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# Information technology — Individualized adaptability and accessibility in e-learning, education and training —

## Part 4: "Access for all" framework for individualized accessibility and registry server application programming interface (API)

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# Contents

Page

**Foreword** ... **iv**
**Introduction** ... **v**
**1 Scope** ... **1**
**2 Normative references** ... **1**
**3 Terms and definitions** ... **1**
**4 Symbols and abbreviated terms** ... **3**
**5 Conformance** ... **3**
**6 Access for All framework** ... **4**
6.1 General ... 4
6.2 Basic principles ... 4
6.3 Use cases ... 5
6.4 Preference concept ... 5
6.5 Resource concept ... 5
6.6 Context concept ... 5
**7 Concept registry** ... **5**
7.1 General ... 5
7.2 Requirements on registries ... 6
7.3 Requirements on concept submissions ... 6
**8 REST architecture** ... **7**
8.1 General ... 7
8.2 Request and response parameters ... 7
8.3 Response codes ... 8
8.4 Security considerations ... 8
8.5 Authentication ... 8
8.6 MIME type ... 8
8.7 Other general requirements ... 9
**9 Registry API (JSON mapping)** ... **9**
9.1 General ... 9
9.2 Concept record (JSON format) ... 9
9.3 CREATE concept record ... 12
9.4 UPDATE concept record ... 14
9.5 DELETE concept record ... 16
9.6 GET concept record ... 16
9.7 GET list of concept records ... 17
**Bibliography** ... **20**

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# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see https://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

This first edition cancels and replaces ISO/IEC TS 24751-4:2019, which has been technically revised.

The main changes are as follows:

— requirements on registries and concept submissions have been added to the scope;

— new terms have been defined in Clause 3;

— new clauses on the Access for All framework (Clause 6) and the concept registry (Clause 7) have been added.

A list of all parts in the ISO/IEC 24751 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.


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# Introduction

This document introduces the AccessForAll (AfA) concept registry as warranted by the AfA framework whose basic principles are introduced in subclause 6.2.

The AfA framework follows an inclusive approach to participation in life by individuals. This inclusivity focuses on addressing the usability of all resources based on individual requests and requirements which would thus reverse the current practice of favouring the majority.

Typically, services and products are designed for the largest possible customer base. This leaves many marginal, or minority needs unmet. Nevertheless, many products and services can be adapted to accommodate individual requirements. The expression of unmet requirements can also prompt the diversification of available resources, increasing the pool of choices available to individuals.

The AfA approach recognizes that anyone can experience a mismatch between personal needs and a resource (including service, environment, experience or product). The approach addresses accessibility for persons with disabilities as integral to the spectrum of human diversity, and an impetus for more flexibility, responsiveness, and inclusion for everyone.

Everyone can benefit from designs that match their personally unique needs and preferences. Inclusive systems respect individual needs and preferences.

For individualized accessibility, the needs and preferences of individual users need to be described in a concise and machine-readable manner. User interfaces and their components can then read such personal AfA preference statements and accommodate them in their adaptations. In addition, other aspects of the context of use need to be described so that user interfaces and their components can take the user's tasks, their equipment and their environment into account. Also, user interface resources need to be described so that AfA services can identify the most appropriate resources for a specific context of use.

For all descriptions, vocabularies are instrumental to allow for a strict semantic and machine-readability. Therefore, this document specifies an AfA concept registry for AfA concepts for the description of AfA preference statements, other aspects of the context of use and user interface resources. For each AfA concept, a concept record contains a globally unique identifier and other characteristics of the AfA concept.

An AfA concept registry needs to be globally accessible through a well-defined API and format rules need to exist for the exchange of AfA concept records. This document specifies a RESTful API for an AfA concept registry service (a.k.a. registry server) and a JSON format for AfA concept records to be exchanged through the AfA concept registry API.

The following use cases are meant to illustrate the benefits of the AfA framework and its standardized AfA concept registry including API and concept record format. This list of use cases is not meant to restrict further uses of this document in any way.

— A person using an AfA concept registry (e.g., a developer of an assistive technology solution) registers an AfA concept on a registry server. This can be facilitated by either a web interface of the registry or by a third-party development application (e.g., an integrated development tool) running on the person's computer. The third-party development application has some advantages over the web interface since it allows for a tighter integration of development platform and registry server. It requires the definition of a concept registry API and of the format of AfA concept record.

— An infrastructure component (e.g., a tool for setting up AfA preference statements or an AfA service) looks up an AfA concept on a registry server. Thus, the definition of an AfA concept can be presented to the user or the range of allowed values of an AfA concept can be considered for the identification of matching AfA resources.

— A syntax checker (e.g., special lint tool) verifies the contents of a new AfA preference statement by validating against the AfA concept records on a registry server. By this procedure, invalid values for

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AfA concepts can be detected. In case of an invalid AfA preference statement, the syntax checker can notify the user about the error or make automatic corrections.

NOTE 1 A syntax checker could be part of a service managing AfA preference statements, checking every incoming AfA preference statement for syntax errors before storing it.

— Two services managing AfA preference statements synchronize their AfA preference statements. This could be a full synchronization over all contained AfA preference statements, or it could affect only a part of the statements. To avoid the distribution of invalid content, incoming statements can be verified against the AfA concept records of an AfA concept registry server (e.g., to detect invalid values), and erroneous statements can be skipped or automatically corrected.

— Two AfA concept registry servers synchronize their entries. This could be a full synchronization over all contained AfA concept records or it could affect only a part of the entries.

