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People-Centric Elearning: A Joint IEEE-LETSI Workshop

The LETSI Foundation

Note: This first draft will be discussed at the Joint IEEE-LETSI CMI working group meeting on June 17th. The ultimate purpose of this white paper is to explain to potential participants in the August workshop what LETSI is up to and what the workshop is about.

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Elearning today is institution-centric. Schools and companies deploy large enterprise software systems to manage their online offerings. Students and teachers are bound to this enterprise system for their online work. The slow evolution of enterprise software generally, compared to web software, is one reason that elearning lags so far behind our other online pursuits in terms of the sophistication of both the learner's experience and the tools available to teachers.

Today's enterprise learning management systems and virtual learning environments are unable to incorporate the online offerings that are available today, much less the tidal wave of innovative offerings that today's technologies could enable. And then there's tomorrow's technology! By changing the way data flows between software systems, students and teachers can be empowered to use innovative new resources while still allowing organizations to manage their content purchases and their people.

LETSI's working groups are developing a framework for defining data payloads that will allow future web-based teaching and training systems (websites, mobile apps, and hosted systems) to securely share learning data with institutional learning management systems and with each other. At the same time, the IEEE's Learning Technology Standards Committee Working Group 11 is re-thinking the widely-used CMI runtime data standard along the same lines, following the lead of LETSI's pioneering Runtime Web Services project in 2010.

These efforts are at a point where a face-to-face working meeting is called for. The goals of this one-day workshop are:

- Working drafts of several initial web services data payloads:
  - Description of a learning activity that may be web-based or locally hosted
  - Launch data (including entitlements, student data, etc.)
  - Status report (from a learning activity back to one or more management apps)
  - Performance report (assessment data)

- Evaluation of Crispin Weston's structured editing tool for defining data models.
- Planning for a late-in-the-year Pensacola-type meeting to expose this work to a wider audience.

This white paper delineates the issues and summarizes our current thinking going into the workshop.

The Shortcomings of Today's Learning Architecture

LETSI believes that an architectural change is needed to bring the Internet's engine of innovation to the world of teaching and training. In today's elearning environment, the institutional learning management system has a central, monolithic position. (See Figure 1.) The term "learning content" has traditionally been applied to static, expositive resources, which have normally been distributed for local installation and delivery via an institutional virtual learning environment, course management system, or learning management system (LMS).

As a result, the LMS has become an isolated data silo. More importantly, this institution-centric architecture is a gating factor that retards adoption of (and thus investment in) more advanced learning activities (intelligent, immersive, mobile, creative, collaborative, and multi-player) and more advanced tools for teachers (like content aggregators and apps to monitor students' progress on your iPhone).

