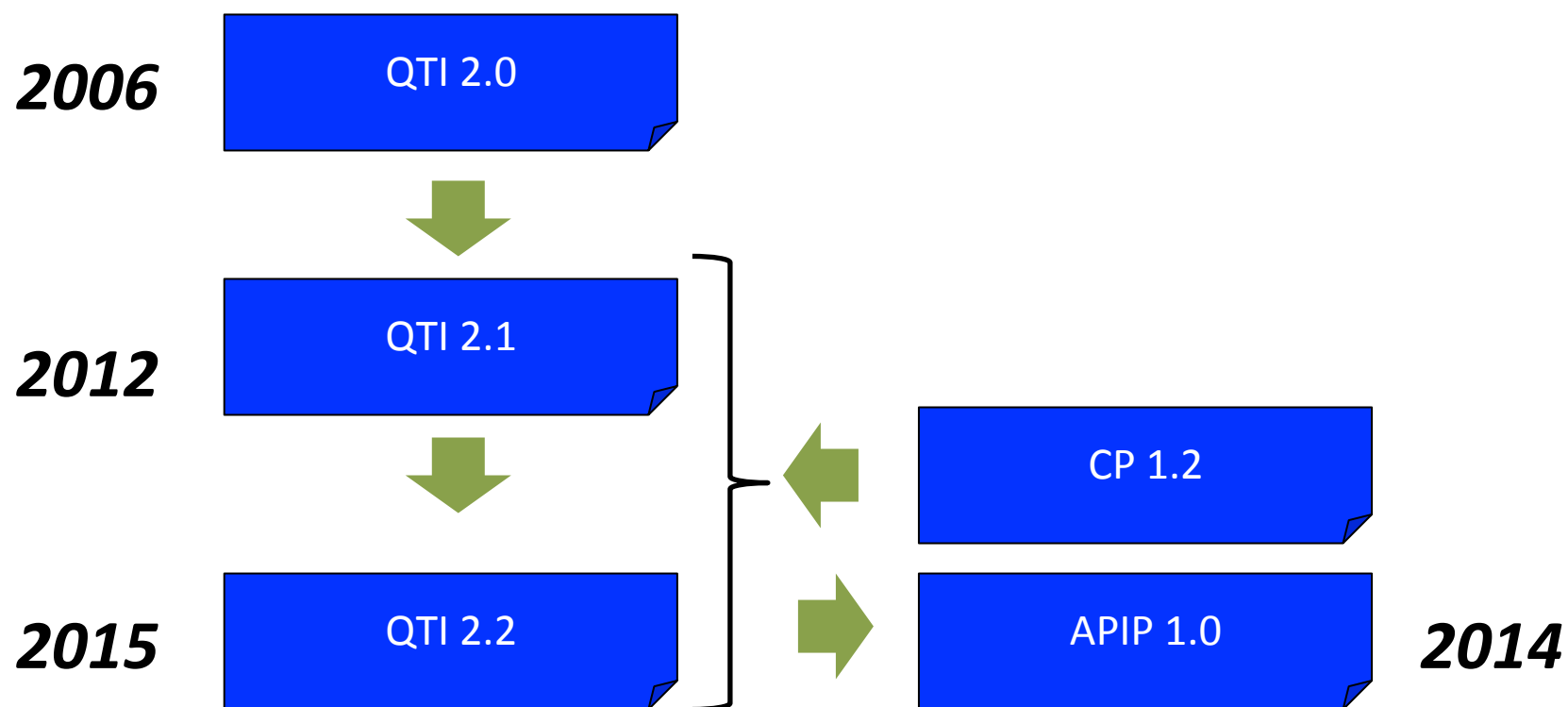
This time the problem is authoring an Assessment/Test or Quiz and using different online testing delivery systems



## QTI (2000-2003)



## QTI (2006-2015)





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Learning Consortium

Advancing Learning Impact by Enabling the Open Foundation for  
Seamless, Agile and Information-Rich Educational Technology Integration

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**Package:**  no file selected [Browse to begin validation.](#)

Select a Profile:

☒ QTI v2.1 ASI (default)

☐ QTI v2.1 Base Metadata ☐ QTI v2.1 Base Results Reporting ☐ QTI v2.1 Base Usage Data ☐ QTIV2.2 Usage Data (Base) ☐ QTIV2p2 Results Report (Base)

☐ Dutch Examinations Profile v1.0 (DEP)

☐ QTI v2.2 ASI ☐ QTIV2.2 Usage Data (Base)

For APIP™ validation, visit <http://validator.imsglobal.org/assessment>

## IMS Assessment Conformance and Certification

This test system is made available free-of-charge so that you can perform your own testing. To achieve IMS conformance, visit the QTI2/APIP Alliance. A [primer](#) is available on the IMS Website for more information on conformance and certification.

## How to use the validator

### VIA WEB UI, SOAP WEB SERVICE OR COMMAND LINE

Currently the validator can validate an imsmanifest.xml file or an entire cartridge. The validation options are: Validate by URI (provide a URI to an ims manifest file or cartridge), Direct Input (copy

[Accessible Portable Item Protocol](#)

[QTI/APIP Alliance Website Login](#)

[APIP v1.0 Validator Tool](#)

[Join the QTI/APIP Alliance Online](#)

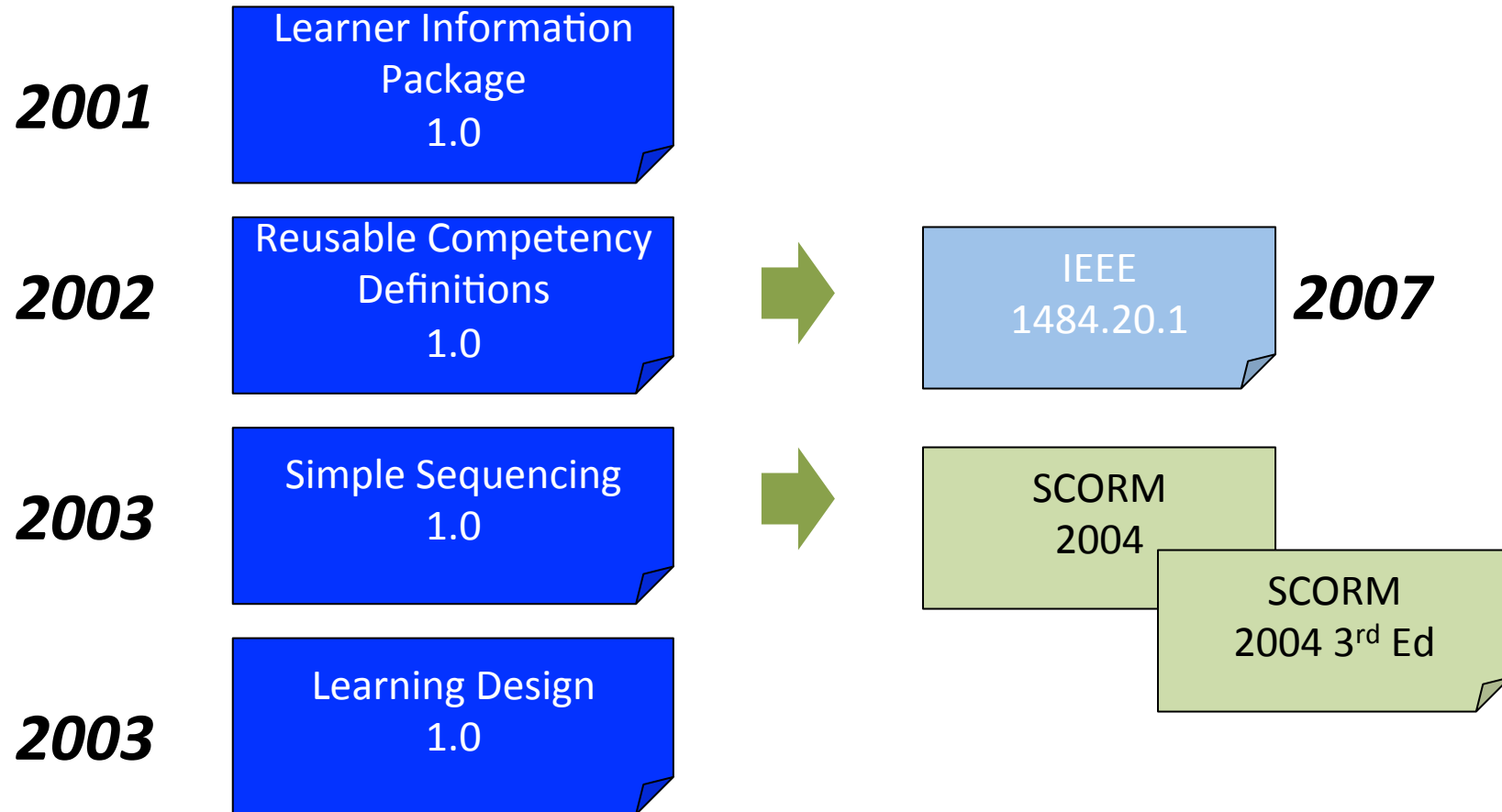
[Read how states and suppliers are working together to revolutionize assessment](#)

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# Data Models (2000-2005)



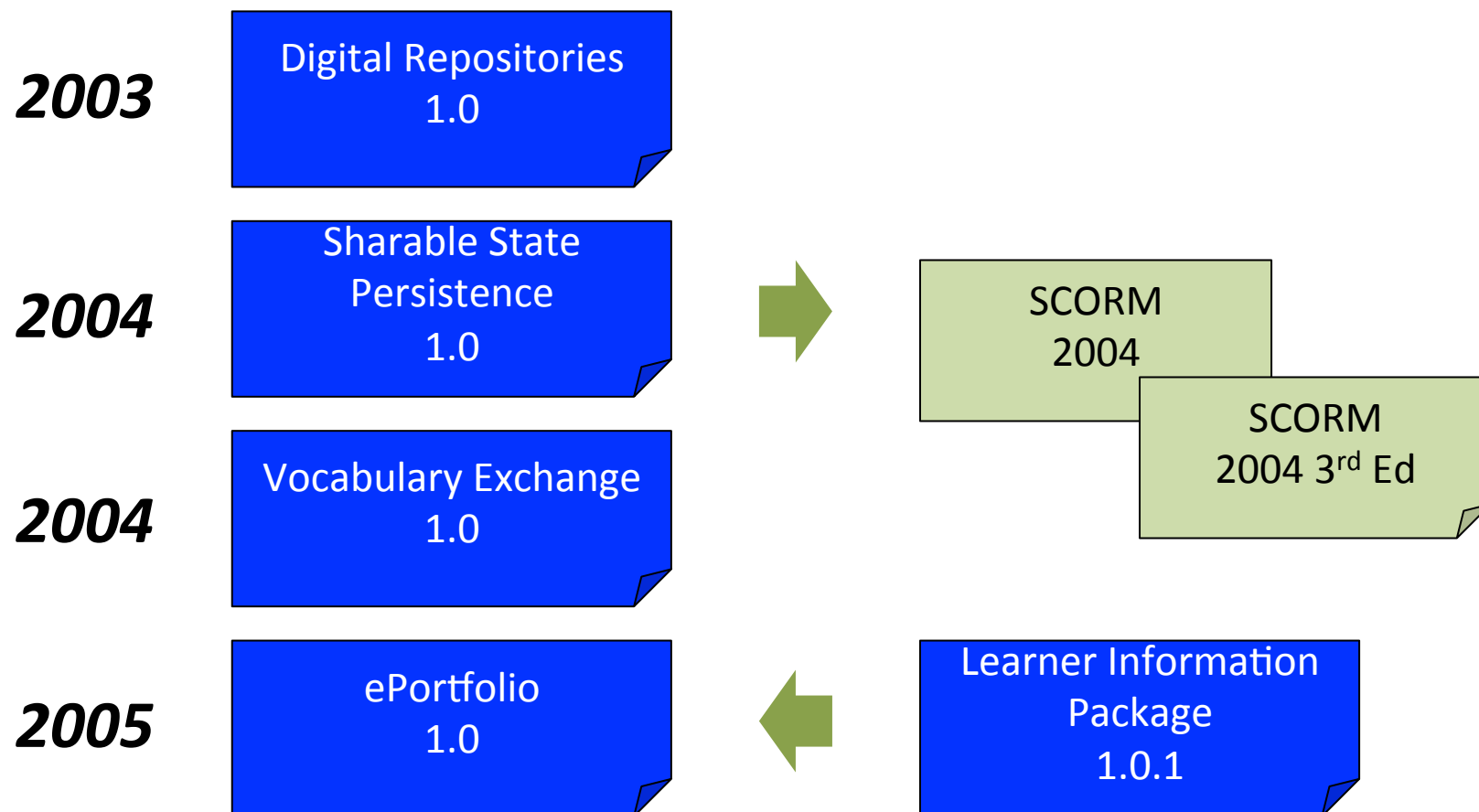
## “Simple” Sequencing

- How to provide a way to define alternative sequences through the content depending on the previous content and user activities/responses
- Implementation leads to a fundamental problem in Computer Science i.e. Halting Problem

