

# SIF 3/LTI Integration: Technical Documentation

National Schools Interoperability Program, Australia. V0.1. [info@nsip.edu.au](mailto:info@nsip.edu.au)

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## Terminology

**Table 1.: Terminology**

Term	Definition
<b>IMS Global</b>	IMS Global Learning Consortium
<b>NSIP</b>	National Schools Interoperability Program, Australia
<b>SIF</b>	Systems Interoperability Framework.® (Registered trademark of the SIF Association)
<b>SIS</b>	Student Information System
<b>SSO</b>	Single Sign On
<b>Tool Provider</b>	An External 3 <sup>rd</sup> Party Site
<b>Tool Consumer</b>	The Jump off point (LMS or Portal) which enables SSO to the 3 <sup>rd</sup> party.
<b>LTI</b>	Learning Tools Interoperability.® (Registered trademark of IMS Global Learning Consortium)
<b>LIS</b>	Learning Information Services specification.® (Registered trademark of IMS Global Learning Consortium)
<b>LMS</b>	Learning Management System

## 1. Overview

### Purpose

This document describes a profile of LTI® which makes it interoperable with SIF 3. It describes the configurations needed to set up a workflow whereby a SIF®-aware LTI Tool Consumer is able to delegate its SIF authority, to enable an LTI Tool Provider to access further information through SIF than what can be obtained via an LTI Launch link.

One example of this is preprovisioning accounts for an entire class into the Tool Provider, so they can all do an activity together. Another example of this is preprovisioning accounts for an entire school district into the Tool Provider. This is the rostering use case of particular relevance in US K-12 education. Once such preprovisioning has taken place, users on the LTI Tool Consumer can access the LTI Tool Provider with single sign-on, as normal in LTI, but with the LTI Tool Provider already preprovisioned with all necessary user information.

However the profile applies more generally, to all cases where the Tool Consumer cannot provide all the information necessary to the Tool Provider, but the Tool Provider can access that information from a SIF endpoint. This is applicable particularly to the K-12 sector, in which Tool Consumers are typically data poor and are not integrated with an SIS: the profile enables integration of the Tool Provider with the SIS instead, via SIF.

The workflow described here can be generalised to other services which need to be accessed by a Tool Provider as part of its integration with the Tool Consumer, beyond the exchanges between Consumer and Provider within the scope of LTI. For example, a similar workflow can be put in place for the Tool Provider to preprovision accounts through OneRoster, LIS, or other provisioning services; for the Tool Provider to access a Caliper service; and so on.

## 2. Use Case.

### Background

In real world circumstances in higher education, students participate in a course which is hosted on a LMS. Students must therefore Sign On to that LMS to see the items in the course. LTI leverages this, and permits an already authenticated user to click a link on the LMS (called a Tool Consumer), which takes them to an external site (called a Tool Provider), providing content relating to the course. LTI embeds into the link information about the user and their course context. As a result, not only is the user authorised to use the Tool Provider, because the link invokes a shared secret, but the Tool Provider has enough information about the user and the course to provide a customised educational experience.

There are a set of structural differences between the K-12 and the Higher Education markets, which make a difference to when to consider the use of the SIF and LTI standards both separately and together:

- Integrations with Tool Consumers routinely range across multiple schools, and are often mediated by a school authority (e.g. school district, state department of education)
- There is potentially a separate instance of the SIS located in each participating school
- Tool Consumers are typically not fully-fledged LMS, and may be relatively unsophisticated platforms (e.g. Sharepoint sites)
- Individual schools do not have the technical expertise to implement current interoperability standards
- School authorities perform QA and data format conversions, as well as aggregating data from participating schools
- Tool Consumers are often poorly integrated with the SIS, because of low technical capability and silo'd information. In fact, the Tool Provider may be able to access information from the SIS more readily than the Tool Consumer can.
- Consistent with this, course and enrolment information are not necessarily located in the same source of truth (enrolment information is in the SIS, course information is in the Tool Consumer)
- Enrolment in specific classes is often not mastered in the SIS (which in the K-12 sector is often a third party timetabling product)
- Because of the different procurement models, teachers create their content for classes off line, and it is not common to find full courses with content established in advance
- Not all students have logins, or e-mails
- SIS and other school and school authority systems are typically firewalled
- School authorities may have already invested in enterprise authorisation schemes like SAML
- Cohorts of students (classes, sections) are more central to the use of education tools than in higher education, particularly when they are interacting with an activity and not just consuming a learning resource
- Because cohorts are so important, it is more common for tools to be pre-provisioned with accounts, so that an entire classroom is set up for tool use in an activity ahead of time, and the teacher can receive aggregated assessment reports for the classroom
- If a Tool Provider is servicing a large number of schools, it may want to control when accounts are provisioned, in order to manage bandwidth. This is much easier to do if the Tool Provider can initiate pre-provisioning of accounts, than if it waits for accounts to be provisioned on the fly.

