



International  
Standard

**ISO/IEC/IEEE  
39274-1-1**

**Learning technology — JavaScript  
Object Notation (JSON) data model  
format and Representational State  
Transfer (RESTful) web service for  
learner experience data tracking  
and access —**

**Part 1-1:  
xAPI using JSON serialization and  
RESTful data transport**

*Technologie de l'apprentissage — Format de modèle de  
données JavaScript Object Notation (JSON) et service web  
Representational State Transfer (RESTful) pour le suivi des  
données de l'expérience de l'apprenant et l'accès à ces données —*

*Partie 1-1: xAPI utilisant la sérialisation JSON et le transport de  
données RESTful*

**First edition  
2025-10**



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# **IEEE Standard for Learning Technology—JavaScript Object Notation (JSON) Data Model Format and Representational State Transfer (RESTful) Web Service for Learner Experience Data Tracking and Access**

Developed by the  
**Learning Technology Standards Committee**  
of the  
**IEEE Computer Society**

Approved 30 March 2023

**IEEE SA Standards Board**

**Abstract:** This standard is a collaborative effort to improve and standardize the 1.0.3 version Experience Application Programming Interface (xAPI) specification. This Standard describes a JavaScript Object Notation (JSON) data model format and a Representational State Transfer (RESTful) Web Service Application Programming Interface (API) for communication between Activities experienced by an individual, group, or other entity and a Learning Record Store (LRS). The LRS is a system that exposes the RESTful Web Service API for the purpose of tracking and accessing experiential data, especially in learning and human performance.

**Keywords:** Experience API, IEEE 9274™, IEEE 9274.1.1™, JavaScript object notation, JSON, Learning Record Provider, Learning Record Store, LRP, LRS, representational state transfer, REST, xAPI

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## Participants

Experience API Specification documents are a product of Research and Development efforts led by the Advanced Distributed Learning Initiative, which is a DoD program under the Office of the Deputy Assistant Secretary of Defense (Force Education and Training).

At the time this IEEE standard was completed, the Experience API Base Standard Working Group had the following membership:

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The working group would like to acknowledge the effort of the following individuals in the creation of the Experience API and Experience API community.

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## Introduction

This introduction is not part of IEEE Std 9274.1.1-2023, IEEE Standard for Learning Technology—JavaScript Object Notation (JSON) Data Model Format and Representational State Transfer (RESTful) Web Service for Learner Experience Data Tracking and Access.

Today’s learning ecosystems, digital applications, content, and web-based tools take advantage of large amounts of learning data to provide learning analytics to improve curricula, to apply artificial intelligence for the purpose of making recommendations, to visualize data in ways that leverage advances in both data logistics and human-centered computing, and many other emerging use cases. Due to a lack of standardized technologies for these use cases, the vendors creating these platforms are forced to create proprietary solutions. The result is a locked-in environment where a single vendor may levy undue control over all parts of a learning ecosystem—to the detriment of learning objectives.

In response to this modernization, an Open-Source collaborative effort resulted in the creation of the Experience API (xAPI). This Standard is a collaborative effort involving that same community, partnered with the IEEE to improve upon and standardize version 1.0.3 of the xAPI. Artifacts and the latest versions of this specification can be found at <https://opensource.ieee.org/xapi/xapi-base-standard-documentation>.

This standard describes a JavaScript Object Notation (JSON) data model format and a Representational State Transfer (RESTful) Web Service Application Programming Interface (API) for communication between Activities experienced by an individual, group, or other entity and a Learning Record Store (LRS). The LRS is a system that exposes the RESTful Web Service API for the purpose of tracking and accessing experiential data, especially in learning and human performance.

## Historical contributors

In collection of requirements for the xAPI, many people and organizations provided invaluable feedback to the SCORM, distributed learning efforts, and learning technology efforts in general. While not an exhaustive listing, the [white papers](#) gathered in 2008 by the Learning Education and Training Standards Interoperability (LETSI) group, the Rustici Software UserVoice website, one-on-one interviews and various blogs were important sources from which requirements were gathered for the xAPI specification.

## ADL’s role in the Experience API (xAPI)

The Advanced Distributed Learning (ADL) Initiative took on the roles of steward and facilitator in the development of the xAPI. The xAPI is seen as one piece of the ADL Total Learning Architecture (previously the Training and Learning Architecture), which facilitates learning anytime and anywhere. ADL views the xAPI as an evolved version of Sharable Content Object Reference Model (SCORM) that can support similar use cases but can also support many of the use cases gathered by ADL and submitted by those involved in distributed learning that SCORM could not enable.

