The IMS Learning Tools Interoperability (LTI) specification provides a standard mechanism for seamlessly connecting learning applications and remote content to virtual learning environments (VLEs) and enterprise portals.

It is increasing in popularity as a method for providing integrations which are not dependent upon a particular VLE.

This briefing paper provides an overview of the LTI specification and illustrates the benefits for developers, VLE administrators, teachers and learners.

IMS Learning Tools Interoperability

A Briefing Paper

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Commissioned by JISC CETIS.

The emerging interest in distributed learning environments was discussed in a JISC CETIS briefing paper in 2010 [1]. One of the models outlined was the use of plug-ins to existing VLEs. Following the release of LTI [2], instances of this model are now being seen in practice. The use of LTI allows these environments to be achieved in a single, standard way without the need for a separate integration for every combination of application and VLE. This not only eases the effort for developers, but also ensures that these connections continue to work across VLE upgrades and VLE replacements. The simplicity of implementation coupled with the significant benefits it offers, explain why LTI is being adopted so quickly within the educational community.

What is LTI?

At the core of LTI is the ability for a user within a VLE (or other web-based system) to seamlessly access a separate learning application, an item of protected content, or other restricted resource. When a user is passed from the VLE to the other system, the following data may be carried with them:

- details about them (including name and email address);
- details about the institutional context (such as the VLE being used);
- details of the specific context from which they are coming (such as an online course); and
- their role within that context (such as "teacher" or "learner").

This "launch" process occurs in a secure manner (using OAuth) via the user's web browser. A connection between the two systems is created by simply entering the following details in the VLE:

- the URL to the other system;
- a value to identify the customer (known as the "consumer key");
- a shared secret to secure the connection.

One of the immediate benefits of LTI is that it provides a single-sign-on mechanism for users connecting from the VLE to other systems. However, LTI is not designed to replace authentication systems (such as Shibboleth or CAS) which allow a user to connect to multiple web-based applications whilst only providing their credentials (such as username and password) once. Instead it is providing a secure way of sharing a user's authorisation to access a specific resource (such as a course) with other web-based systems.

A VLE is an example of what is referred to as a "tool consumer" (TC) within the LTI specification as it consumes the other application or resource, which is supplied by a "tool provider" (TP). An enterprise portal is another example of a TC. Examples of TPs include a separate wiki or quiz tool, or accessing content from a publisher's server. The data passed via LTI may be used to provision the tool provider system "on-the-fly", or used to associate the connection with pre-existing user and context entities.

In addition to enabling users to be launched into another site, the latest release of LTI (1.1) provides a simple Outcomes service which allows a TP to read or write a mark in the TC's grade book (for a specific user and context). This provides, for example, an alternative to using locally hosted SCORM packages; the content may be hosted remotely (outside the VLE) whilst still retaining the ability to record progress in the grade book within the VLE.

Benefits of LTI

The process of delivering additional functionality to users via a VLE plug-in can be separated into the following stages:

- developing,
- deploying, and
- utilising.

LTI provides benefits to the parties at each stage.