To summarise, Tool Consumer systems in K-12 does not have access to information in the way that their counterparts in Higher Education do. The two relevant issues for consideration are:

- The data is not available in the Tool Consumer at the time the connection is made to the Tool Provider
  - This means it can be a significant challenge in K-12 to provide information on demand to a Tool Provider—as the LTI request presupposes. There is not necessarily a single SIS involved; the data may come from an aggregator outside the school; and the SIS or SIS aggregator does not always share data with the Tool Consumer. The usual practice is for accounts to be provisioned together as a section, rather than on demand by individual students accessing the tool. The K-12 sector does not use LMS's to the same extent as higher education, with rich information about student progress: they tend to use generic portals instead for external tool integration. Finally for high-traffic situations, having the account information provided to a Tool Provider on the fly, as end users access the Tool Consumer, may be undesirable for the Tool Provider.
- More data is required than can be associated with an LTI session, particularly with its use of the LIS data model.
  - The LIS data model, which underpins the attributes exchanged in LTI, has been developed for higher education rather than K-12. Several entities and attributes necessary to K-12 are not present in LIS, and interoperable use of LTI in K-12 would presuppose standardising a K-12 data model for attribute exchange. This would be redundant where Tool Consumer instances already have a K-12 data model in place.

## Use Cases

Given the foregoing, the LTI default workflow, where a Tool Consumer provides the Tool Provider with all the information it needs, is problematic for use cases like the following:

- An instructor needs to preprovision an entire cohort to access an activity on a Tool Provider from a Tool Consumer.
- A school district needs to preprovision its entire school population (or a significant subset) to access an activity on a Tool Provider from a Tool Consumer.
- A learner needs to access a resource on the Tool Provider. The Tool Consumer is data poor (not integrated with the SIS), and cannot provide all the information needed to the Tool Provider, to contextualise the learner's access.
- A learner needs to access a resource on the Tool Provider. The data that the Tool Consumer needs to convey to the Tool Provider, to contextualise the learner's access, is too complex to express as LTI attributes.

If these circumstances do not apply, then LTI can be used as it is currently, as the information flow from Tool Consumer to Tool Provider is satisfactory. But if those circumstances do apply, there is an overarching use case that parcels of data must be supplied to a Tool Provider outside of the LTI protocol, and from a source other than the Tool Consumer—though the LTI protocol can enable that data exchange.

For such use cases, if there is a SIF endpoint and a data agreement in place, it is useful to give LTI Tool Providers access to the required data via the SIF protocol. SIF is a well established standard for the exchange of data in the school sector, which can be transported using REST as of version 3.0. SIF has a large and appropriate data model specific to the school sector. And the K-12 sector has already invested heavily in SIF infrastructure. There is precedent for using LTI with other external provisioning services (such as LIS), and LTI is actively pursuing integration with other external provisioning services (such as OneRoster); this particular profile is specific to SIF as an external service.

Significantly for LTI, SIF endpoints are deployed by authorities that are resourced to exchange student data with other systems—so LTI Tool Providers can get the information they need from SIF endpoints, if they cannot get the data direct from the Tool Consumers. This means that there are circumstances in K-12 where LTI and SIF can be used side by side.

The integration pattern described in this profile focuses on the common situation where a Single Sign On Server and a SIF endpoint are already in place in a K-12 institution, but that K-12 institution either does not use a discrete LMS, or else the volume of accounts to be generated preclude on-the-fly provisioning. Vendors can use LTI with SSO under this pattern to integrate with pre-existing infrastructure, without requiring the K-12 institution to have an LTI-compatible LMS in place.

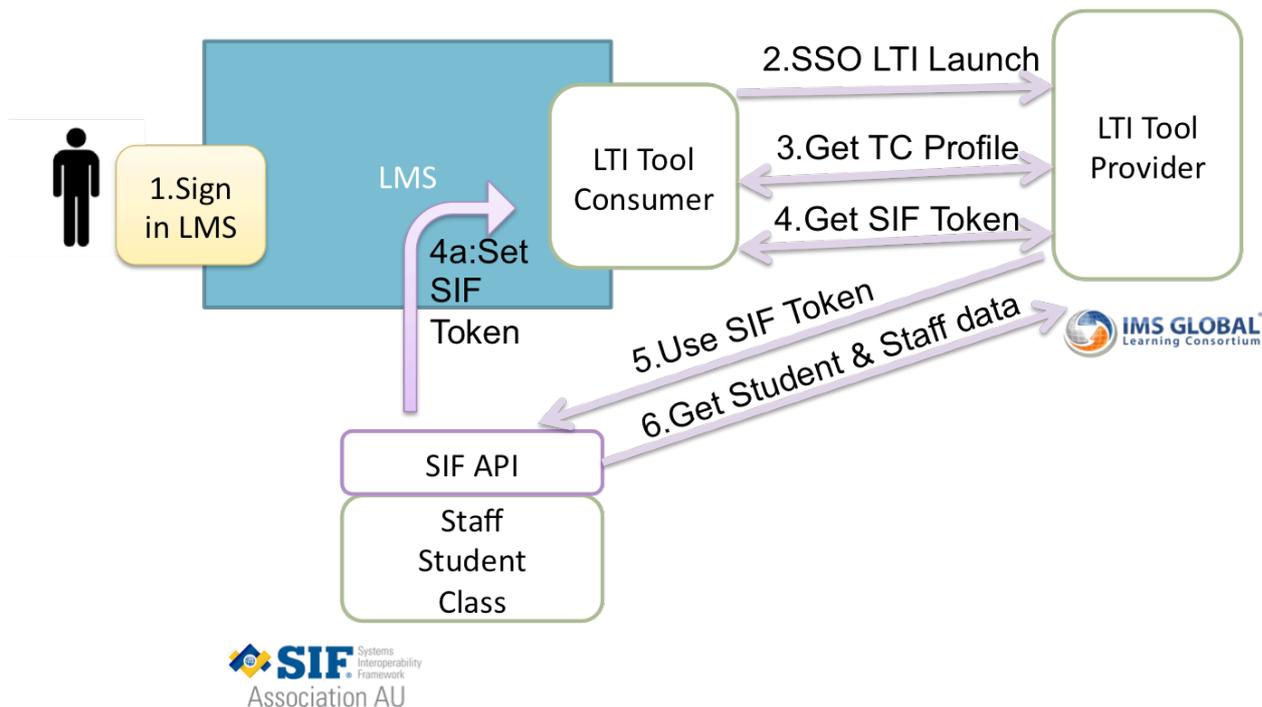
## When to use LTI and SIF together

There are circumstances where it might be more appropriate to use either LTI on its own, or SIF on its own. The factors on when to integrate SIF with LTI can be summarised as follows:

<b>LTI alone</b>	<b>SIF alone</b>	<b>SIF &amp; LTI</b>
Higher Education	K-12	K-12
No SIF infrastructure in place	SIF infrastructure in place	SIF infrastructure in place
LMS system in place	No LMS system in place, relies on SSO and portals	(either)
Data exchange covered by LIS data model (or can use K-12 attributes as ad hoc extensions)	Data exchange requires SIF data model	Data exchange requires SIF data model
Tool Provider uses LTI for integration	Tool Provider uses SSO technologies (e.g. SAML, OpenID) in preference to LTI	Tool Provider uses LTI for integration
Tool Consumer is data-rich, and can provide Tool Provider with all the information it needs via LTI	Tool Consumer is data poor; Tool Provider need to be provided with data from a common external source	Tool Consumer is data poor; Tool Provider needs to supplement information in the LTI Launch with an external source
Single source of information about students using the Tool, covering both courses and enrolments, integrated with LMS (Tool Consumer)	Multiple sources of information about students (one SIS per school, separate enrolment and course data sources); Single source of information (which may be aggregator) is not integrated with Tool Consumer	Multiple sources of information about students (one SIS per school, separate enrolment and course data sources); Single source of information (which may be aggregator) is not integrated with Tool Consumer
Integration is specific to a single school, and technical expertise is available (e.g. from the vendor)	Integration ranges across multiple schools, via a school authority as aggregator	Integration ranges across multiple schools, via a school authority as aggregator
Information is supplied to Tool Provider only as a result of a user action	Data on Tool Provider is synchronised continuously with information in SIS	(either)
Course content is provisioned in advance	Course content may be provisioned during teaching term	Course content may be provisioned during teaching term
Students have logins and email addresses	Students may not have logins or email addresses	Students may not have logins or email addresses
Tools accessible on open internet	Tools may be accessed from behind a firewall	Tools may be accessed from behind a firewall
Learning is individual	Learning is cohort-centric: classroom must be provisioned in advance	Learning is cohort-centric: classroom must be provisioned in advance
Multiple external tools are used routinely; must be easy to integrate	Few external tools are used, external integration is not priority	Multiple external tools are used routinely; must be easy to integrate
There is a moderate number of user accounts to be generated;	A large number of user accounts needs to be generated; on-the-fly	A large number of user accounts needs to be generated; on-the-fly

on-the-fly account provisioning will not impact Tool Provider performance significantly.	account provisioning will impact Tool Provider performance significantly.	account provisioning will impact Tool Provider performance significantly.
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## Use Case: LTI SSO & SIF Direct Data



### Provisioning Flow

Under this integration pattern, the Tool Consumer profile includes information on how to access a secure SIF endpoint, which contains data on the students using the Tool Consumer. As part of the initial handshake between Tool Consumer and Tool Provider, the Tool Provider obtains this information from the Tool Consumer profile, and uses it to request provisioning information from the SIF endpoint. The Tool Provider then pre-provisions user accounts using the requested SIF data.

For this flow to be initiated under LTI v1.2, a Launch URL needs to be clicked on the Tool Consumer, as that is the only mechanism for the Tool Provider to be made aware of the Tool Consumer profile. In LTI v2.0, that exchange can instead be enabled through Tool Proxy Registration, as a negotiation between Tool Consumer and Tool Provider. Likely scenarios for those Launch URLs to be presented are discussed in a separate *Implementation Guide*, and are not in scope of this technical profile.

Once the Tool Provider has access to the SIF endpoint, it can query the endpoint to create or update accounts as often as it wants; the Tool Consumer has no control over when the Tool Provider does this. In fact, there is no constraint on the Tool Provider to use this information to preprovision accounts: the Tool Provider can still create accounts on the fly—whether for an entire cohort, or for a new user accessing a Launch URL, and for which the Tool Provider has not already preprovisioned an account. A suggested workflow in which authorised Tool Consumer users can request an accounts refresh for their class is discussed in the *Implementation Guide*.

1. An authorised user signs in to the Tool Consumer.
2. The user access a Launch URL on the Tool Consumer. This URL is used to initiate communication between the Tool Consumer and Tool Provider.
3. The Tool Provider requests a standard LTI profile, which contains the information on how to get the secure Token to access the SIF API.
4. The Tool Provider uses the profile to request the SIF Token (4a: which comes from the SIF API )
5. The Tool Provider uses the SIF Token to gain authentication to the API (and to restrict what the Instructor is allowed to access on the API). The Tool Provider requests from the SIF endpoint a list of users to provision (based on the class nominated in the Launch URL), with associated attributes (e.g. section, demographic data, parent contacts).
6. The SIF API sends data to the Tool Provider, which uses it to provision accounts.