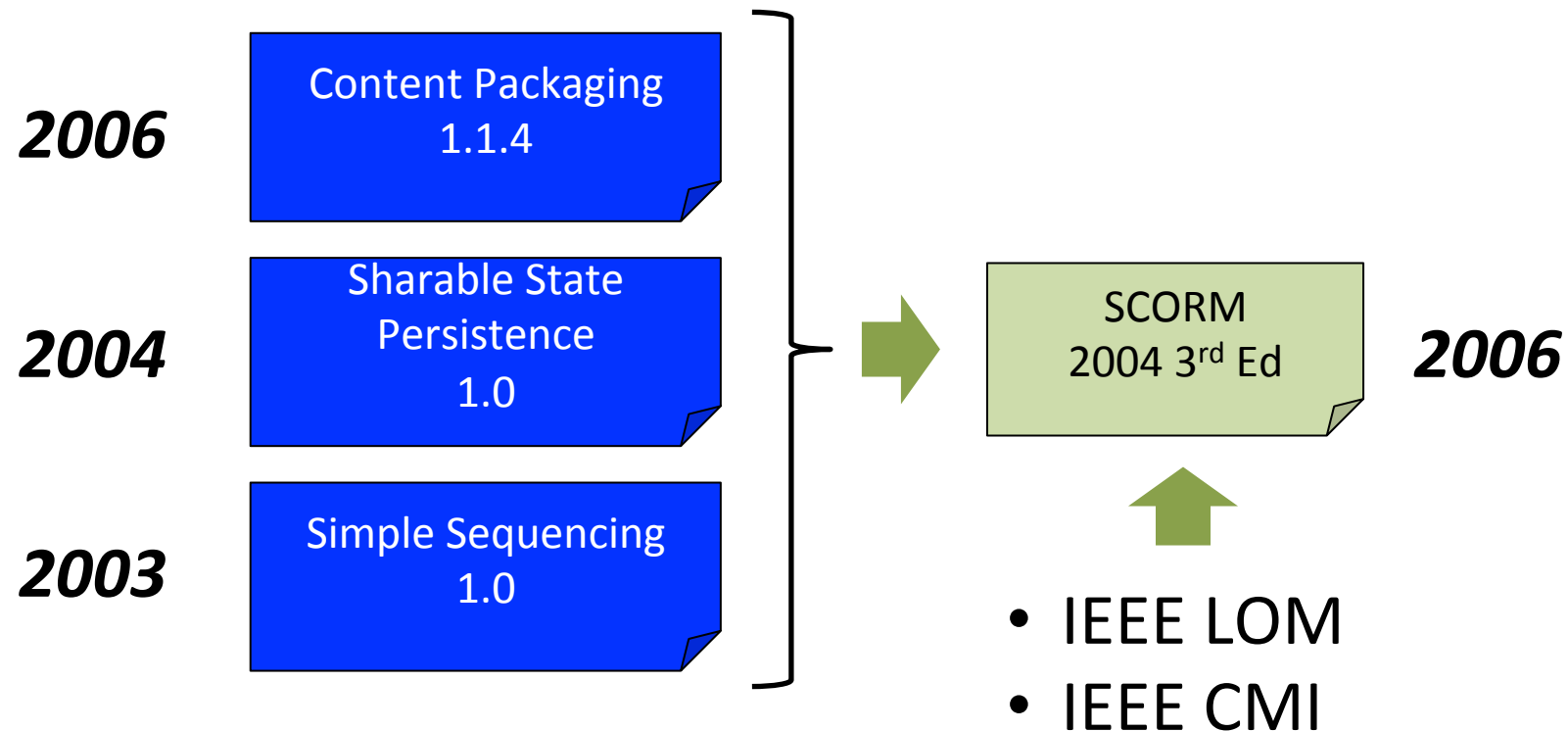
# Learning Design

- A format to allow the design of learning experiences in a pedagogic independent way
- Championed by Dutch Open University who also created the only engine i.e. CopperCore
- Has its own sequencing approach

## More Data Models (2000-2005)



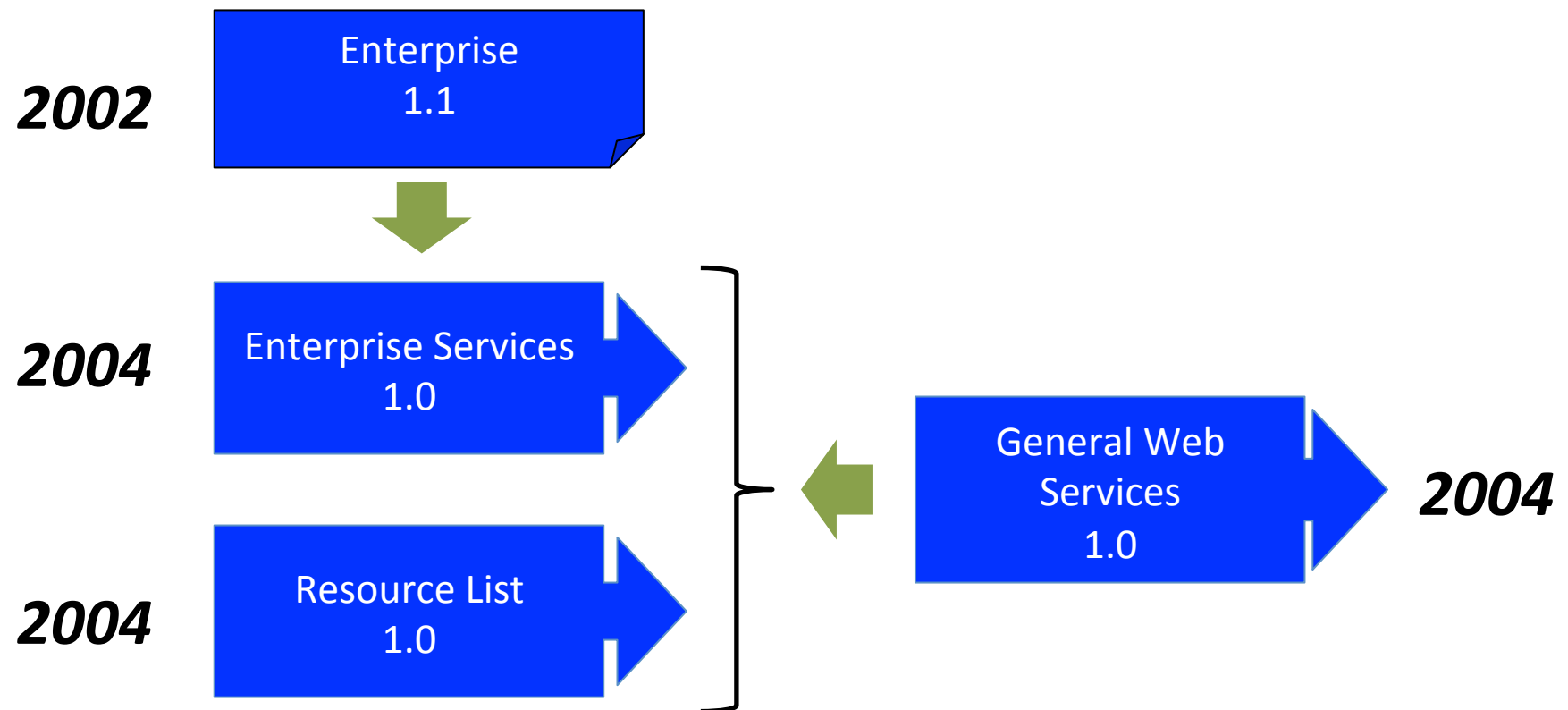
# SCORM Use of IMS



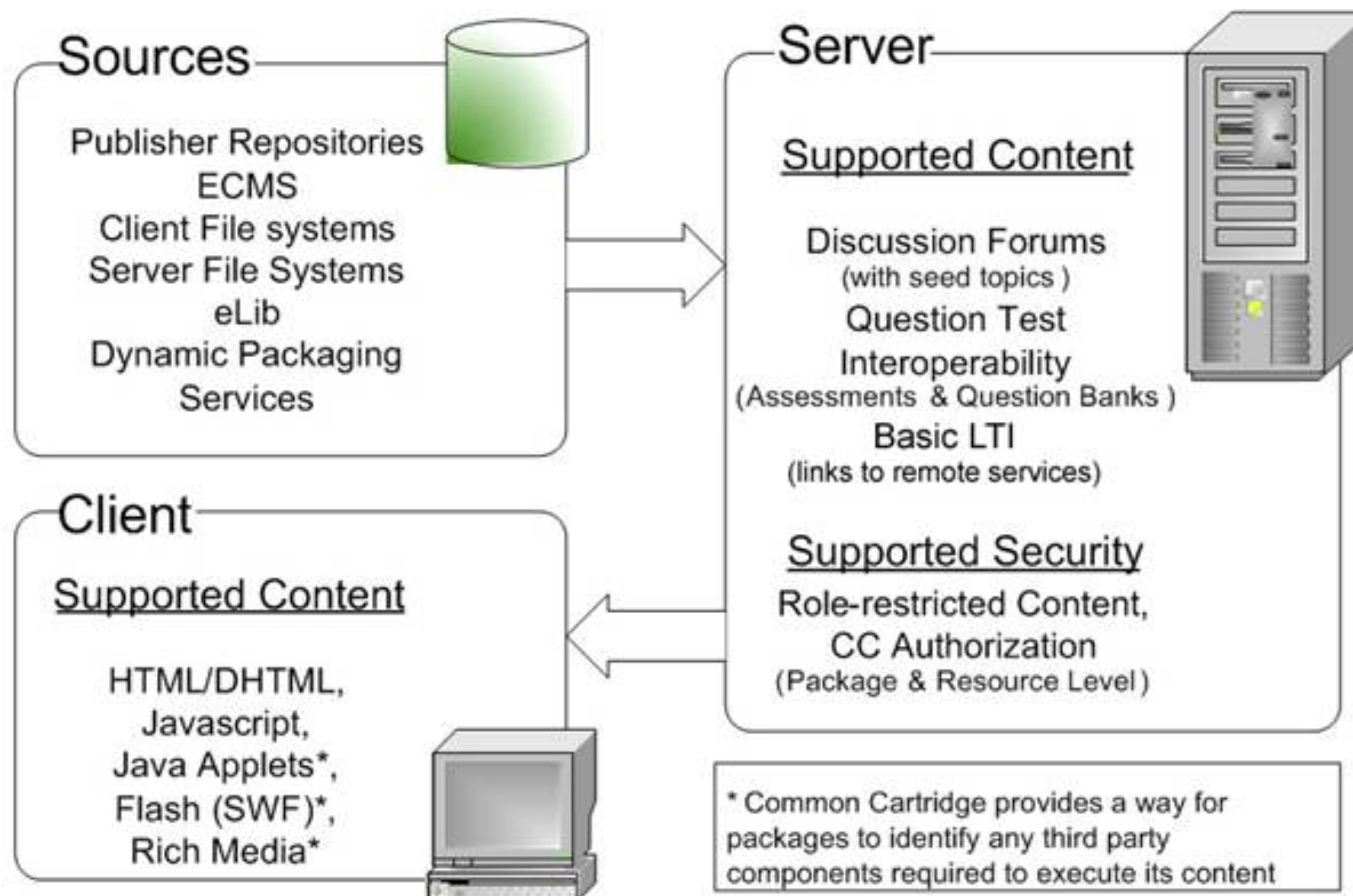
# Introduction of Services

- Data Models described what is exchanged
- Service Models also described how the data is exchanged
- Service Oriented Architecture support introduced using WSDL/SOAP