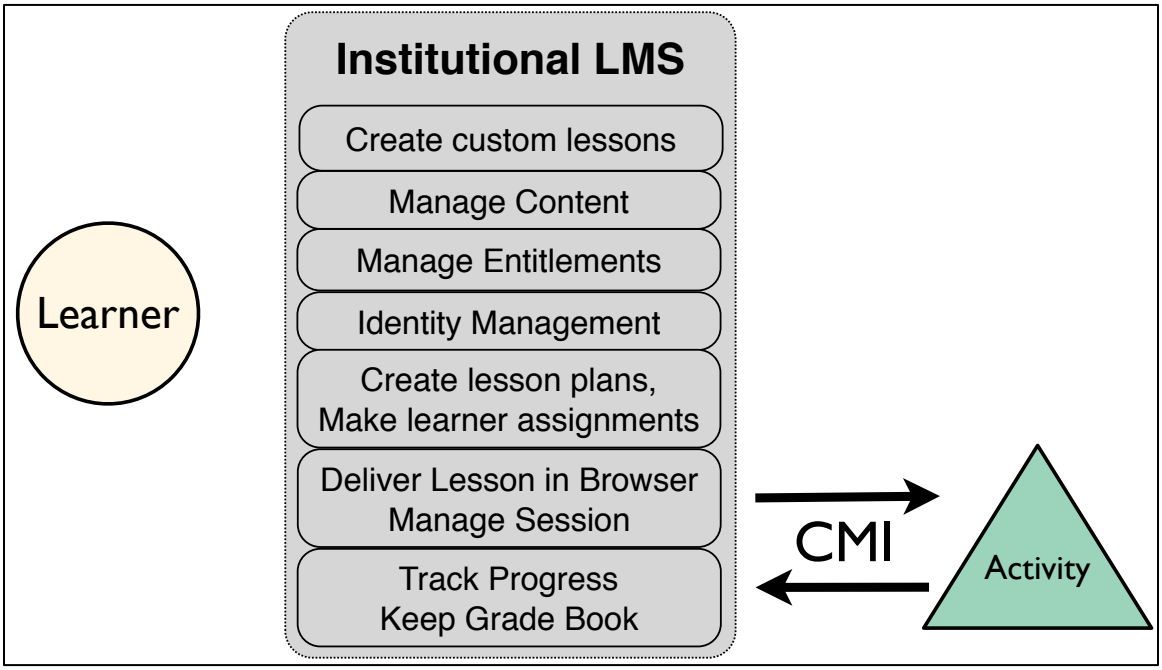

Figure 1. Today's elearning architecture

Specifically, today's elearning systems assume that there is a single institutional LMS that:

- Stores all content "packages"
- Authenticates learners
- Controls all persistent data about the learner
- Launches & manages all learning sessions
- Is the only app that tracks progress and performance
- Manages institutional contracts with publishers (entitlements)
- Provides planning and scheduling tools to teachers

And there are a few more limiting assumption in today's elearning architecture:

- Activities involve a single learner
- Teacher doesn't monitor/observer/coach during an activity
- Each learner has a single institution and teacher
- Learning activities require no student background data
- Performance is measured by test scores

LETSI's Overall Architectural Vision

LETSI has identified a requirement to create new forms of metadata to describe resources that are likely to:

- be sold, managed and delivered remotely over the internet;
- support the high levels of interactivity typical of new immersive and collaborative learning environments;
- require the exchange of runtime and assessment data with multiple management systems and mobile apps;
- be described in terms of community-defined competencies;
- support a wide variety of delivery platforms, including mobile devices;
- be reusable, allowing for adaptation and flexible aggregation.

LETSI's working groups are developing schemes that will allow many different kinds of web-based learning activities and teacher's apps to communicate via web services with each other and with institutional LMS's. (See Figure 2.)