### 3. Technical.

#### Background

This integration uses two types of service call: **Server-to-Server** calls, and **End User** calls.

##### *Server-to-Server calls*

SIF provisioning occurs through the SIF protocol, as a Server-to-Server call (*Step 5 above*): the Tool Provider retrieves information from the Tool Consumer (or from another server nominated by the Tool Consumer). In order to discover and authorise the SIF provisioning service, LTI Server-to-Server calls are used.

LTI Server-to-Server calls involve JSON payloads submitted directly to REST endpoints. They are not mediated through browsers, and do not involve end users. Server-to-Server calls enable Tool Proxy Registration, and are expected to be a part of that workflow under LTI 2.0. In LTI 1.2, on the other hand, use of Server-to-Server calls is limited, and use of additional Server-to-Server calls needs to be set up out of band.

The two administrative services offered by the Tool Consumer as LTI Server-to-Server calls are the Tool Consumer Profile service (which is a standard component of LTI), and the SIF Profile service (which is specific to this profile). The Tool Consumer Profile enables discovery of the SIF Profile service (*Step 3 above*), and the SIF Profile service provides authorisation for the SIF provisioning service (*Step 4 above*).

##### *End User calls*

End User calls are used to launch an LTI session, once the Tool Provider and Tool Consumer are appropriately configured and provisioned via Server-to-Server calls. End User calls are initiated by end users, and are mediated by the user's browser: the parameters of the request are passed from consumer to browser via an HTML form in the usual launch configuration. This integration profile uses the Basic LTI Launch type of user request. If this profile is used in LTI v.2, the profile assumes that the relevant Tool Consumer capabilities, including use of a SIF Profile service, are enabled by the Tool Provider during Tool Proxy Registration.

The classes of end user and Basic LTI Launch links which should initiate discovery of the SIF Profile service are out of scope of this profile, though some suggestions are made in the *Implementation Guide*.

The Tool Consumer should use the `lis_person_sourcedid` or `lis_course_section_sourcedid` launch parameter to pass the ID of the user or cohort, as provisioned from the SIF service. This allows the Tool Provider to match users on an LTI launch with the data retrieved via a SIF request.

#### LTI version required

This technical specification is based on IMS LTI v1.2 <http://www.imsglobal.org/lti/#lti1.2> and IMS LTI v.2 : <http://www.imsglobal.org/lti/index.html#lti2.0> , and OAuth 1.0 <http://oauth.net/core/1.0/> . It can be used under both Basic LTI Launch, and Tool Proxy Registration.

The specification can be supported under IMS LTI v1.1 by use of custom parameter substitution. However it is expected that any Tool Consumer which adds support for any SIF services, such as are described here, is likely to want to also provide a profile and effectively be supporting LTI 1.2.

## Configuration, Tool Provider:

The LTI Tool Provider needs to provide the following attributes out of band, so that the LTI Tool Consumer can set up both Server-to-Server and End User interactions:

- The Launch URL: this is the URL endpoint on the LTI Tool Provider that the LTI Consumer will submit LTI requests to.
- The OAuth Consumer key (“A value used by the Tool Consumer to identify itself to the Tool Provider”)
- The OAuth Shared secret (“A secret used by the Tool Consumer to establish ownership of the Consumer Key.”)

The LTI Tool Provider may also use optional custom parameters; none is required for the configuration described here.

## Configuration, Tool Consumer

### Configuration, Tool Consumer (LTI Server-to-Server: Tool Consumer Profile)

The Tool Consumer publishes a Tool Consumer Profile endpoint URL; the Tool Consumer Profile indicates the capabilities to be offered to the Tool Provider. In particular, the Tool Consumer Profile publishes to the Tool Provider a new SIF Profile service URL, which the Tool Provider uses to request a security token for use when accessing the SIF services. Since the Tool Consumer Profile service is a standard component of the LTI specification, the default workflow suggested is to call the Tool Consumer Profile service first, to discover the non-standard SIF Profile service.

The Tool Consumer Profile is formatted as normal in LTI; see

<http://www.imsglobal.org/lti/litiv2p0/mediatype/application/vnd/ims/lti/v2/toolconsumerprofile+json/index.html>

It is a JSON response to HTTP GET, with the URL for the Tool Consumer Profile endpoint given in the Launch request.

The following is a sample Tool Consumer Profile; the values specific to the Tool Consumer deployment are in red.

```
{
  "@context": [
    "http://purl.imsglobal.org/ctx/lti/v2/ToolConsumerProfile"
  ],
  "@type": "ToolConsumerProfile",
  "@id": "http://tc.example.com/ltiservice/profile/xyz",
  "lti_version": "LTI-1p0",
  "guid": "b6ffa601-celD-4549-9ccf-145670a964d4",
  "product_instance": {
    "guid": "c86542d5-fde1-4aae-ae18-7018089fddcd",
    "product_info": {
      "product_name": {
        "default_value": "HITS",
        "key": "product.name"
      },
      "product_version": "2.3",
      "description": {
        "default_value": "Hub Integration Testing Service",
        "key": "product.description"
      },
      "product_family": {
        "code": "hits",
        "vendor": {
          "code": "nsip",
          "vendor_name": {
            "default_value": "NSIP",
            "key": "product.vendor.name"
          },
          "description": {
```



```
"@context" : "http://purl.imsglobal.org/ctx/lti/v1/SIFProfile",
"@type" : "SIFProfile",
"baseUrl" : "http://hits.dev.nsip.edu.au/SIF3InfraREST/hits/requests/",
"accessToken" : "MmZkMjVmODItYjAxMC00NTFiLWFjZTEtNmRjNTI4MWYwZjdlOmhpdHNAbnNpcA==",
"objectServices" : ["Student", "Section", "StudentSectionEnrollment"],
"servicePathServices" : ["/Section/{}/Student"]
}
```

(The curly brackets in the Service Path services are a SIF convention: they are a place holder for an identifier.)