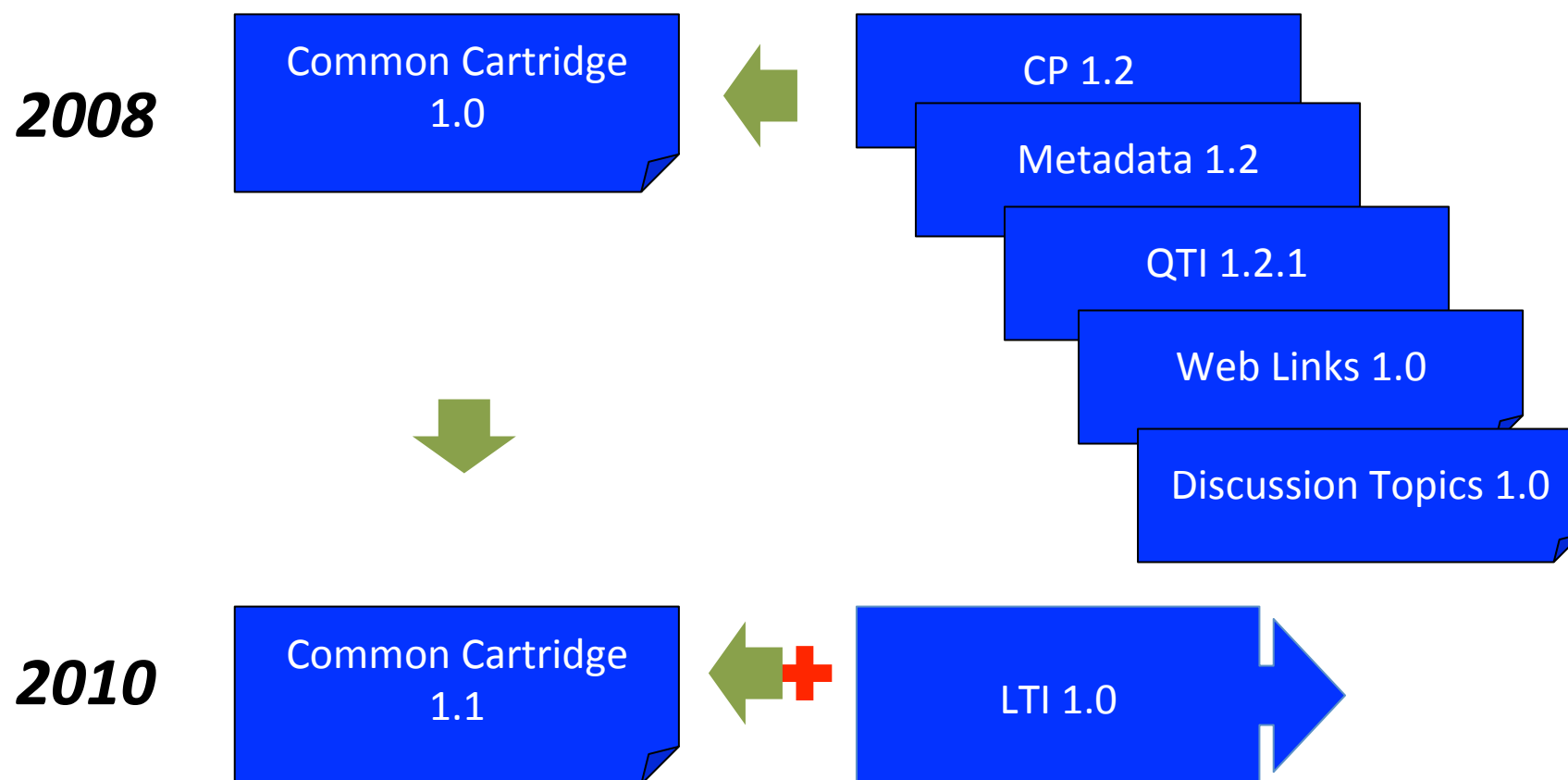
## New Services (2004)



# Common Cartridge (2008-2015)



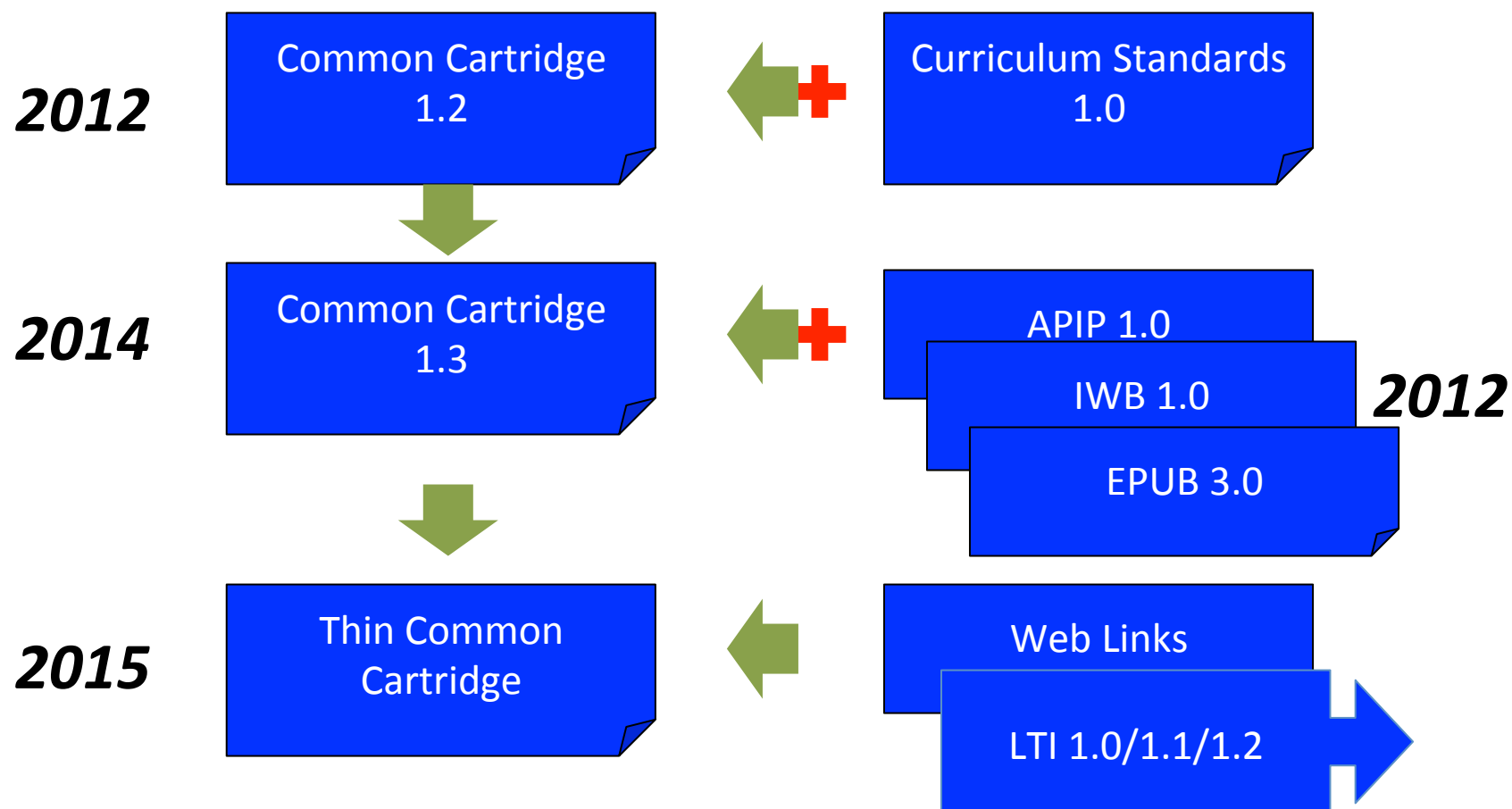
# Common Cartridge Components



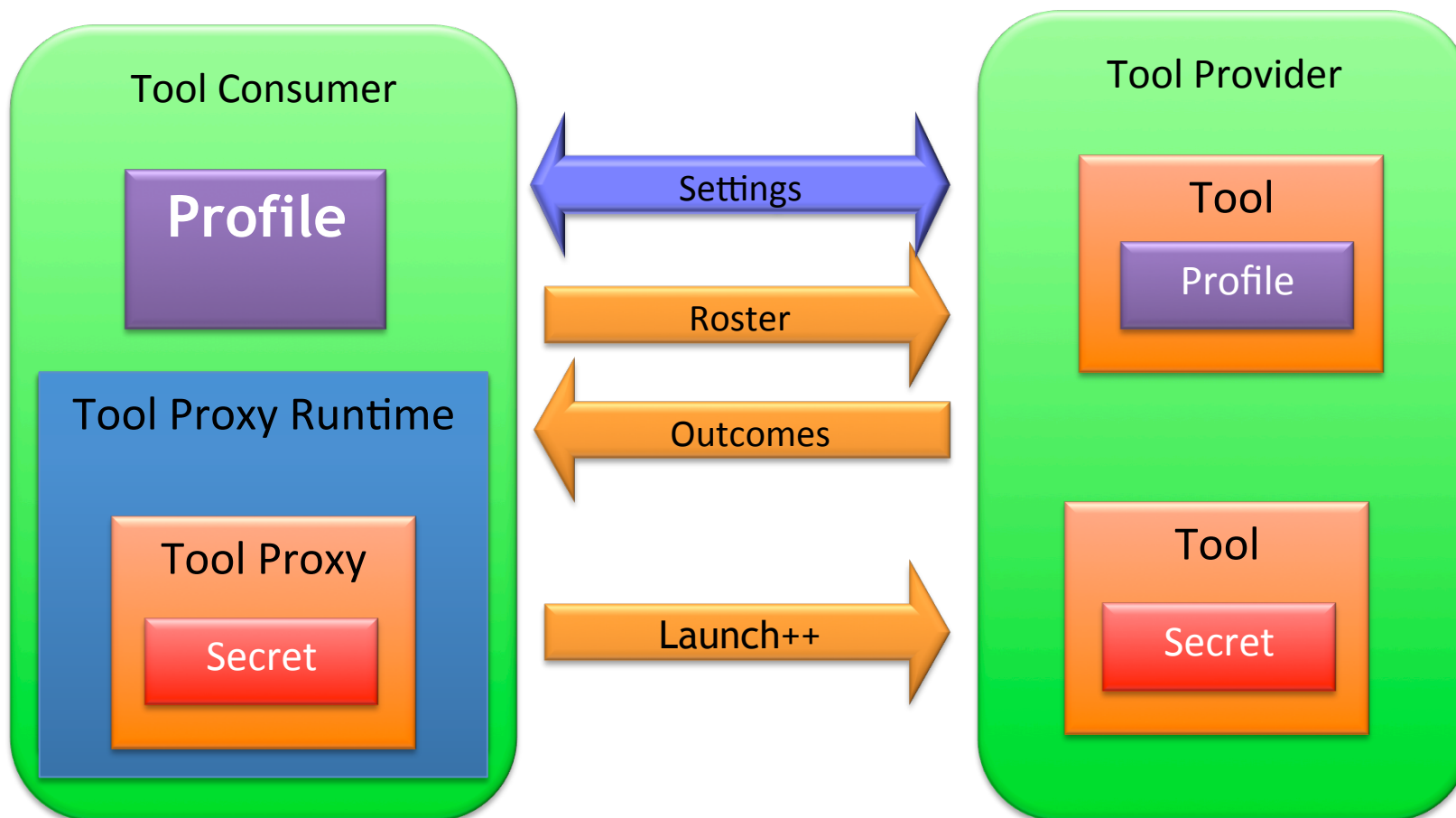
# Learning Standards Annotations

- IMS metadata to enable learning content to be annotated by **links** to the associated learning standards
- Use pointers to the actual learning standards themselves and allow any resource to have multiple annotations