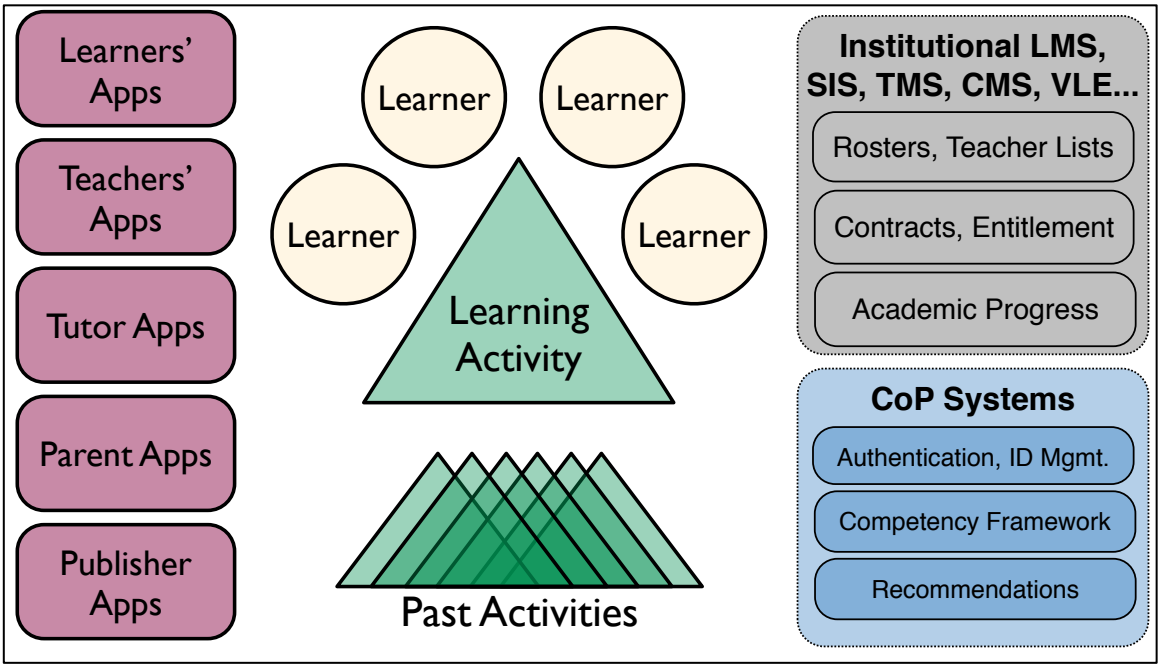

Figure 2. Tomorrow's elearning ecosystem

A typical scenario for a student launching a web-based learning activity (a simulation or a publisher's intelligent online homework assistant) might go something like this:

1. Learner goes to a "lobby" and launches the activity. The lobby may be part of the institutional LMS or it may be a feature of a publisher's website. She may be working individually or undertaking a team activity. The launch data may include:
   - Data about the learner, her institutions, teachers, etc.
   - Teacher's launch options (learner's role in the activity, lesson options, monitoring instructions)
   - Instruction for reporting progress and performance back to the institutional LMS and to teacher's apps (location, data format)
   - The launch data may also include links to sources of the above data on the web, which the learning activity can later query.
2. As the activity prepares to launch, it may query other systems about:
   - Entitlements (e.g., from the learner's institutions, or her iTunes account.)
   - Learners' preferences (from learner's app, past activities, …)
   - Learners' backgrounds (from learner's various institutions)
3. The activity launches with
   - Teacher-specified parameters set per role for each learner
   - Monitoring, coaching enabled if requested by teacher
   - Activity can request additional background data as required (from student's Facebook data, institutional LMS, past activities, …)
4. When the activity terminates it sends

- Status report per instructions
- Performance report per instructions

As the assumptions about what systems are in place are relaxed, the elearning ecosystem can be populated by a variety of innovative learning activities and apps for teachers. However, today's single runtime data payload, CMI, must be split into several payloads and new data elements must be added to the conversation. For example, today one can assume that the student's school's LMS is responsible for handling all entitlements and contracts with publishers. In the web-learning world, that information may need to be passed between systems: the institutional LMS (or perhaps one of several that the student is affiliated with), the publisher's systems, or even the student's iTunes account.

The above example about entitlement data is being addressed by LETSI's Content as a Service working group. That group is also proposing a way to represent a catalog of purchased items. Two other working groups are central to the planned workshop:

LAD: LETSI's Learning Activity Description working group is extending the metadata description of a learning activity to support interaction with multiple processes over the course of its lifetime: acquire, modify, organize, schedule, assign, monitor, recommend.

CMI: A joint effort by LETSI and the IEEE Learning Technology Standards Committee Working Group 11 is re-thinking the requirements for runtime data (launch, monitor, report status and performance) in the case where multiple web and mobile applications are involved.

LAD – Learning Activity Description

Traditionally, a learning activity (typically a content "package") has been described in terms metadata (e.g., IEEE LOM) that would help a teacher find relevant resources in a repository. LETSI's LAD working group has, after many months of due diligence and discussion (technical, pedagogical, and philosophical), begun to draft a modern framework for describing learning activities. The framework relaxes several of the assumptions in SCORM and similar "LMS content portability" standards about the location, structure, and behavior of an online learning activity. The new metadata specification will:

LETSI's LAD will not be limited to the descriptive metadata used in searching for useful learning materials. It will include metadata useful throughout the activity's lifecycle:

I. Acquisition: Find/acquire a product or OER offering
   a. Preview, DRM, price, runtime requirements, reviews
II. Planning - tools for teachers: organize content, lesson plans, customize content, make assignments

   a. NHC-like frameworks, dis-aggregatable lessons, assessment instruments, configurable online activities
III. Launch: Deliver lesson, monitor learning, report status and performance
   a. Learners/roles, launch parameters, data reporting requirements.
   b. The current SCORM/CMI focuses on phase 3
IV. Evaluate/recommend/share learning activity

The working group anticipates that this new kind of content metadata will:

- be accessed from a single starting location in the cloud;
- be strongly typed in order to deliver robust interoperability;
- define the different data inputs and outputs supported by a learning activity;
- support innovation through a clearly defined extensions mechanism;
- link to additional metadata which support versioning, marketing, search, discovery, and social tagging and reviews.