## How to contribute

To contribute to this effort, [please register](#) to join the IEEE SA 9274.1.1 Working Group

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# IEEE Standard for Learning Technology—JavaScript Object Notation (JSON) Data Model Format and Representational State Transfer (RESTful) Web Service for Learner Experience Data Tracking and Access

## 1. Overview

The Experience API (xAPI) is a standard that describes an interoperable means to document and communicate information about learning experiences. It specifies a structure to describe learning experiences and defines how these descriptions can be exchanged electronically.

In assessing candidates' suitability for positions or their capability for performing various tasks, there is a need to consider a wide range of formal and informal learning experiences, both on and offline. That information, more often than not, is scattered across a wide variety of sources.

Out of this decentralized environment, the Advanced Distributed Learning (ADL) Initiative created the original xAPI community and specification. The working group effort was moved to the IEEE in 2019.

xAPI assumes that:

- There is a need to be able to analyze information about learning experiences and their outcomes distributed across a wide variety of sources, platforms and technologies.
- Developing a commonly-accepted framework for gathering, storing and exchanging this information represents the best way of achieving this.

The goals of the xAPI are:

- To make it easier to understand and compare learning experiences and their outcomes recorded across a wide variety of contexts, platforms and technologies.
- To maximize interoperability of services which create, gather, store and process information about learning experiences.

- To provide a guide to those who want to build applications that conform to and implement this specification.
- To provide criteria against which conformance to this specification can be tested.

The xAPI Base Standard is an IEEE Open Source Project hosted on the IEEE Open Source Platform (it is licensed under the terms of the Apache 2.0 License and copyright the IEEE XAPI Authors see [xAPI About](#) for licensing and copyright information as well as additional information on contributing to this open source project). You can find this document and other open source resources related to the xAPI Base Standard at <https://xapi.ieee-saopen.org>.

Additional xAPI Base Standard resources are available as described below:

- [xAPI Base Standard documentation](#)
- [xAPI Base Standard markdown](#)
- [xAPI Examples](#) (See also Annex A)

## 1.1 Scope

This standard describes a JavaScript Object Notation (JSON) data model format and a Representational State Transfer (RESTful) Web Service Application Programming Interface (API) for communication between Activities experienced by an individual, group, or other entity and a Learning Record Store (LRS). The LRS is a system that exposes the xAPI RESTful Web Service API for the purpose of tracking and accessing experiential data, especially in learning and human performance.

## 1.2 Purpose

The purpose of this standard is to provide an interoperable means to store and retrieve learning experience data as required by modern, data-intensive learning technologies.

## 1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).<sup>6,7</sup>

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

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<sup>6</sup> The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

<sup>7</sup> The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they *shall* be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

FIPS PUB 180-2, Secure Hash Signature Standard (SHA2).<sup>8</sup>

IEEE Std 754™, IEEE Standard for Floating-Point Arithmetic.<sup>9,10</sup>

IETF RFC 2046, Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types.<sup>11</sup>

IETF RFC 2616, Hypertext Transfer Protocol – HTTP/1.1.

IETF RFC 3629, UTF-8, a transformation format of ISO 10646.

IETF RFC 3987, Internationalized Resource Identifiers (IRIs).

IETF RFC 4122, A Universally Unique IDentifier (UUID) URN Namespace (IRIs).

IETF RFC 5646, Tags for Identifying Languages.

IETF RFC 7231, Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content.

IETF RFC 7515, JSON Web Signature (JWS).

IETF RFC 8259, The JavaScript Object Notation (JSON) Data Interchange Format.

ISO 639, Code for the Representation of Names of Languages.<sup>12</sup>

ISO 3166-1, Codes for the Representation of Names of Countries and Their Subdivisions—Part 1: Country Codes.

ISO 8601, Date and time—Representations for information interchange.

SemVer, Semantic Versioning 1.0.0.<sup>13</sup>

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<sup>11</sup> IETF documents (i.e. RFCs) are available for download at <https://www.rfc-archive.org/>.

<sup>12</sup> ISO publications are available from the ISO Central Secretariat (<https://www.iso.org/>). ISO publications are also available in the United States from the American National Standards Institute (<https://www.ansi.org/>).

<sup>13</sup> Available at: <https://semver.org/spec/v1.0.0.html>.