The SIF Profile service needs to return only two variables: a Base URL for the SIF service, and an access token. (As this data is expressed in JSON-LD, the @context and @type elements are static.) This is enough information for the Tool Provider to initiate SIF Provisioning requests to the Tool Consumer.

We anticipate that Tool Providers will already have SIF query templates, which they can use to request provisioning information from the SIF endpoint. The SIF3 Provider Registry service allows SIF clients to query which services they are authorised to access, including both Object services and Service Path services; the Tool Provider can use the Provider Registry service to confirm whether it can use those queries with the given SIF endpoint. However, to expedite SIF configuration, the SIF Profile can include a list of Object services and Service Path services which are authorised for access with the given baseUrl and accessToken. Note that SIF Express is expected to standardise Service Path queries for the rostering use case applicable here.

As a further option, if the body of the SIF Profile GET request includes the Object services and Service Path services that the Tool Consumer expects to use, the SIF Profile response can return the subset of those services that it supports and authorises on the endpoint.

Expiry for the access token may be specified via the HTTP Expires header.

The proposal currently only supports accessToken-based authentication in SIF 3, but could be extended to support other kinds of authentication, in SIF Classic as well as SIF 3.

#### Configuration, Tool Consumer (SIF Provisioning service):

The SIF service on the Tool Consumer needs to be configured with appropriate security privileges, to limit what SIF data are to be made available to the Tool Provider.

The SIF service on the Tool Consumer needs to expose one or more SIF queries which maps an LTI launch parameter to all required provisioning information about either a group of users enrolled in a class (lis\_course\_section\_sourcedid), or a single user (lis\_person\_sourcedid). For example, in SIF-US, given only a Section identifier, the SIF service needs to have queries returning all StudentPersonal records for students enrolled in a Section (as established through the StudentSectionEnrollment object), and possibly also all Identity records containing relevant user names for those students. The queries need to be agreed out of band between the Tool Consumer and Tool Provider; SIF Express is expected to provide an agreed set of service path queries for rostering. See discussion below.

#### Configuration, Tool Consumer (End User calls):

The Tool Consumer passes three packages of data items to the Tool Provider in an End User call:

- The User: attributes of the user, used for authorisation. (Authentication is done by the Tool Consumer.)
- The Context: the place within the Tool Consumer from which the user launched the Tool. Typically this would be a course in an LMS. Other kinds of contexts might be 'group' or 'project'. This configuration has a default context of "Group"
- The Role: the role of the user within the context, used for authorisation.

The information for these data items is presented to the Tool Provider as discrete parameters in the LTI Launch request (discussed immediately below). When an LTI launch is requested by the End User, these parameters are retrieved from the Tool Consumer's local data store, and populated in the HTTP POST form for the launch.

## Launch Links

LTI uses HTTP POST to initiate the LTI session; the HTTP POST contains all the parameters the LTI Provider needs from the Tool Consumer to interact with the End User. The parameters are in the first instance drawn from the IMS LIS standard, but can also include custom elements. LTI expects that these parameters will be retrieved by the Tool Consumer, when the End User clicks the LTI launch link.

This integration extends the LTI model for provisioning: it allows the Tool Provider to retrieve information about users from external sources, via SIF, as well as through the LTI Launch request.

- LTI Launch parameter `custom_tc_profile_url` is the URL of the Tool Consumer Profile; the Tool Provider accesses this URL to retrieve the endpoint for the SIF Profile service.
- In versions of LTI before LTI 1.2, Tool Consumer profiles are not supported; the SIF profile service URL would then be passed as a distinct custom parameter, `custom_sif_profile_url`.

In LTI 1.2, the LTI Launch link is the only mechanism to get information from the Tool Consumer to the Tool Provider. In order to enable preprovisioning under LTI 1.2, the LTI Launch link needs to identify the means by which the Tool Provider will access SIF, and (optionally) the user or cohort of users to be provisioned into the Tool Provider via SIF. (If the cohort is not specified, the Tool Provider will presumably ask for all users available, and the SIF endpoint will restrict which users are visible to the Tool Provider.) This is done using the following Basic Launch parameters:

- `resource_link_id` is an opaque identifier unique to each instance of a launch link in the Tool Consumer site.
- `lis_course_section_sourcedid` is the identifier at the school for the class targeted by the link.
- `lis_person_sourcedid` is the identifier at the school for the individual person targeted by the link.
- `user_id` is a unique and persistent identifier for the End User. The End User is not necessarily included in the accounts to be preprovisioned on the Tool Provider: those accounts are specific to the class nominated in the request by `lis_course_section_sourcedid` or `lis_person_sourcedid`. It is a decision for the Tool Provider to make whether `lis_person_sourcedid`, as well as `lis_course_section_sourcedid`, should trigger preprovisioning, and whether all roles of End User trigger preprovisioning.
- `context_id` is an opaque identifier that uniquely identifies the context that contains the link being launched. In an LMS, there will be one context per course.