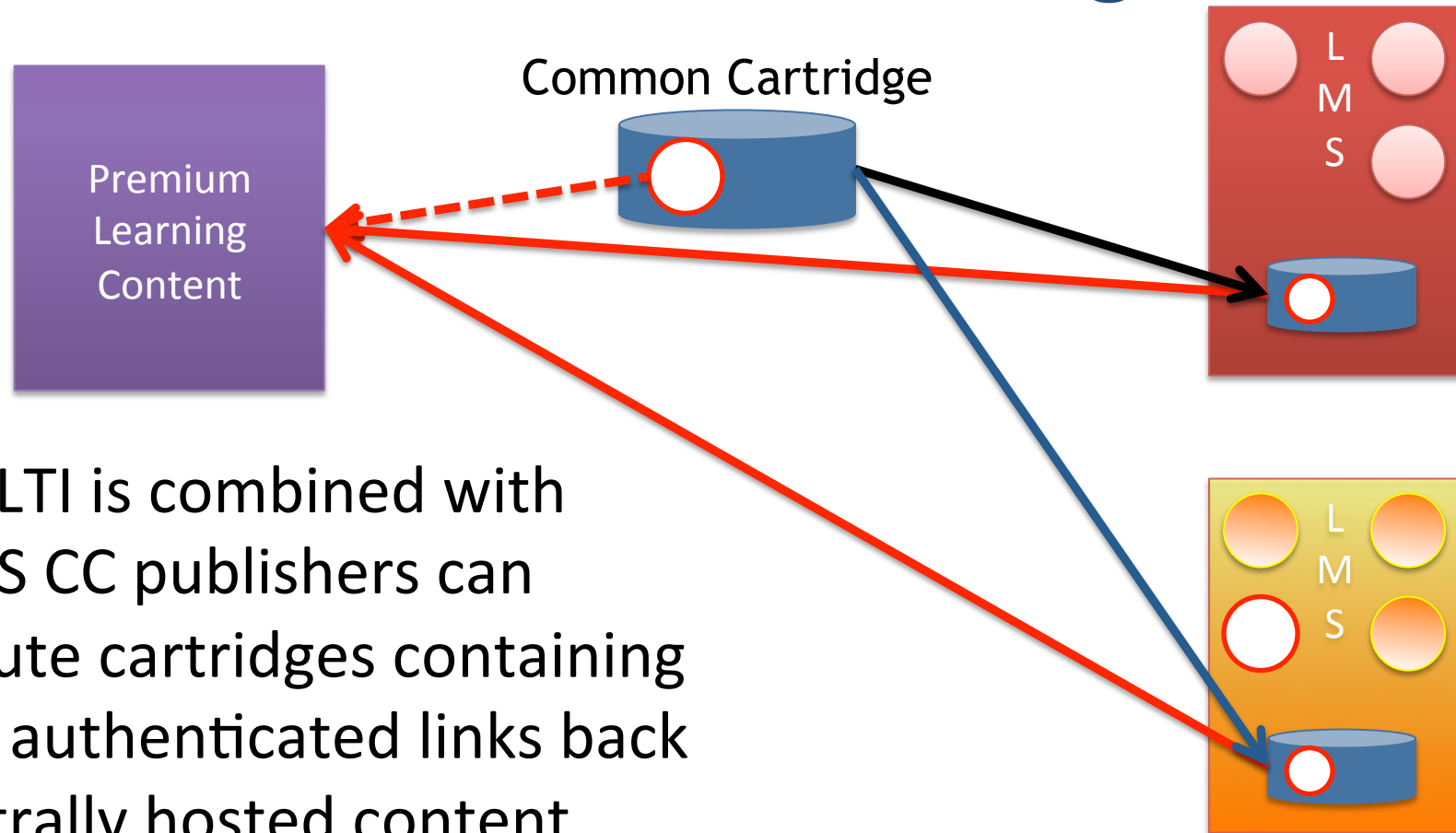
# Common Cartridge Components



# Learning Tools Interoperability

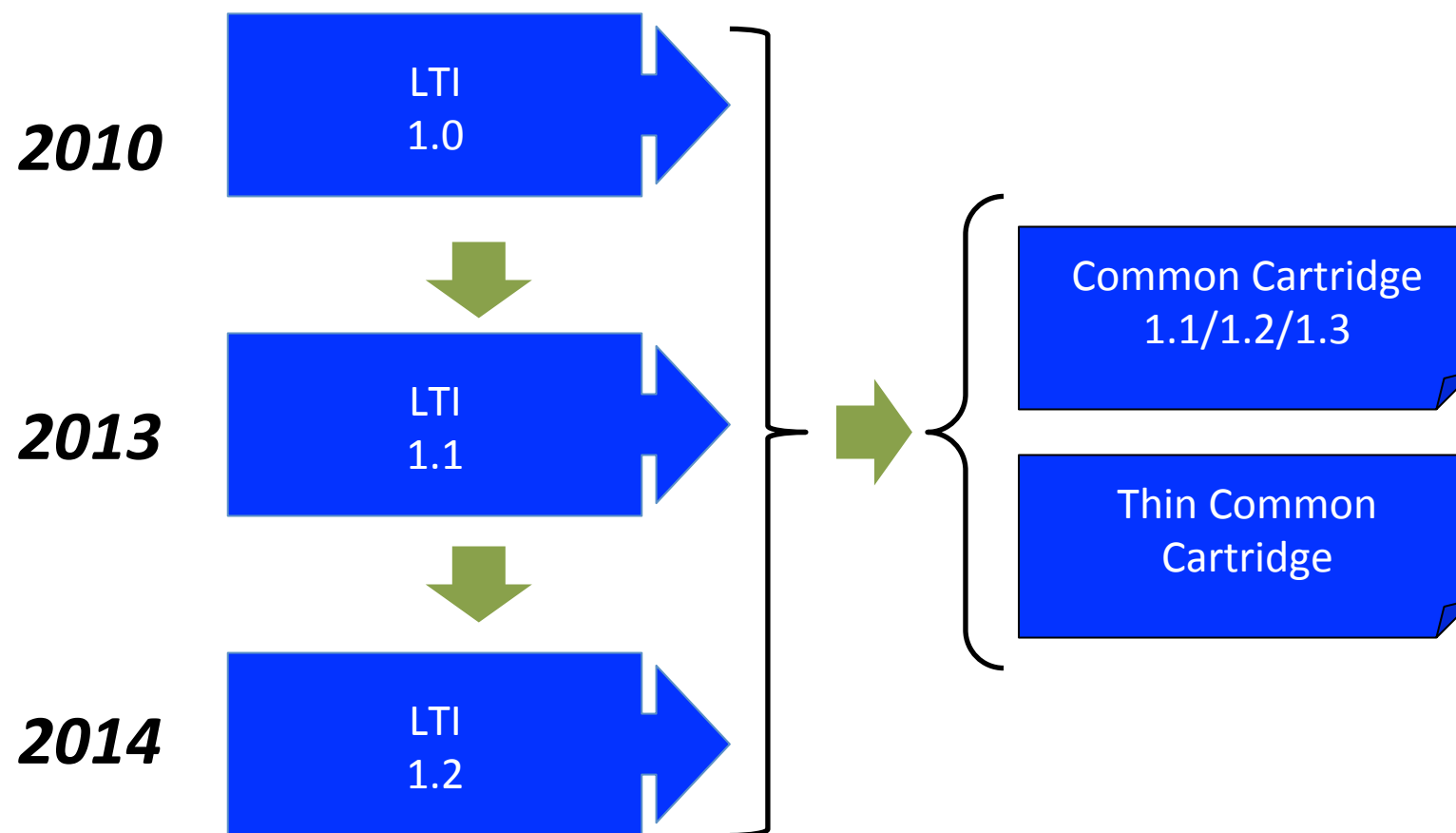


# LTI & Common Cartridge

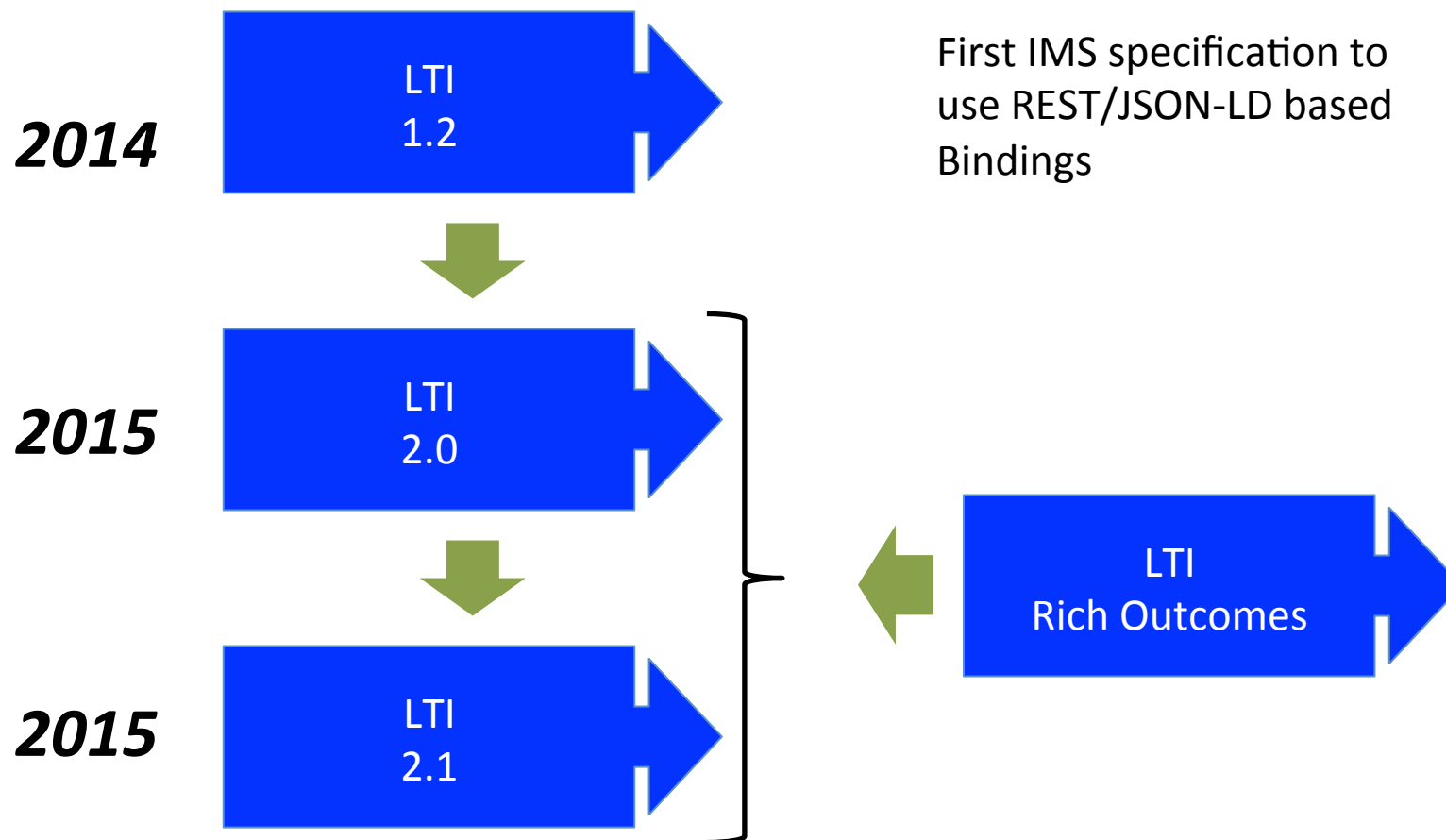


When LTI is combined with the IMS CC publishers can distribute cartridges containing active, authenticated links back to centrally hosted content.

## LTI (2010-2014)



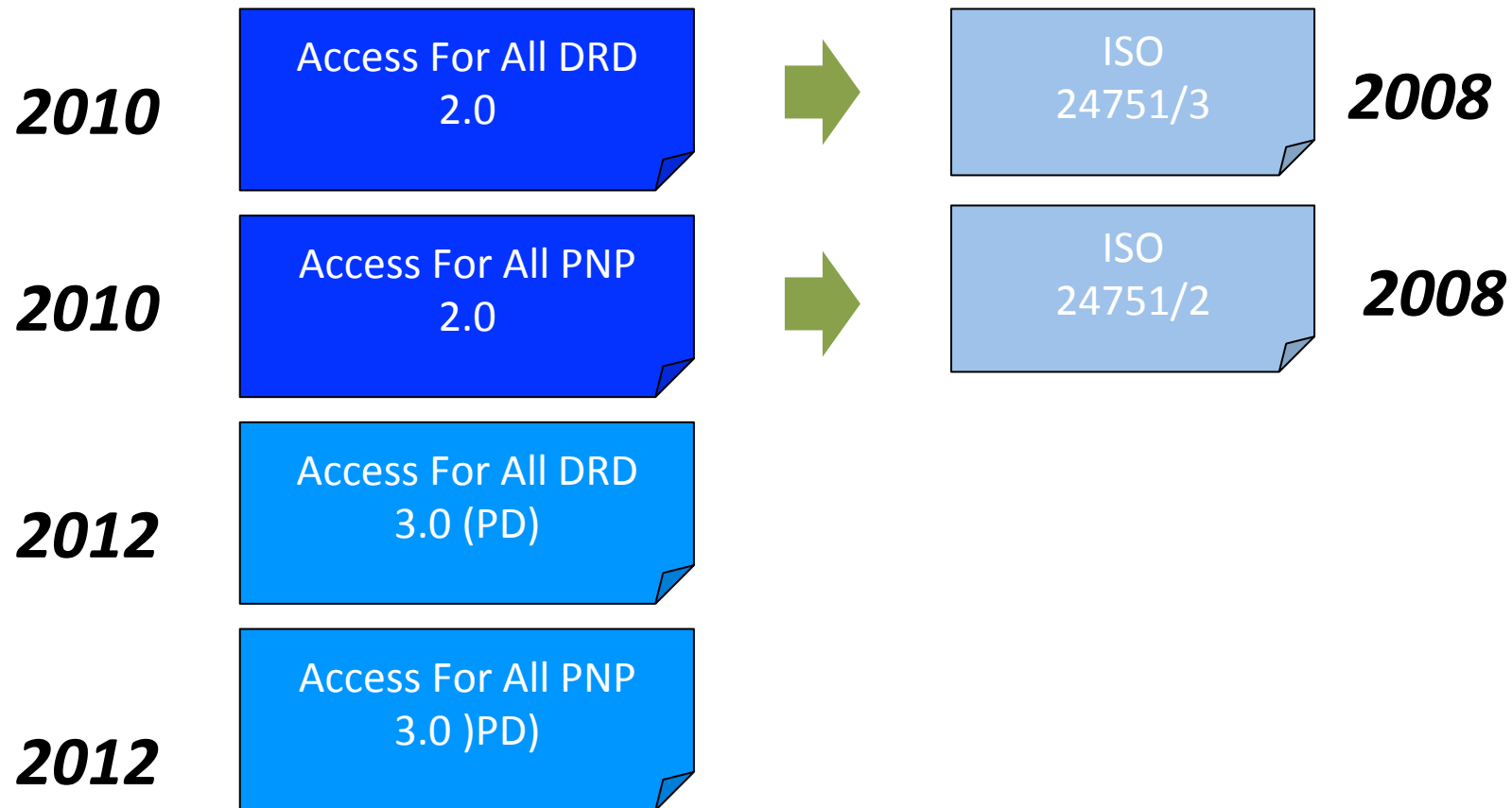
## LTI (2014-2015)