NOTE 2 It is possible to run multiple registry servers globally. Some organizations have built, for security and privacy reasons, self-contained digital infrastructures (such as intranets) with only very few and well-defined gateways to the external internet. Such organizations would possibly prefer to have their own registry server running in their infrastructure, and have it synchronize with some global registry server in a secured way from time to time. Also, organizations that develop adaptive user interfaces or assistive technology solutions would likely want to have their own registry server for experimentation purposes.


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# Information technology — Individualized adaptability and accessibility in e-learning, education and training —

# Part 4: "Access for all" framework for individualized accessibility and registry server application programming interface (API)

## 1 Scope

This document specifies an AfA concept registry service, in particular:

— requirements on registries;

— requirements on concept submissions;

— a data format (in JSON) for the exchange of registry entries (AfA concept records) between registry servers;

— a set of RESTful operations for AfA concept registry servers to allow for the manipulation of AfA concept registry entries by external clients other than server-internal web interfaces.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10646, *Information technology — Universal coded character set (UCS)*

IETF BCP 47, *Tags for Identifying Languages*

IETF RFC 2046, *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*

IETF RFC 3987, *Internationalized Resource Identifiers (IRIs)*

IETF RFC 7159, *The JavaScript Object Notation (JSON) Data Interchange Format*

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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**3.1**
**access for all**
**AfA**
approach to providing accessibility in a computer-mediated environment in which the digital resources and their method of delivery are matched to the needs and preferences of the user

[SOURCE: ISO/IEC 2382-36:2019, 3.8.1]

**3.2**
**AfA concept**
globally identifiable unique combination of characteristics relating to context, individual preference(s), and resource(s) relevant for the personalized interaction for *AccessForAll* (3.1) and *individualized accessibility* (3.12)

Note 1 to entry: The registration of an AfA concept captures its unique identifier, label(s), definitions(s), domain(s), and value space in an AfA concept record.

Note 2 to entry: The defined terms "AfA" and "individualized accessibility" incorporate the concepts of individualized needs and matching of resources.

**3.3**
**AfA concept record**
data or file associated with an *AfA concept* (3.2) in an *AfA concept registry* (3.4)

EXAMPLE AfA concept identifier, its label(s), definition(s), domain(s), and value space.

**3.4**
**AfA concept registry**
electronic directory of *AfA concept records* (3.3)

**3.5**
**AfA concept value space**
component of an *AfA concept record* (3.3) providing the specifications of the values associated with an *AfA concept* (3.2)

**3.6**
**AfA context concept**
situation or circumstance for which an *AfA preference statement* (3.8) applies

Note 1 to entry: A minimal set of AfA preference concepts can be a single preference value.

**3.7**
**AfA preference concept**
personal set of values based on a sub-set of registered *AfA concepts* (3.2)

Note 1 to entry: The collection of AfA preference concepts provides the potential choices of preference values that can be declared by an individual in an AfA preference statement.

**3.8**
**AfA preference statement**
user defined set of AfA *preference concepts* (3.7), and where appropriate, incorporating the *AfA context concept* (3.6) and resources to which the set applies

Note 1 to entry: A minimal set of AfA preference concepts can be a single preference value.

**3.9**
**AfA resource concept**
*AccessForAll* (3.1) approach using an *AfA concept* (3.2) to deliver a resource that satisfies the user's requirements

Note 1 to entry: A resource can include but is not limited to activities, configurations, content, environment, experience, interface, product, service, technology.


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**3.10**
**AfA concept registry server**
*AfA service* (3.11) running an *AfA concept registry* (3.4)

**3.11**
**AfA service**
system that supports individuals in determining and declaring personal *AfA preference concepts* (3.7) found in *AfA preference statements* (3.8), and delivers the matching resource

**3.12**
**individualized accessibility**
<e-learning> facility of an IT system-based learning environment to address the needs of an individual as learner (through adaptation, reaggregation and substitution)

Note 1 to entry: Accessibility is determined by the flexibility of the education environment (with respect to presentation, control methods, structure, access model and learner supports) and the availability of equivalent content deemed to be adequate alternatives.

[SOURCE: ISO/IEC 2382-36:2019, 3.8.7]

## 4 Symbols and abbreviated terms

| | |
|---|---|
| AfA | AccessForAll |
| API | application programming interface |
| IRI | internationalized resource identifier (IETF RFC 3987) |
| HTTP | hypertext transfer protocol (IETF RFC 7230, IETF RFC 7231) |
| HTTPS | HTTP secure (IETF RFC 7230, IETF RFC 2731) |
| JSON | JavaScript object notation (IETF RFC 7159) |
| MIME | multi-purpose internet mail extensions (IETF RFC 2046) |
| REST | representational state transfer [10] |
| URI | uniform resource indicator (IETF RFC 3986) |

## 5 Conformance

A conforming *AfA concept registry* shall have the following characteristics:

— it shall meet all requirements on registries, as specified in subclause 7.2;

— it shall accept only concept submissions that meet all requirements, as specified in subclause 7.3.

A conforming *AfA concept registry server* shall meet all of the following requirements:

— REST architecture, as specified in Clause 8;

— The JSON mapping for the registry API, as specified in Clause 9.

A conforming *AfA concept registry server* may support additional format mappings for the registry API.

NOTE The requirements and recommendations for a registry server in this document apply to its API and data formats for parameters in the API. Nothing in this document is meant to constrain the design, data structure and implementation of the internal parts of a registry server, including its database of AfA concepts.

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