When the Tool Provider receives an LTI Launch request to this resource URL, the Tool Provider can (at any time) look up the `lis_course_section_sourcedid` or `lis_person_sourcedid` provided, and check whether the corresponding users have already been provisioned. If not, it initiates the process for provisioning those users through SIF. The `lis_course_section_sourcedid` and `lis_person_sourcedid` must be an identifier that SIF understands (e.g. TeachingGroup RefId or LocalId in SIF-AU, SectionInfo RefId or LocalId in SIF-US); the choice of identifier, and the SIF queries based on those identifiers, are negotiated out of band.

In LTI 2.0, Tool Proxy Registration can be used to communicate the SIF Profile service to the Tool Provider ahead of time. So the LTI Launch parameter `custom_tc_profile_url` does not need to be included in any LTI Launch links. On the other hand, the Tool Provider can choose to continue checking for this information in LTI Launch requests, in case a user is presented which it has not already preprovisioned through SIF.

## Workflows

The provisioning handshakes envisioned for SIF/LTI connectivity can be summarised as follows:

1. Consumer => Provider: trigger of availability; can be:
  - LTI v1.2: provider long polling; out of band arrangement; LTI Launch request by instructor/administrator (signed)
  - LTI v2.0: Tool Proxy Registration
2. Provider => Consumer: Tool Consumer Profile request (plaintext)
3. Provider => Consumer: SIF Profile Service request (signed, secure channel)
  - This allows exchanges of the SIF authorisation token to be restricted to the trust environment enabled by OAuth, between Provider and Consumer.

4. Provider => SIF Server: SIF Provisioning requests (with access token)

Illustration, Basic LTI Launch

The following is an example of what the provisioning message exchange might look like, mediated through Basic LTI Launches alone (LTI v1.2):

- A resource showing provisioned users on the Tool Provider is <http://exampletool.com/userprovision> . The Tool Consumer has elected a workflow of an administrator accessing this resource through a LTI Launch link, in order to present the SIF Profile URL to the tool consumer for the first time.
- The user initiating the first LTI Launch link is Fred Nerk, [fnerk@school.edu](mailto:fnerk@school.edu)
- The user is an instructor
- The course section sourcedId is grade7english1b
- In SIF terms the course section sourcedId is a local Id of the Section object with RefID 0628280D-2BFD-4627-A9A0-3986F380C88A
- The tool consumer's Tool Consumer profile service has the URL <http://tc.example.com/ltiservice/profile/xyz>
- The tool consumer's SIF Profile service has the URL <http://tc.example.com/ltiservice/sif/xyz>
- The tool consumer's SIF endpoint has the URL <http://school.edu/sif>
- The SIF dynamic query to look up the Section corresponding to grade7english1b is `/Sections?where=[(localId="grade7english1b")]`
- The SIF service path query to return all students in course given its RefId is `/Sections/{refId}/Students`
- The OAuth consumer key is 12345

The instructor clicks on a link in the LMS to <http://exampletool.com/userprovision> . The following HTML form is generated by the Tool Consumer, to submit to the Tool Provider as an LTI Launch:

```
<form action=http://exampletool.com/userprovision
  name="ltiLaunchForm" method="post"
  enctype="application/x-www-form-urlencoded">
<input type="hidden" name="lti_message_type" value="basic-lti-launch-request"/>
<input type="hidden" name="lti_version" value="LTI-1p0"/>
<input type="hidden" name="context_id" value="782369821"/>
<input type="hidden" name="context_type" value="CourseSection"/>
<input type="hidden" name="context_label" value="SX481"/>
<input type="hidden" name="context_title" value="English 7-1B tests"/>
<input type="hidden" name="resource_link_id" value="120988f929-274612"/>
<input type="hidden" name="user_id" value="292832126"/>
<input type="hidden" name="lis_person_contact_email_primary" value="fnerk@school.edu"/>
<input type="hidden" name="lis_course_section_sourcedid" value="grade7english1b"/>
<input type="hidden" name="roles" value="Instructor"/>
<input type="hidden" name="tool_consumer_instance_guid" value="lmsng.school.edu"/>
<input type="hidden" name="tool_consumer_instance_description"
  value="University of School (LMSng)"/>
<input type="hidden" name="custom_tc_profile_URL"
  value="http://tc.example.com/ltiservice/profile/xyz "/>
<input type="hidden" name="launch_presentation_document_target" value="frame"/>
<input type="hidden" name="launch_presentation_locale" value="en-AU"/>
<input type="hidden" name="launch_presentation_return_url"
  value="http://www.imsglobal.org/developers/LTI/test/v1p1/lms_return.php"/>
<input type="hidden" name="custom_provisioning_request" value="yes"/>
<input type="hidden" name="oauth_callback" value="about:blank"/>
<input type="hidden" name="oauth_consumer_key" value="12345"/>
<input type="hidden" name="oauth_nonce" value="93ac608e18a7d41dec8f7219e1bf6a17"/>
<input type="hidden" name="oauth_signature" value="QWgJfKpJNDrpncgO9oXxJb8vHiE="/>
<input type="hidden" name="oauth_signature_method" value="HMAC-SHA1"/>
<input type="hidden" name="oauth_timestamp" value="1348093590"/>
<input type="hidden" name="oauth_version" value="1.0"/>
<input type="submit" value="Press to continue to external tool"/>
</form>
<script language="javascript">
  document.ltiLaunchForm.submit();
</script>
```

The form is submitted to the Tool Provider

The user is navigated to the Tool Provider's resource showing provisioned users, which takes the form of a report on user provisioning for a nominated section.