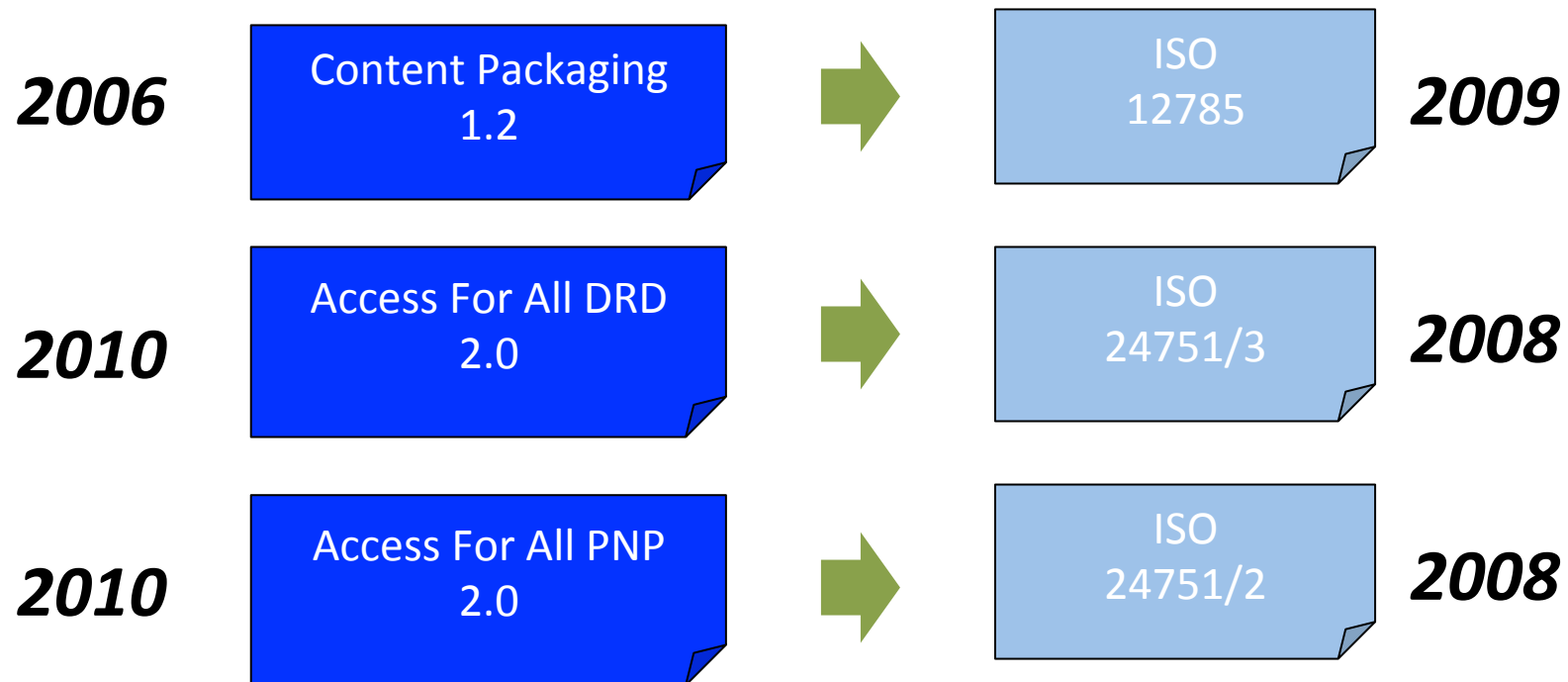
# IMS Accessibility (2002-2015)

- Accessibility Guidelines (2002)
- ACCLIP - Accessibility for LIPv1.0 (2003)
- Access for All (AfA)
  - Personal Needs & Preferences (PNP)
  - Digital Resource Description (DRD)
  - ALLY (Schema.Org/LRMI)

# Accessibility (2000-2015)

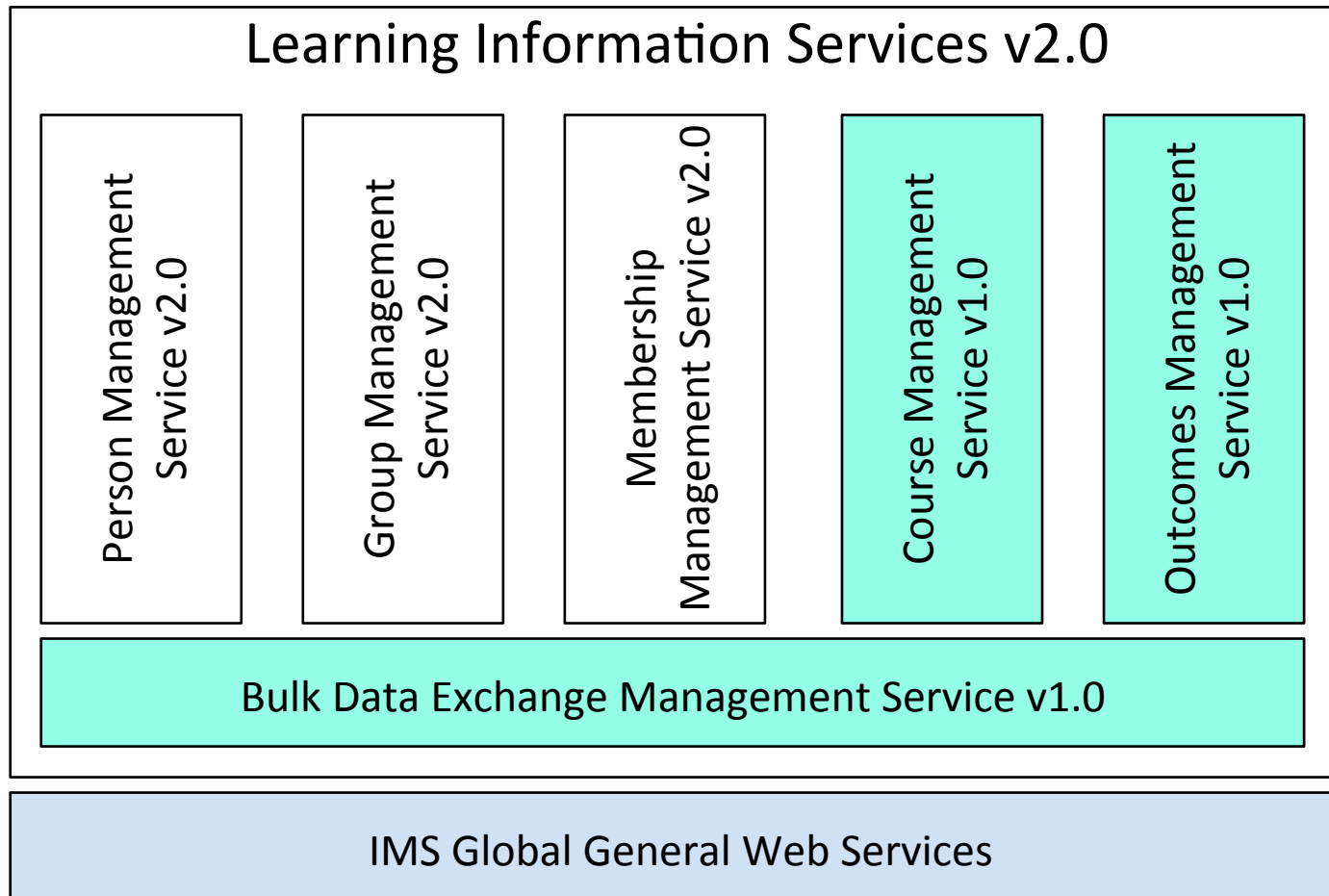


# ISO Adoption of IMS





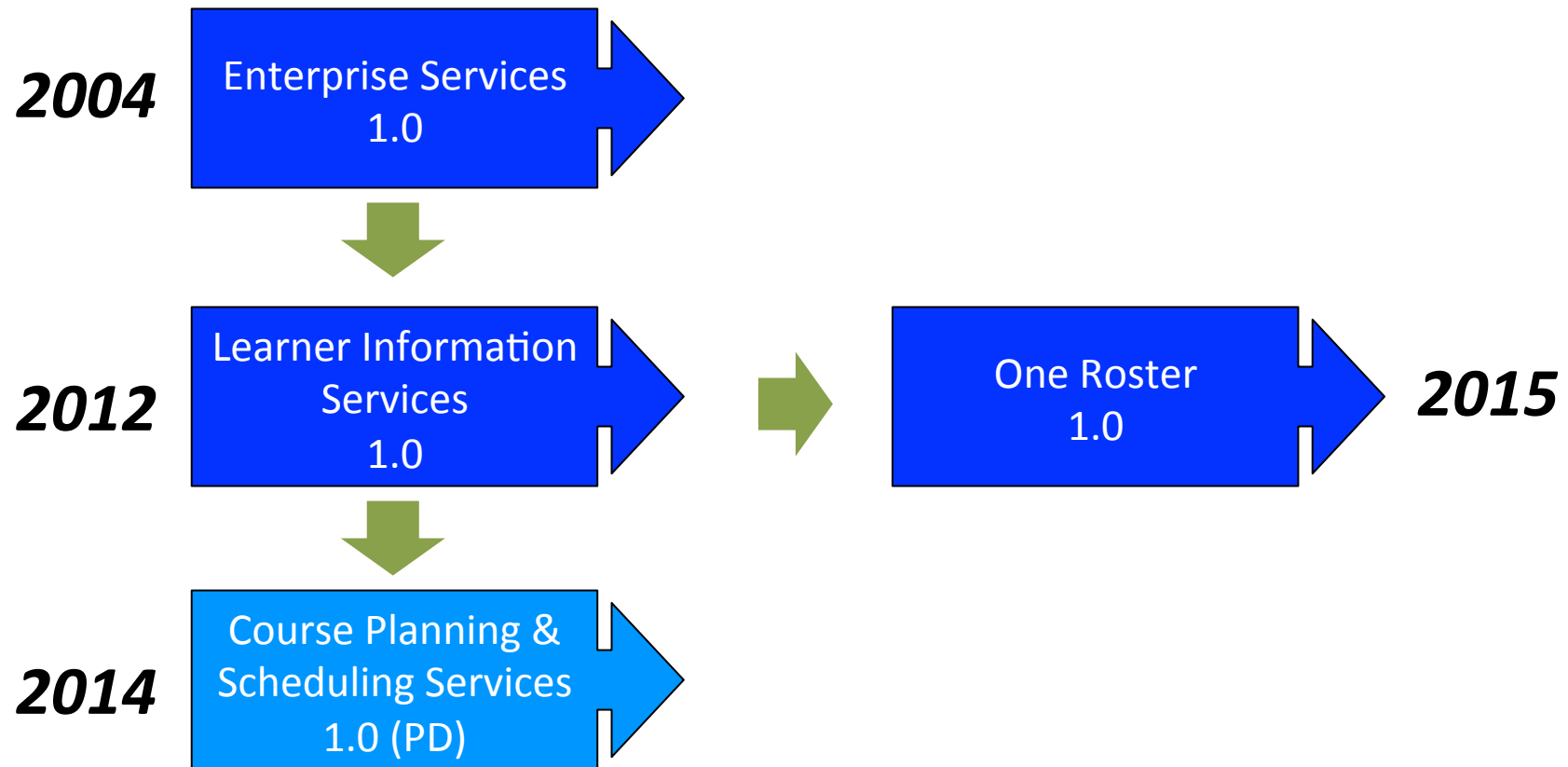
# Learning Information Services



# OneRoster

- An interoperability standard for the transfer of educational data for course rostering/gradebook reporting in K-12.
- It consists of an abstract data model for K12 educational resources, modelled using existing IMS principles (from LTI and LIS)
- It includes service definitions for data access and bindings in REST and CSV