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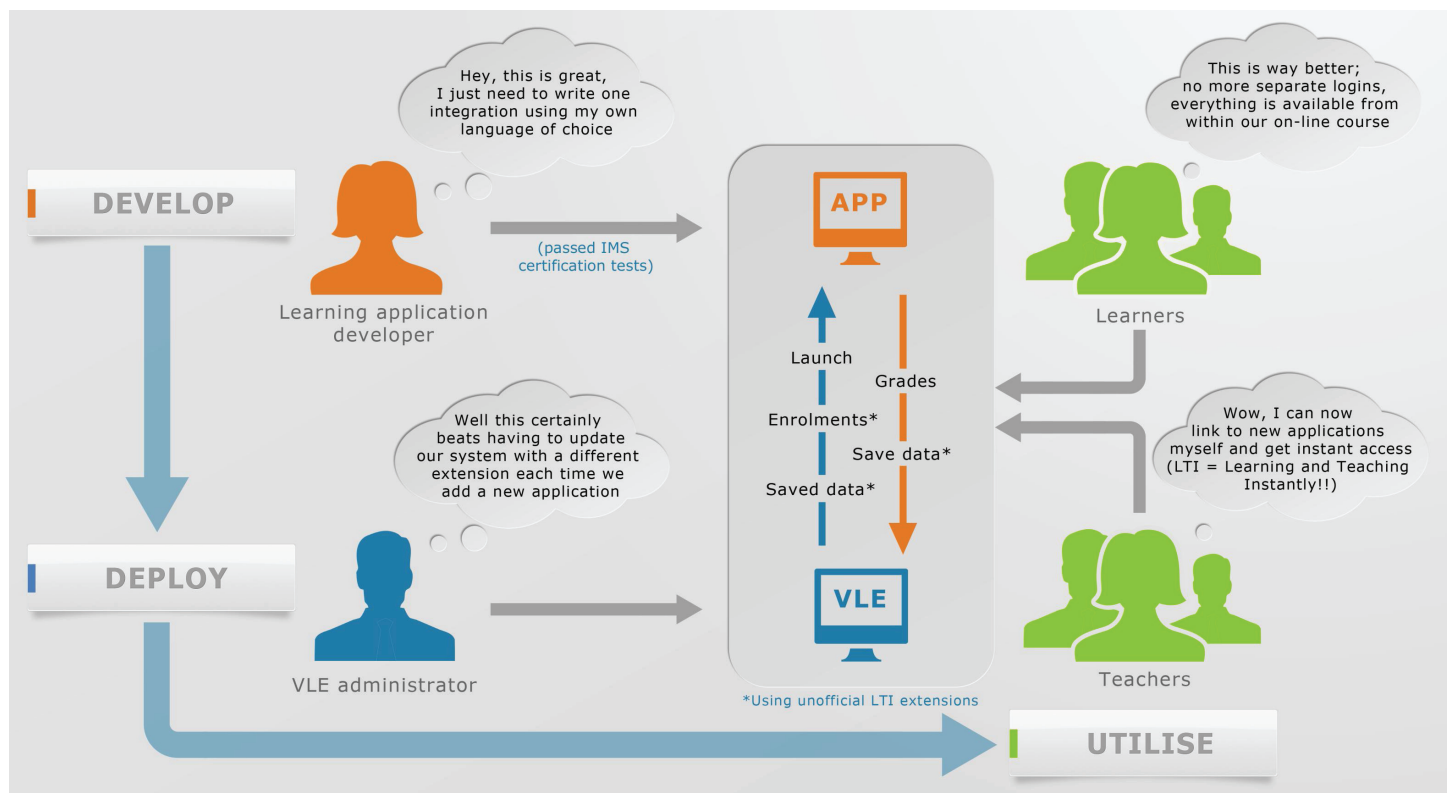
How can LTI benefit me? [3]

DEVELOPERS

- do not need to have expertise in each VLE platform;

- can use their own preferred programming language and development environment;

- only one code base needs to be developed and maintained to support multiple VLEs;

- can still build plug-ins for specific VLEs (such as a Moodle module or a Blackboard Building Block) if they wish to achieve a deeper level of integration or more consistent user interface, but this need not be at the expense of support for other platforms.

VLE ADMINISTRATORS

- do not need to install and test a separate integration for each application to be made available to users;

- can delegate the authority for adding LTI connections to teachers without the need to be involved in this process
  (this depends upon how LTI has been implemented within the VLE, but is possible in both Moodle and Blackboard Learn 9);

- can be assured that these other applications will not compromise the performance or security of the VLE service because they are being run on separate servers;

- can install VLE updates and support multiple VLEs without impacting LTI connections;

- can more easily and quickly provide the VLE services requested by users.

TEACHERS (AND LEARNERS)

- have a greater ability to select, and seamlessly connect to, applications and resources which best match the learning needs of their students, they do not need to be popular enough to be supported across the institution;

- can share a single instance of an application with users from different VLEs and/or institutions.

LTI in practice

The list of products which have passed the LTI conformance tests shows a growing number taking advantage of the benefits it provides to developers [13]. Some examples of how LTI is being used in practice are described in the box below.