The Tool Provider has a business rule which establishes that account preprovisioning is an expected result (or side-effect) of this call.

The Tool Provider confirms that the course section grade7english1b has not yet been provisioned.

The Tool Provider discovers the Tool Consumer Profile is at <http://exampletool.com/userprovision>

The Tool Provider uses the Tool Consumer Profile to discover that the SIF Profile service is at <https://tc.example.com/ltiservice/sif/xyz>

The Tool Provider requests the SIF Profile from the SIF Profile service URL through a secure channel (e.g. HTTPS).

The SIF Profile service authenticates the OAuth signature on the SIF Profile request.

The SIF Profile service returns a JSON response to the Tool Provider.

The Tool Provider uses the SIF Profile service response to discover that the SIF endpoint is at <http://school.edu/sif> and retrieves the access token for the SIF endpoint

The Tool Provider address the query [http://school.edu/sif/Sections?where=\[\(localId="grade7english1b"\)\]](http://school.edu/sif/Sections?where=[(localId=) to the SIF endpoint, using the access token, to retrieve information about the section (including its Refld)

The Tool Provider addresses the query <http://school.edu/sif/Sections/0628280D-2BFD-4627-A9A0-3986F380C88A/Students> to retrieve the records for all students enrolled in the section

The Tool Provider provisions accounts for all students retrieved by the query. It records an agreed student identifier (in this instance, the StudentPersonal LocalId) to reference students through the `lis_person_sourcedid` parameter.

The Tool Provider updates the report shown to the instructor to confirm that all accounts have been populated.

Now student Jane Public, who is enrolled in English 7-1B, logs in to the LMS, and accesses the test <http://exampletool.com/testXYZ> from the English 7-1B course page. The following HTML form is generated by the Tool Consumer, to submit to the test resource:

```
<form action=http://exampletool.com/testXYZ
  name="ltiLaunchForm" method="post"
  enctype="application/x-www-form-urlencoded">
  <input type="hidden" name="lti_message_type" value="basic-lti-launch-request"/>
  <input type="hidden" name="lti_version" value="LTI-1p0"/>
  <input type="hidden" name="context_id" value="782369821"/>
  <input type="hidden" name="context_type" value="CourseSection"/>
  <input type="hidden" name="context_label" value="SX481"/>
  <input type="hidden" name="context_title" value="English 7-1B tests"/>
  <input type="hidden" name="resource_link_id" value="120988f929-282631"/>
  <input type="hidden" name="user_id" value="787107147"/>
  <input type="hidden" name="lis_person_sourcedid" value="jpub21"/>
  <input type="hidden" name="lis_person_contact_email_primary" value="jpublic@student.school.edu"/>
  <input type="hidden" name="lis_course_section_sourceids" value="grade7english1b"/>
  <input type="hidden" name="roles" value="Learner"/>
  <input type="hidden" name="tool_consumer_instance_guid" value="lmsng.school.edu"/>
  <input type="hidden" name="tool_consumer_instance_description"
    value="University of School (LMSng)"/>
  <input type="hidden" name="custom_tc_profile_URL"
    value="http://tc.example.com/ltiservice/profile/xyz "/>
  <input type="hidden" name="launch_presentation_document_target" value="frame"/>
  <input type="hidden" name="launch_presentation_locale" value="en-AU"/>
  <input type="hidden" name="launch_presentation_return_url"
    value="http://www.imsglobal.org/developers/LTI/test/vlp1/lms\_return.php" />
  <input type="hidden" name="oauth_callback" value="about:blank"/>
  <input type="hidden" name="oauth_consumer_key" value="12345"/>
  <input type="hidden" name="oauth_nonce" value="93ac608e18a7d41dec8f7219e1bf6a17"/>
  <input type="hidden" name="oauth_signature" value="QWgJfKpJNdrpncgO9oXxJb8vHiE"/>
  <input type="hidden" name="oauth_signature_method" value="HMAC-SHA1"/>
  <input type="hidden" name="oauth_timestamp" value="1348093590"/>
  <input type="hidden" name="oauth_version" value="1.0"/>
  <input type="submit" value="Press to continue to external tool"/>
```

```
</form>
<script language="javascript">
    document.ltiLaunchForm.submit();
</script>
```

The course section named in the request is the same as that for which provisioning has taken place.

The Tool Provider confirms that the user with local Id **jpub21**, and email address [jpublic@student.school.edu](mailto:jpublic@student.school.edu), has already been provisioned for the course section **grade7english1b**. Note that the `lis_person_sourced_id` parameter is used to check the user against SIF provisioning, rather than the `user_id` parameter: the `user_id` parameter originates in the Tool Consumer, whereas the `lis_*_sourcedid` class of parameters expressly reference identifiers maintained in an SIS.

Alternatively, the user has not already been provisioned for the course. The tool provider goes through the same process as above, to initiate on the fly provisioning of the user. (The scope of provisioning may be restricted to the individual user, rather than the entire class.) This on the fly provisioning may potentially use SIF, so the Tool Consumer Profile URL should still be included in the LTI Launch URL.

### Illustration, Tool Proxy Registration

The following is an example of what the provisioning message exchange might look like, mediated through Tool Proxy Registration (LTI v2.0):

Assume the same setup as before.

The Tool Provider communicates to the Tool Consumer administrator the endpoint for its Tool Proxy Registration service; e.g. <https://acme.example.com/lti/registration>.