## Enterprise Services (2006-2015)



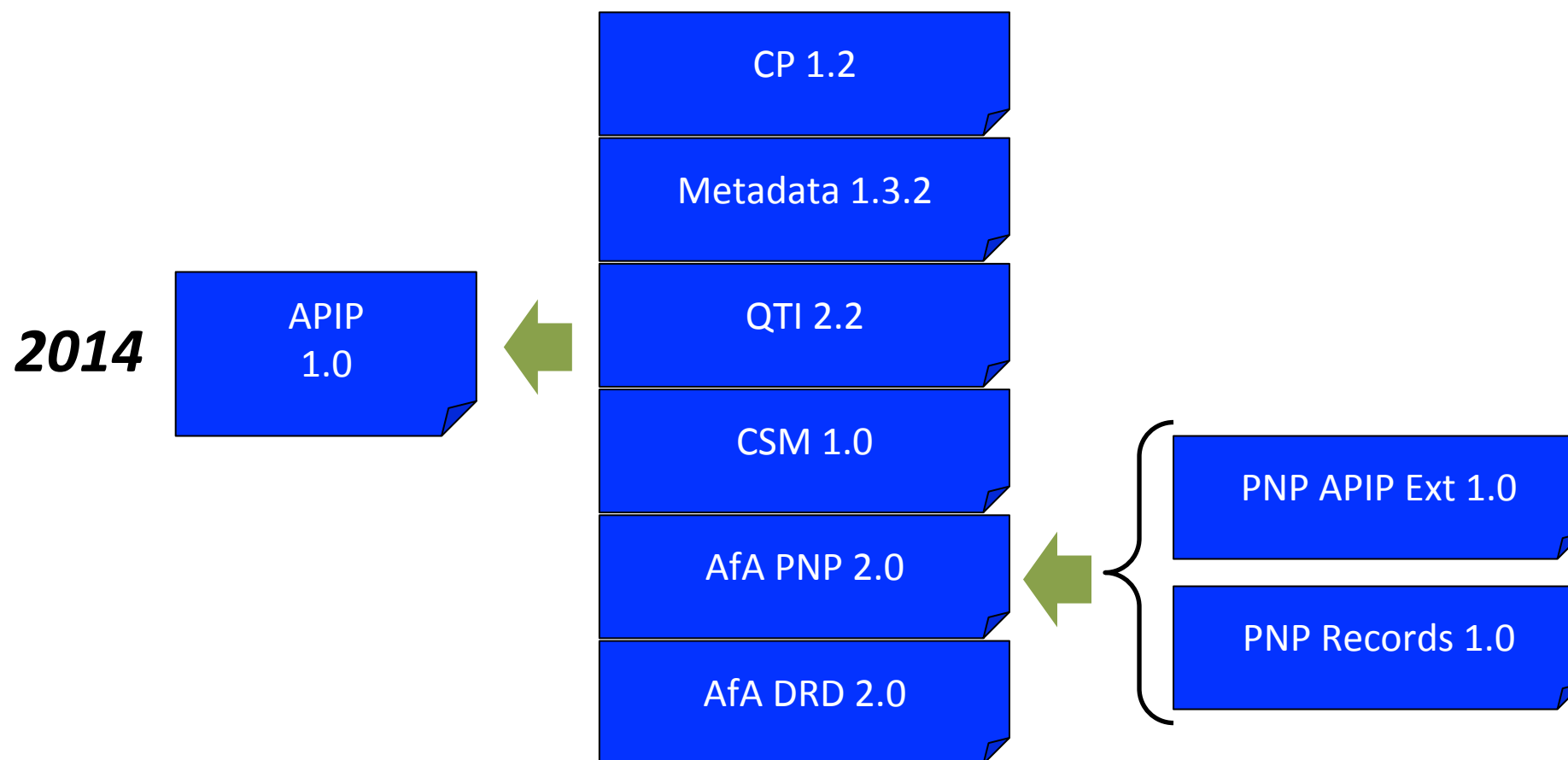
## Supporting Library Access

- Learning Object Discovery & Exchange (LODE)
  - Federated discovery and retrieval of learning objects contained in more than one collection
  - Profile a set of off-the-shelf standards inc. SSI/SRU, Open Archives Initiative-Protocol for Metadata Harvesting (OAI-PMH), etc.
- Internal Candidate Public Draft released in 2011

## APIP (2010-2015)

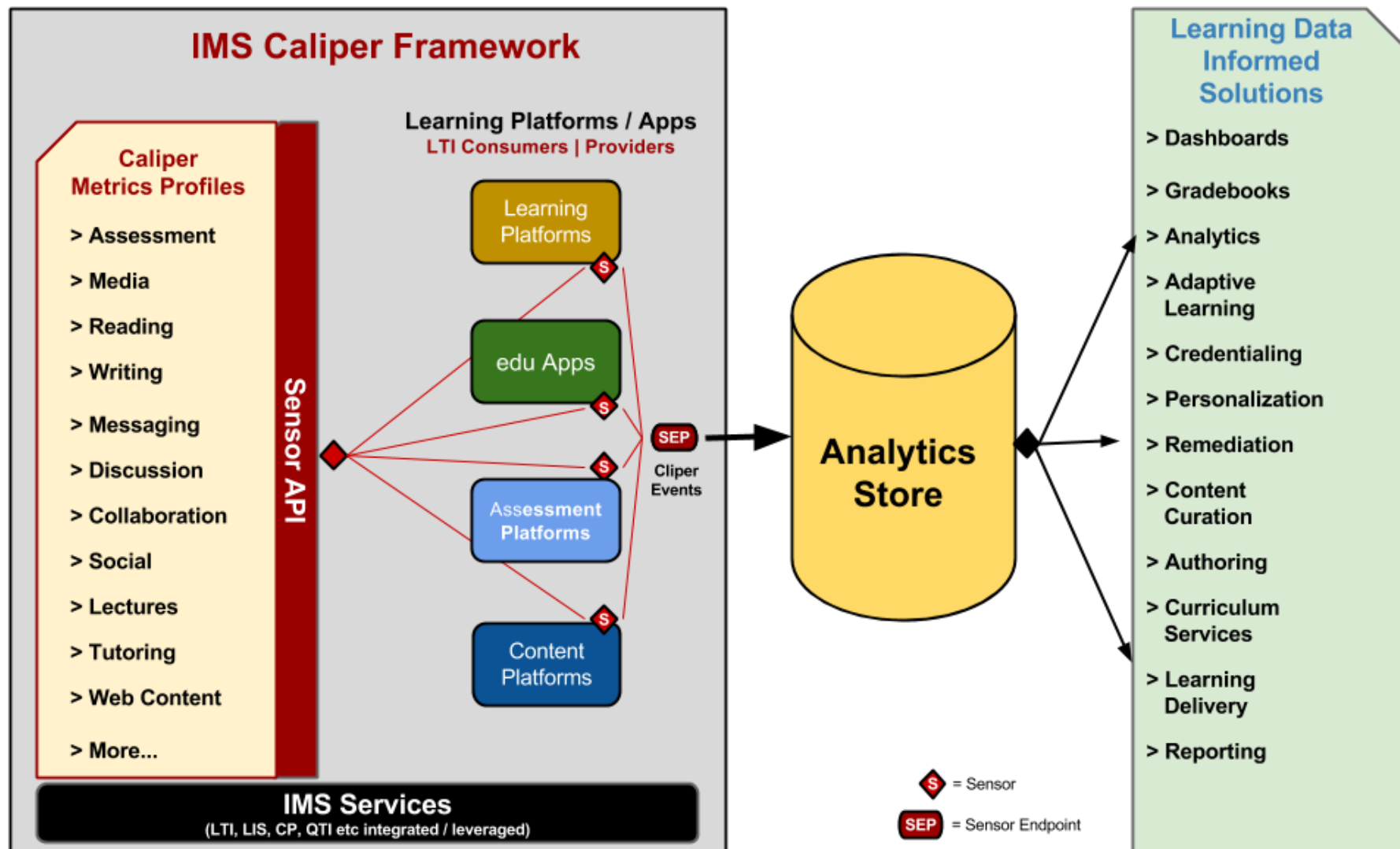
- Accessible Portable Item Protocol
  - To provide accessible Assessments
  - Start with IMS QTI and add support for users with physical and learning disabilities
  - Core part of the USA Race To The Top Assessment (RTTA) projects

# APIP 1.0 (2014)

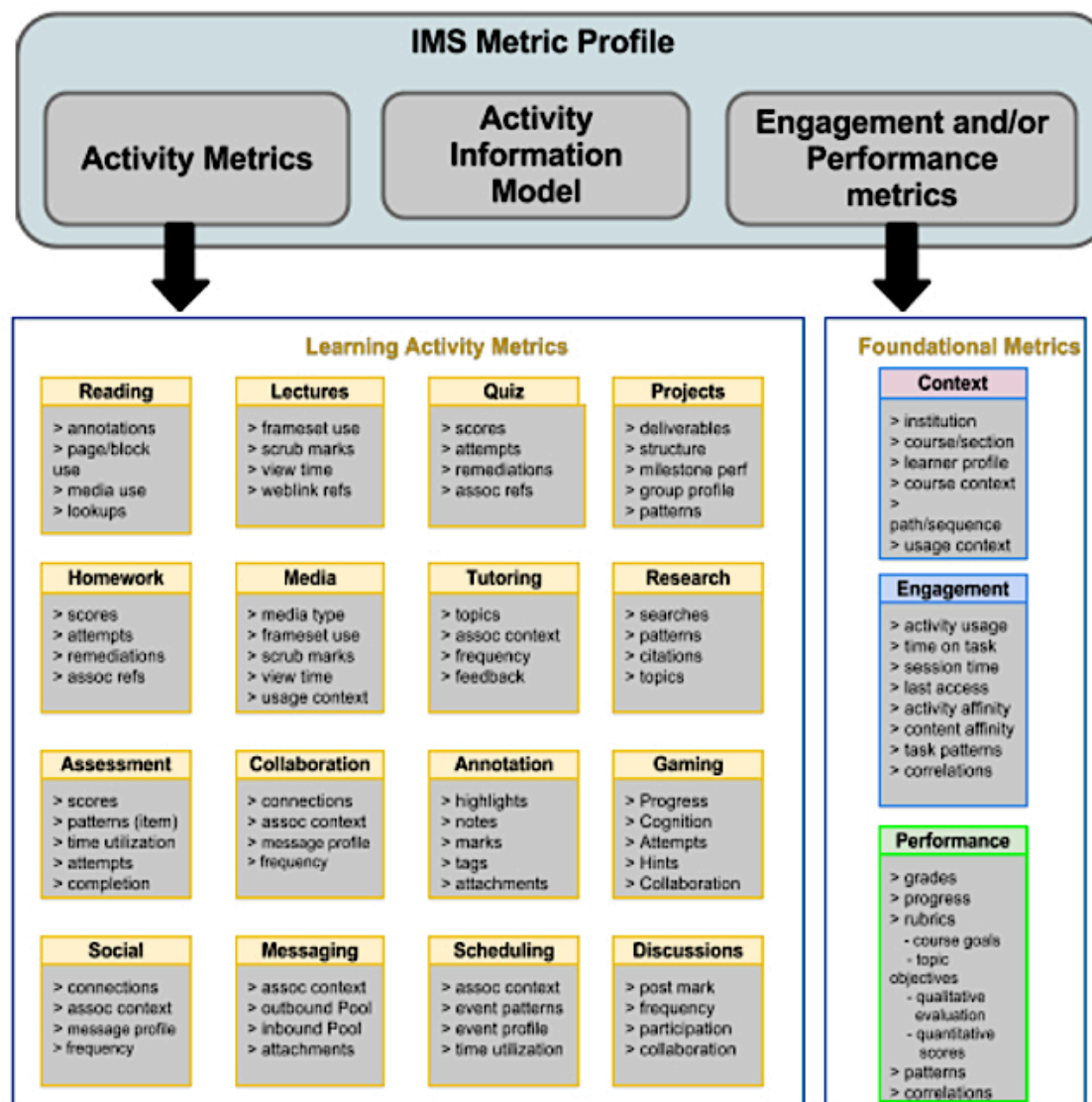


# IMS Learning Analytics

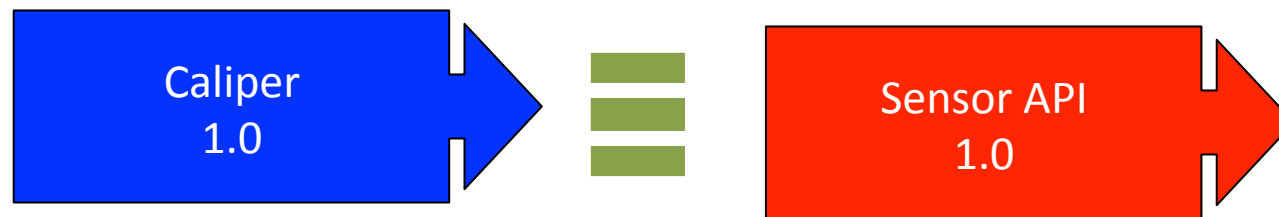
- A Learning Analytics Framework
  - Part 1 – Caliper Metric Profiles and Sensor API
  - Part 2 – Repository Read Access API
- Caliper vs. Tin Can/xAPI
  - Caliper has Metric Profiles
  - Caliper is Open Standard
  - Caliper has Code APIs available
  - Caliper is integrated with other IMS standards