As well as looking for LTI support in third-party systems, some institutions, like the University of Kent [12], are choosing to use LTI for integrating their own in-house developments with their VLE. The benefits which accrue to third-parties apply equally to internal developments.

SOME EXAMPLES OF LTI IN PRACTICE

1 The ceLTIc project [4] included WebPA (an open source peer assessment tool) [5] as one of its case studies to investigate the impact of LTI. The benefits of integrating WebPA with a VLE are only fully realised if student enrolments can be synchronised as well as enabling single sign-ons; without the enrolments, teachers cannot set up the group assessments for students to take. Thus, this application provides a good example of how all of the Memberships, Outcomes and Setting services can be used to meet the needs of teachers [6].

2 Noteflight [7] has leveraged LTI to enable its music composition tool to be used by students from within any VLE. As a small organisation, this could probably not otherwise have been achieved, and certainly not in such a timely and cost effective manner.

3 An increasing number of publishers are adopting LTI to provide access to content (including ebooks); for example, Pearson, McGraw-Hill [8] and CourseSmart [9] are all actively deploying content using LTI. It is also now possible to embed links to LTI resources within IMS common cartridges (which are cross-platform content packages) [10].

4 The LTI connector for Perception [11] will allow Questionmark to replace multiple, bespoke solutions (one for each VLE) with a single integration. This example also illustrates how LTI support can be added without significant disruption to an existing application: their LTI connector merely acts as middleware to translate LTI messages into service requests using their own interface (QMWISe), and back again.

VLE SUPPORT FOR LTI

	LTI 1.0	EXTENSIONS	LTI 1.1
BLACKBOARD LEARN 9.0	P	P	P
BLACKBOARD LEARN 9.1	C,P	P	P
MOODLE 1.9	P	P	-
MOODLE 2	C	P	C
SAKAI CLE 2.7+	C	C	-
SAKAI CLE 2.9	C	C	C
SAKAI OAE	C	-	-

Where C = available in core product and P = available via a plug-in.

History of LTI

LTI has its origins in the IMS work on Tools Interoperability (TI). TI 1.0 was released in 2006 but was considered too complex to implement and so was not widely adopted. The IMS Learning Tools Interoperability project was established to deliver the same aims as TI but using a simpler solution. Its work was referred to as "Full LTI" for a period, and is currently known as LTI 2. In parallel to the work on LTI 2, a simpler launch-only version of LTI was published to provide a small and agile implementation. This was originally named "Basic LTI" but is now referred to as LTI 1.0.