The Tool Consumer administrator submits a Tool Proxy Registration request to the Tool Proxy Registration service endpoint. The following HTML form is generated by the Tool Consumer, to submit to the Tool Proxy Registration service:

```
<form action=https://acme.example.com/lti/registration
    name="ltiRequest" method="post"
    enctype="application/x-www-form-urlencoded">
<input type="hidden" name="lti_message_type" value="ToolProxyRegistrationRequest"/>
<input type="hidden" name="lti_version" value="LTI-2p0"/>
<input type="hidden" name="user_id" value="292832126"/>
<input type="hidden" name="roles" value="http://purl.imsglobal.org/vocab/lis/v2/person#SysAdmin"/>
<input type="hidden" name="tc_profile_url" value="http://tc.example.com/ltiservice/profile/xyz"/>
<input type="hidden" name="reg_key" value="93ac608e18a7d41dec8f7219e1bf6a17"/>
<input type="hidden" name="reg_password" value="QWgJfKpJNDrpncgO9oXxJb8vHiE"/>
<input type="hidden" name="launch_presentation_return_url"
    value="http://www.imsglobal.org/developers/LTI/test/v1p1/lms_return.php"/>
<input type="submit" value="Press to continue to external tool"/>
</form>
<script language="javascript">
    document.ltiLaunchForm.submit();
</script>
```

The form is submitted to the Tool Provider.

The Tool Provider discovers from the Proxy Registration request that the Tool Consumer Profile is at <http://exampletool.com/userprovision>

[The Tool Provider retrieves the](http://exampletool.com/userprovision?lti_version=LTI-2p0) Tool Consumer Profile instance specific to LTI v2.0, by doing an HTTP get to [http://exampletool.com/userprovision?lti\\_version=LTI-2p0](http://exampletool.com/userprovision?lti_version=LTI-2p0)

If the Tool Provider is capable of using one or services for preprovisioning (e.g. OneRoster, SIF, LIS), it will look for at least one of those services to be advertised on the Tool Consumer Profile, and it will pick the service it considers most appropriate.

The Tool Provider uses the Tool Consumer Profile to discover that there is a SIF Profile service available at <https://tc.example.com/ltiservice/sif/xyz>

The Tool Provider confirms that it too can use SIF, and proceeds to formulate the integration contract with the Tool Consumer on that basis, through a Tool Proxy.

The Tool Proxy indicates that SIF will be used in the integration, by repeating the Tool Consumer Profile information on the SIF Profile service:

```
{
  "@context": "http://purl.imsglobal.org/ctx/lti/v2/ToolProxy"
  "@type": "ToolProxy",
  "@id": "http://tc.example.com/ltiservice/profile/xyz",
  "lti_version": "LTI-2p0",
  "tool_proxy_guid": "b6ffa601-celd-4549-9ccf-145670a964d4",
  "tool_consumer_profile": {
  ...
    "service_offered": [
      {
        "@type": "RestService",
        "@id": "SIFProfile",
        "endpoint": "http://tc.example.com/ltiservice/sif/xyz",
        "format": [
          "application/vnd.ims.lti.v1.sifprofile+json"
        ],
        "action": [
          "GET"
        ]
      }
    ]
  ...
}
"tool_profile": {
...
}
"custom": {
...
}
"security_contract": {
...
}
}
```

The Tool Provider submits the Tool Proxy to the Tool Consumer's Tool Proxy REST service. This registers the Tool Proxy with the Tool Consumer.

The request is redirected to the `launch_presentation_return_url` parameter of the Tool Proxy Registration request.

The Tool Consumer administrator reviews the security impact of the integration (presumably on the `launch_presentation_return_url` page), and makes the Tool Proxy available within the Tool Consumer system.

Now that the integration contract is confirmed, the Tool Provider requests the SIF Profile from the SIF Profile service URL through a secure channel (e.g. HTTPS).

The Tool Provider gets access to the SIF endpoint through the same workflow as described above, and initiates provisioning of accounts.

When student Jane Public, who is enrolled in English 7-1B, logs in to the LMS, the Tool Provider confirms that the user with local Id `jpub21`, and email address `jpublic@student.school.edu`, has already been provisioned for the course section `grade7english1b`, as above.

## Differences between versions of LTI

LTI 1.1 is still the most widely deployed version of LTI, but lacks much of the required functionality for this profile:

- LTI 1.2 introduced profile services, discovered as launch parameters
- LTI 2.0 introduced profile services as separate LTI endpoints, and tool proxy registration

The differences between versions of LTI, as they impact on the SIF–LTI integration, can be summarised as follows:

	<i>LTI 1.1</i>	<i>LTI 1.2</i>	<i>LTI 2.0</i>
<i>Launch</i>	Parameters included in launch	Parameters included in launch	Parameters included in launch
<i>Shared Secret</i>	From Provider (out of band)	From Provider (out of band)	From Provider (during registration process)
<i>Discovery of SIF service</i>	SIF service URL included as launch parameters, has to be set up manually out of band	SIF service URL included as launch parameters; can be set up manually out of band (not recommended)  Tool Consumer Profile service included as launch parameter; SIF Service URL can be discovered via Tool Consumer Profile service	Tool Consumer Profile service exposed externally; SIF Service URL can be discovered via Tool Consumer Profile service
<i>Return path data</i>	Supported as LIS services (LTI Outcomes management v 1.0)	Supported as LIS services (LTI Outcomes management v 1.0)	Supported as LIS services (LTI Outcomes management v 1.0)