# The Metric Profiles



# Caliper 1.0 (2015)



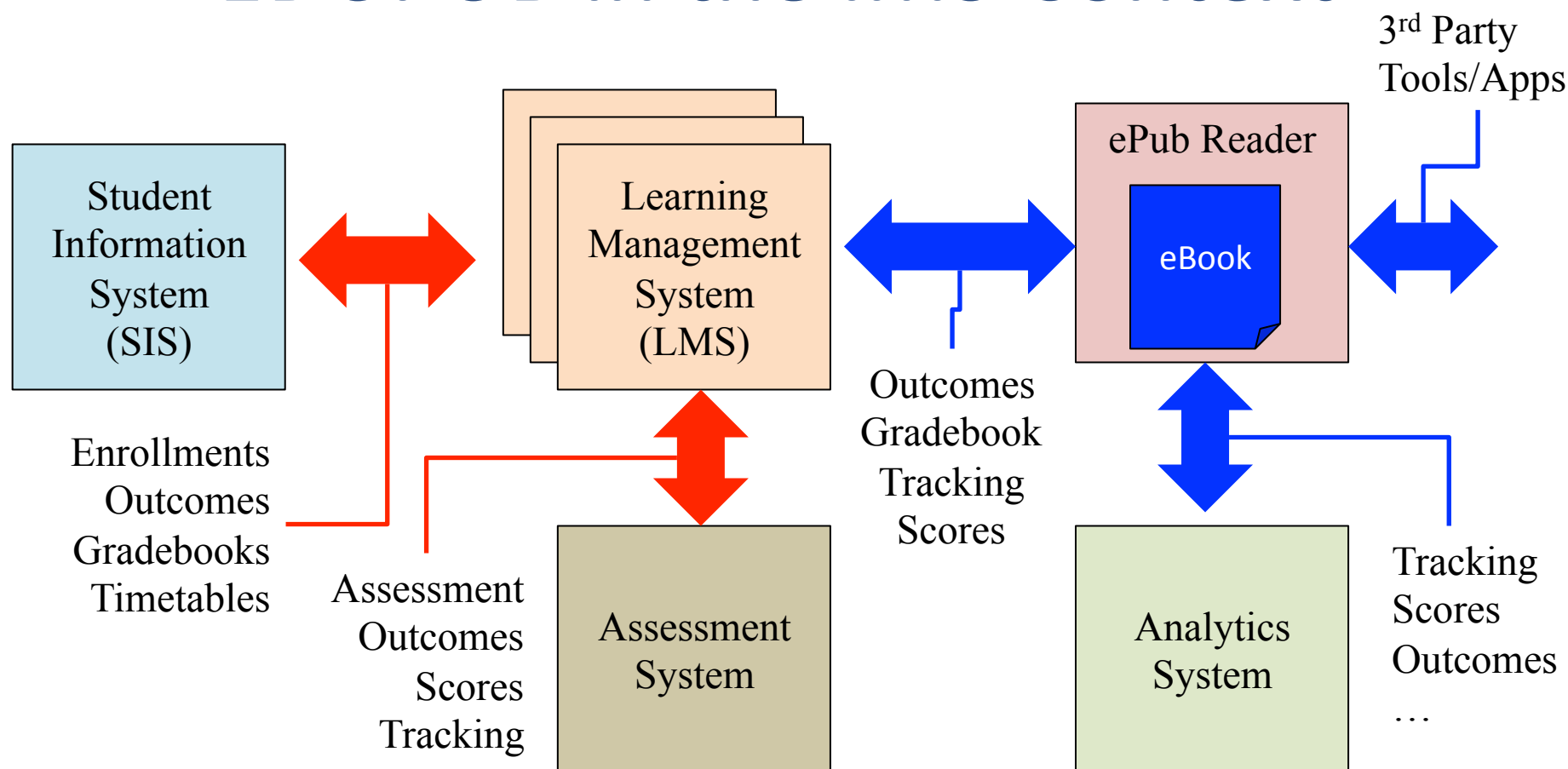
Supported code bases:

- JavaScript
- Java
- PHP
- Python
- C#
- Ruby

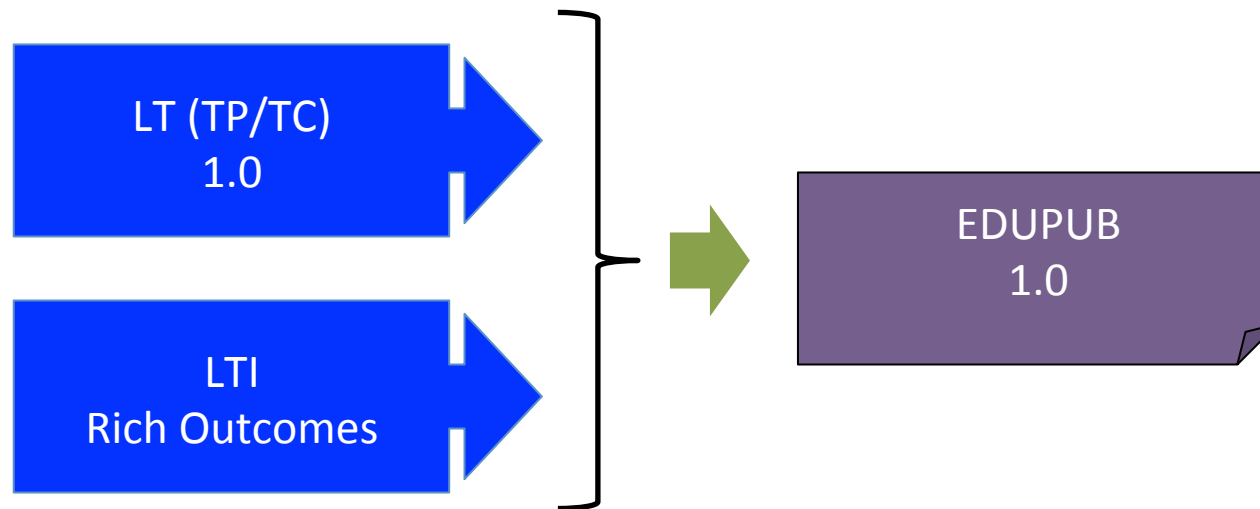
# EDUPUB

- Joint activity between IDPF and IMS
- IDPF responsible for electronic book EPUB specification
- Initial motivation for IMS was how to support quizzes and formative testing inside of EPUB3