To further meet the needs of users, some unofficial extensions were widely adopted to provide services to:
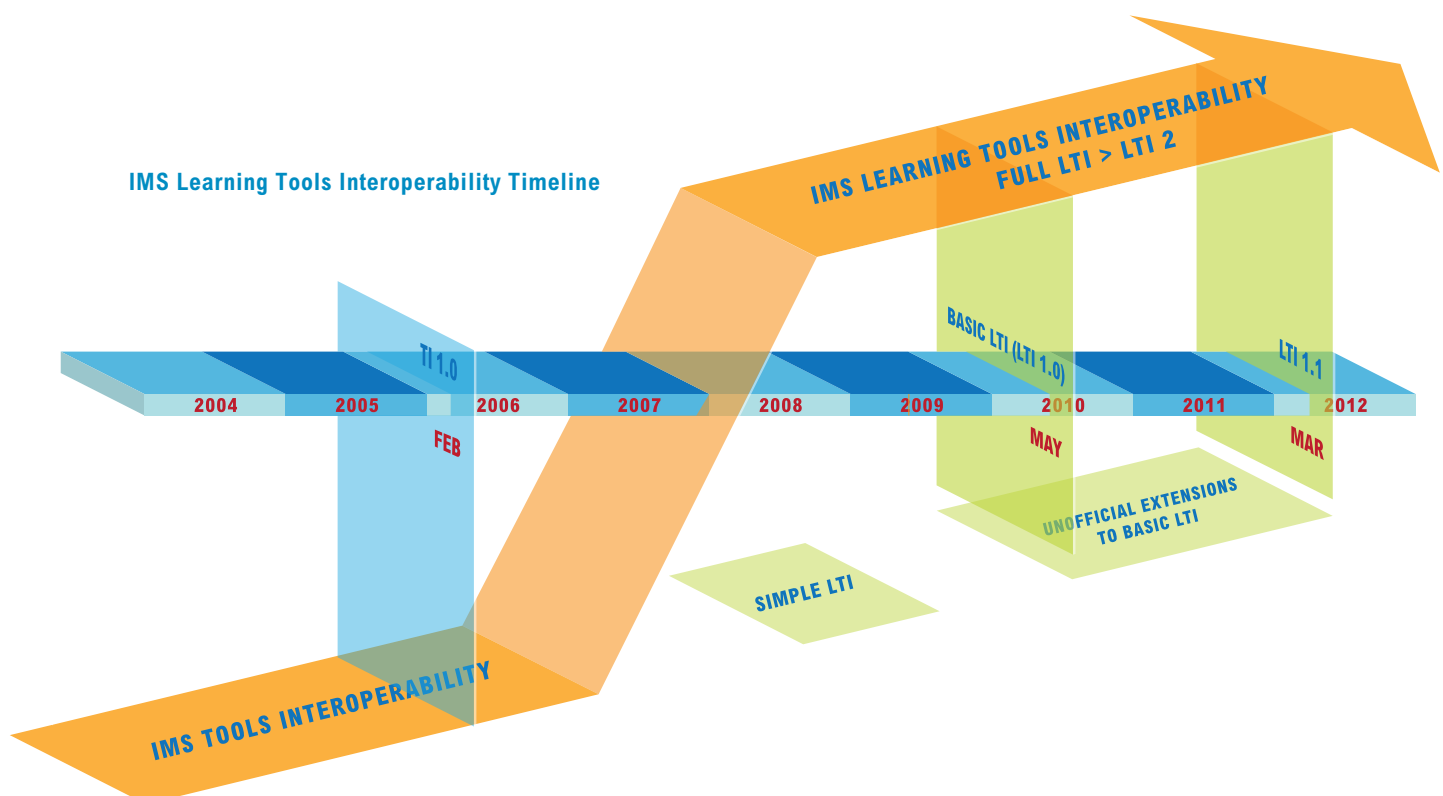
- allow a list of enrolments to be retrieved from the VLE (Memberships service),

- provide access to the VLE grade book (Outcomes service), and

- use the VLE as a small data store (Setting service).

The Outcomes service was formally added to the LTI specification in version 1.1.

On the horizon

The IMS is currently working on LTI 2 which will deliver a more sophisticated and extensible platform for providing deeper integrations, and greater support for services and events. For example, a tool provider will be able to specify where its links should appear in the VLE and provide support for user-selected languages. VLEs may notify tool providers when a course is copied, archived or restored to allow consistent states of each system to be maintained. LTI 2 is expected to use REST and JSON-LD to deliver this new functionality.

The future developments of LTI should continue to narrow the differences (from a user's experience) between tools which are embedded within a VLE and those which are hosted externally, thereby delivering increasing benefits to the education community.

IMS Learning Tools Interoperability Timeline

IMS LEARNING TOOLS INTEROPERABILITY
FULL LTI > LTI 2

BASIC LTI (LTI 1.0)

TI 1.0

LTI 1.1

| 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |

FEB

MAY

MAR

UNOFFICIAL EXTENSIONS TO BASIC LTI

SIMPLE LTI

IMS TOOLS INTEROPERABILITY

What you can do

JISC is currently funding a number of projects to further demonstrate the benefits of LTI and to support those seeking to implement it themselves. The ceLTIc:developers project is creating training resources and running hands-on workshops for developers. The ceLTIc:sharing project is demonstrating how LTI can be used to set up applications as shared services [4].

Whenever a new application is procured, ask about LTI support; the benefits of LTI will only be realised if the specification is known to, and used by, providers of learning applications.

Any products which have passed the IMS conformance tests are permitted to display the "Certified" logo and will appear on the IMS website [13].

IMS GLOBAL

CERTIFIED

Current Registrations:
imscert.org

REFERENCES

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[13] IMS Interoperability Conformance Certification Status
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