All LETSI data models include a general extension mechanism, stubs for additional data models, which will minimize developer costs resulting from variation across communities of practice. These extensions will also lower the barriers to entry for innovative systems with new data requirements. The LAD framework will also incorporate the work of LETSI's Orchestration Working Group, specifically the distinction between declared and delegated control (sequencing) regimes.

CMI – Runtime Data

The Joint LETSI/IEEE-LTSC CMI working group is tasked with updating the CMI data model which is used in SCORM to launch a learning activity (within the LMS) and receive back progress and performance data. LETSI's Runtime Web Services project explored web-services as a transport mechanism for this data. The RTWS group pointed out the kinds of issues that would result when assumptions about LMS control of the learning experience are relaxed.

Our thinking about the update to the IEEE CMI runtime data standard has changed recently, since the AICC has defined its direction for the forthcoming CMI-5. The AICC's new CMI standard will provide an open framework for launching activities and reporting progress and performance, but it will not specify the launch, progress, or performance data in detail. This approach meshes with LETSI's architectural assumptions about web-based application communication. It presents to LETSI an opportunity to re-think the runtime data requirements: what might a learning activity want to know and what might it want to communicate to other applications, including the institutional LMS, at various stages of the activity's life cycle.

Data Model Definition Mechanism

Recent work in the Joint CMI WG has focused on how to define, in a grounded and rigorous manner, a modern data model that is modular and extensible. As a result, the LAD and CMI working groups have overlapped in recent weeks. They are

addressing together both the nature of "runtime" data payloads and the tools we need to describe these data models for modern software developers.

Crispin Weston has developed a MS-Word based model-building tool that both working groups are exploring and that will be demonstrated at the workshop. To enable the vision of plug-and-play systems that allow rapid innovation in elearning products, teaching methods, and business models, systems will eventually need to exchange multiple types of data. The table below lists an initial set of data models and some of the related standards that we have studied.

Data Model	Description	Relevant Standards
Published Activity	Data used by apps for learner, teacher, or buyer to find, preview, and acquire offerings. Describes a learning activity or publisher's tool for creating an activity. Includes runtime requirements and monitoring & reporting options.	IEEE LOM, ISO MLR, SIF, LETSI LAD & CaaS
Activity Internal Structure	Data for teacher's apps -- organize, customize, and assign learning activities. Teacher instructions; configuration options; disaggregation options; orchestration.	SCORM, IMS CC & CP, LETSI LAD & Orchestration
Activity Evaluation	Reviews, star ratings, comments from teachers and students, recommendations	
Launch	Learner(s) launch activity (in LMS, browser, or mobile app). Includes learner's role and runtime options, with pointers to the following data	IEEE CMI, AICC CMI-5, SCORM, LETSI RTWS
Learner	Authentication from an institution or Facebook or iTunes. Name, preferences, learning style, context, prior activities, institutional affiliations, teachers, ...	SIF, HR-XML
Learner Background	Pedagogically useful information (language, grade, reading level, ...) E.g., LMS data or a learner's personal record-keeping app or website that might point to data at various institutions and publishers' websites.	ePortfolio
Entitlements	Student & institutional entitlements, e.g., OER accounts, publishers' contracts	LETSI CaaS
Status Reporting	Status of student(s) in an ongoing activity, including attempt management	SCORM, IEEE CMI, AICC
Performance Reporting	Scores on test items, extend with evidence (description of test items). Advice/guidance to learners, teachers (e.g., text memo, competency judgements, ...)	IMS QTI, IEEE CMI, SIF Assessment

There are numerous unanswered questions in this work towards a new, distributed elearning architecture, including several "chicken and egg" conundrums. How can you build data exchange standards for classes of apps that do not exist yet? LETSI's philosophy has been to create open, extensible models that make minimal assumptions about future apps and data flow and thus do not stand in the way of innovation.

The work is at a critical stage. The August workshop will address critical questions and your participation would be most appreciated.