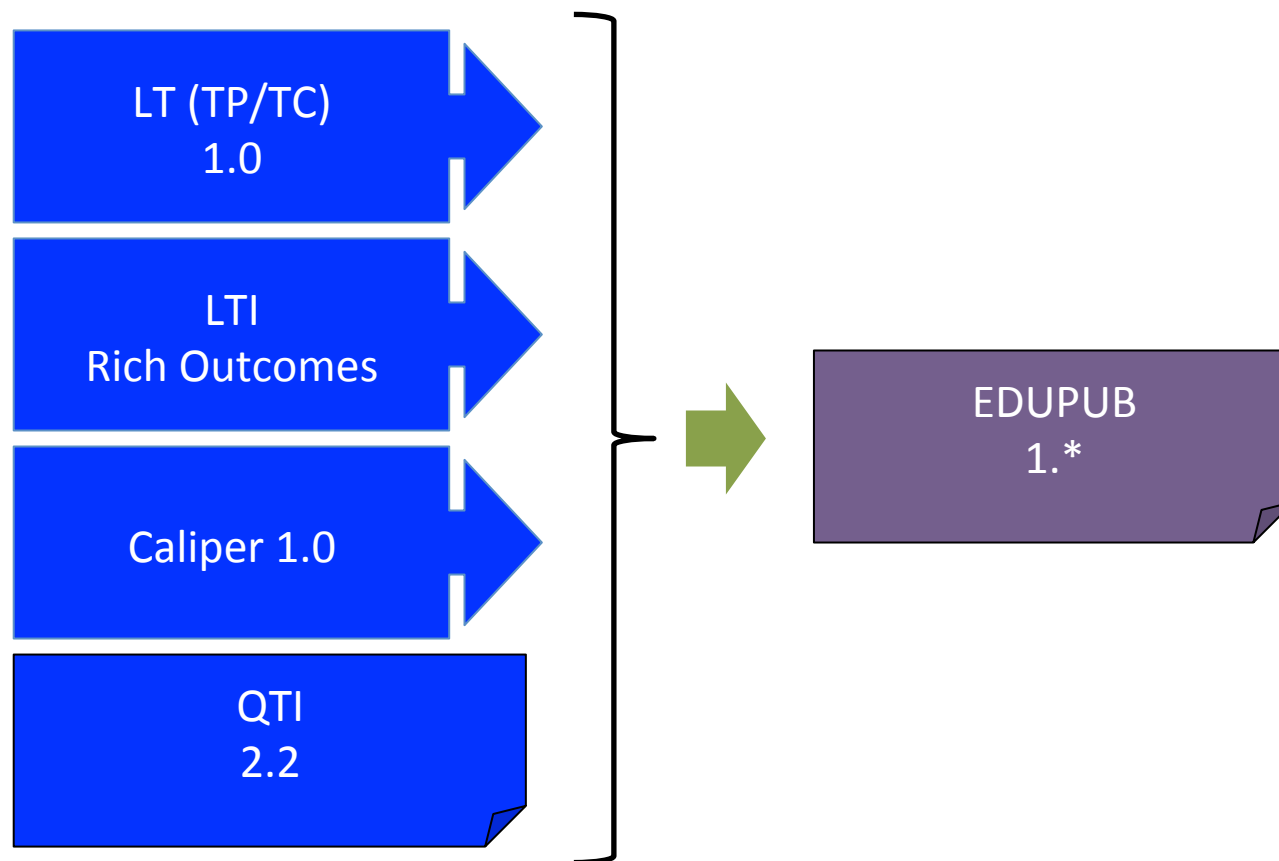
# EDUPUB in the IMS Context



# IMS & EDUPUB 2015



# IMS & EDUPUB Long Term



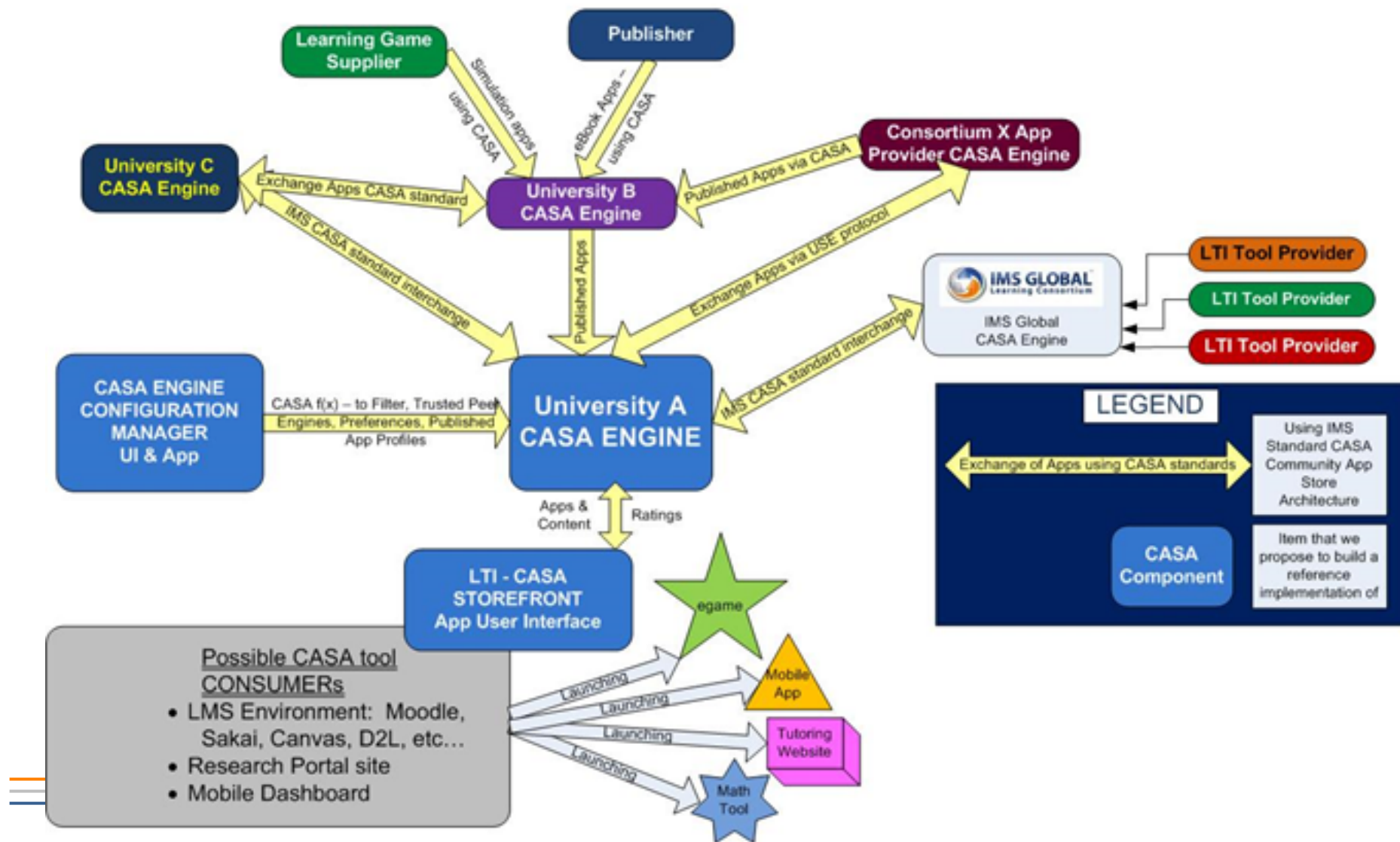
# Community “App Store” Architecture (CASA)

- An Open Source Community Initiative for open sharing of ‘apps’ via trusted distributed ‘app’ stores
- To develop and support code libraries and APIs to reduce the time and effort required to enable interoperable educational resources in seamless, agile and information-rich enterprises

# IMS-GLC INITIATIVE

## CASA – COMMUNITY APP STORE

### ARCHITECTURE DIAGRAM



## Competency Based Education (CBE)

- Designing a CBE-aware ecosystem that leverages the technical groundwork of IMS LTI Standards
- Includes demonstration of the exchange of an Electronic Transcript (eT) to support evidence of competencies
- First deliverables in November 2015

# Digital Credentials

- Started in early 2015
- Digital Badges (based upon Mozilla Open Badges)
- Support deeper integration and exchange within extant systems, while exploring new models of badge system design, storage, usage, and evaluation in the institutional context

## 2015 and Beyond

- There is an extensive legacy to be supported
- New versions to be released in response to our Member needs
- New specifications to address outstanding or new pain-points of our Members
- Create when required, adopt/profile/integrate whenever possible

# Active Work-1

Common Cartridge  
2.0

APIP  
1.1

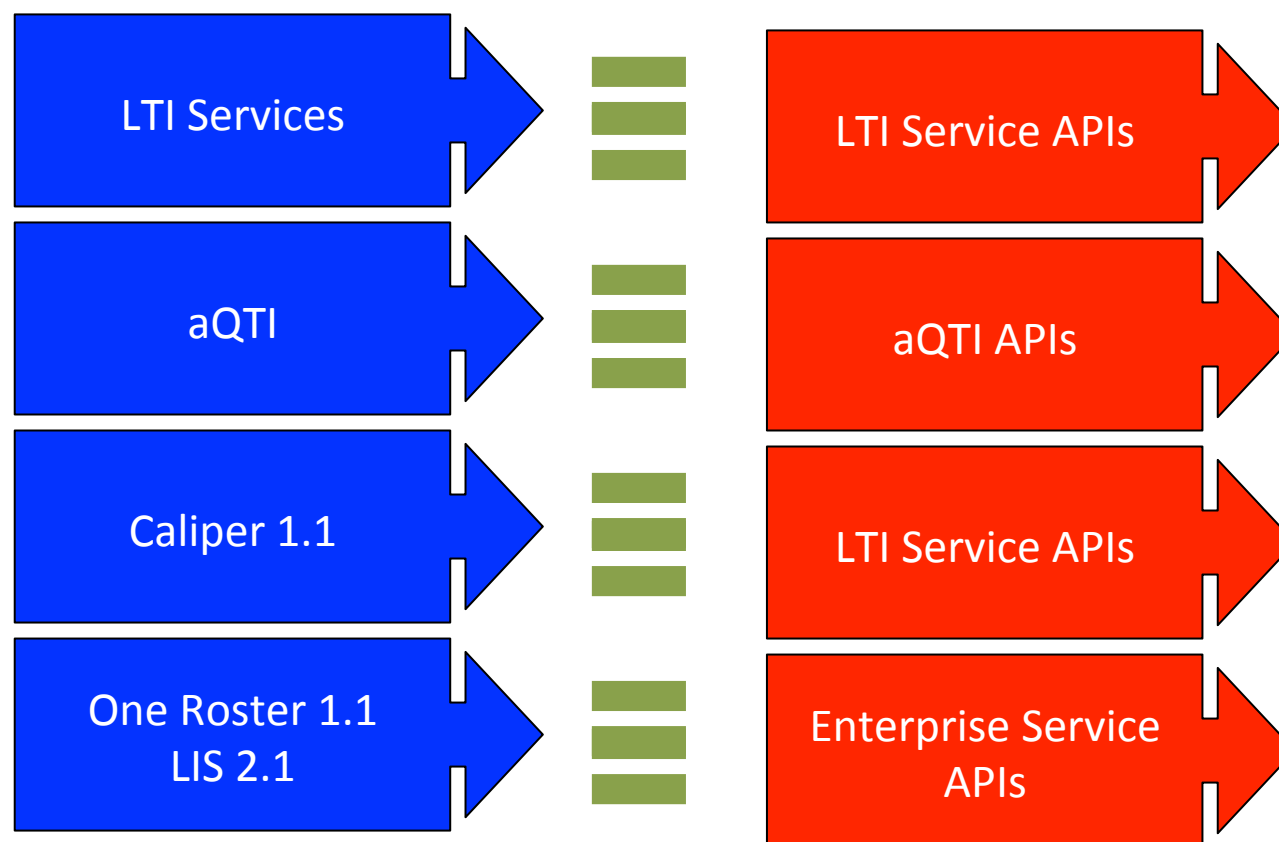
Open Video  
1.0

Access For All DRD  
3.0

Access For All PNP  
3.0

Privacy & Security  
1.0

## Active Work-2



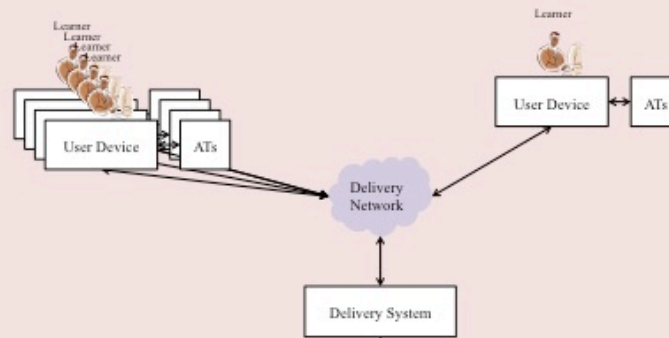
## aQTI

- 3<sup>rd</sup> Generation QTI
- Full end-to-end Test/Item delivery
  - Authoring-to-Delivery-Results Reporting
  - Transformationless
  - Services-based
  - Full accessibility-aware/support
- Initial solution delivered in mid-2017

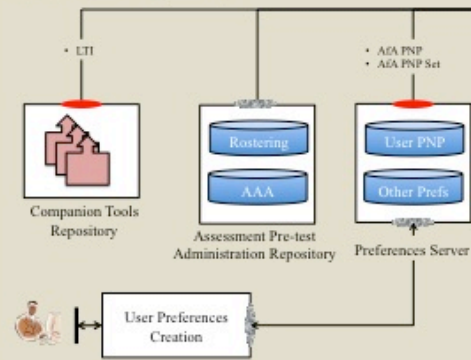
# QTI Specification Mosaic

- IMS
  - QTI XML
  - Content Packaging
    - Common Cartridge v2.0
  - Access for All DRD
  - Access for All PNP
  - Curriculum Standards Metadata
  - Learning Tools Interoperability v2.\*
  - Caliper v1.\*
  - APIP v1.\*
  - REST/JSON-based services
- Non IMS
  - HTML5/CSS3
  - Web Components
  - WCAG 2.0
  - WAI ARIA
  - SSML & PLS
  - IEEE LOM
  - CSS
  - Schema.Org/LRMI
  - SMIL
  - SVG

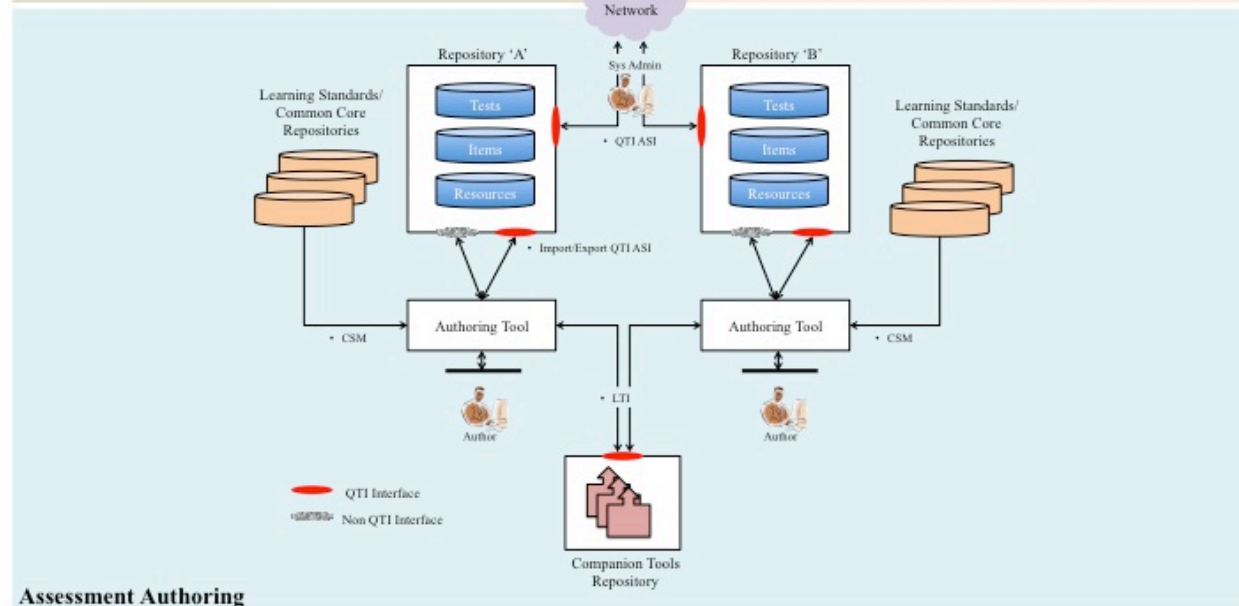
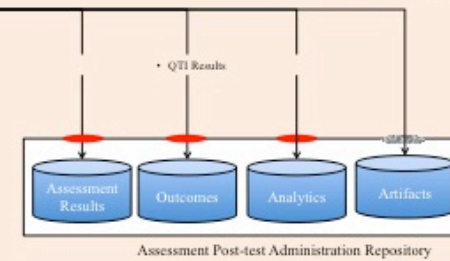
## Assessment Delivery



## Assessment Preparation



## Assessment Reporting



## Summary

- Nearly 20 years of developing, advocating and supporting interoperability standards for learning
- An extensive set of standards with global adoption to enable best practice learning in the education and corporate markets
- The success of IMS is heavily dependent on the Members' involvement in the IMS activities and not just paying the membership fee

# Questions & Comments