INTERNATIONAL STANDARD

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Information and documentation — Digital object identifier system

Information et documentation — Système d'identifiant numérique d'objet

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 26324 was prepared by Technical Committee ISO/TC 46, *Information and documentation*, Subcommittee SC 9, *Identification and description*.

Introduction

The digital object identifier [DOI®[1)]] system provides an infrastructure for persistent unique identification of objects of any type.

DOI is an acronym for “digital object identifier”, meaning a “digital identifier of an object” rather than an “identifier of a digital object”. In this International Standard, the term “digital object identifier” refers to the system defined in this International Standard unless otherwise stated. The DOI system was initiated by the International DOI Foundation in 1998, and initially developed with the collaboration of some participants in ISO/TC 46/SC 9. Due to its application in the fields of information and documentation and previous collaboration with some ISO/TC 46/SC 9 participants, it was introduced as a possible work item in 2004 and further developed from 2006 to 2010.

The DOI system is designed to work over the Internet. A DOI name is permanently assigned to an object to provide a resolvable persistent network link to current information about that object, including where the object, or information about it, can be found on the Internet. While information about an object can change over time, its DOI name will not change. A DOI name can be resolved within the DOI system to values of one or more types of data relating to the object identified by that DOI name, such as a URL, an e-mail address, other identifiers and descriptive metadata.

The DOI system enables the construction of automated services and transactions. Applications of the DOI system include but are not limited to managing information and documentation location and access; managing metadata; facilitating electronic transactions; persistent unique identification of any form of any data; and commercial and non-commercial transactions.

The content of an object associated with a DOI name is described unambiguously by DOI metadata, based on a structured extensible data model that enables the object to be associated with metadata of any desired degree of precision and granularity to support description and services. The data model supports interoperability between DOI applications.

The scope of the DOI system is not defined by reference to the type of content (format, etc.) of the referent, but by reference to the functionalities it provides and the context of use. The DOI system provides, within networks of DOI applications, for unique identification, persistence, resolution, metadata and semantic interoperability.

1) DOI® is a registered trademark. Information concerning trademark issues can be found on ISO online webpage for the ISO 26324 Registration Authority at http://www.iso.org/iso/maintenance_agencies.html.

Information and documentation — Digital object identifier system

1 Scope

This International Standard specifies the syntax, description and resolution functional components of the digital object identifier system, and the general principles for the creation, registration and administration of DOI names (where DOI is an acronym for “digital object identifier”).

This International Standard defines the syntax for a DOI name, which is used for the identification of an object of any material form (digital or physical) or an abstraction (such as a textual work) where there is a functional need to distinguish it from other objects.

The DOI name does not replace, nor is it an alternative for, an identifier used in another scheme, such as the schemes defined by ISO/TC 46/SC 9. This International Standard describes how the DOI system can be used in conjunction with another identifier scheme (for example, to provide additional functionality, such as resolution, where this is not already available), and how the character string of that other scheme can be integrated into the DOI system through the DOI metadata record and/or the DOI syntax.

This International Standard does not specify specific technologies to implement the syntax, description and resolution functional components of the digital object identifier system.

2 Normative references

The following referenced document is indispensable for the application 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.

Unicode Consortium. *The Unicode™ Standard*[2)]

3 Terms and definitions

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

3.1
allowed value
item which may be used as a value of an element

3.2
application profile
set of DOI names that share some common characteristics

NOTE A DOI application profile is a grouping mechanism for DOI names; the functional specification of the application profile includes a set of metadata, comprising the kernel metadata and additional information applicable to that particular genre of object and functional requirements. Each DOI name is associated with one or more application profiles.

2) Available at: http://www.unicode.org. Unicode is a trademark of Unicode, Inc. The Unicode Standard imposes additional constraints on implementations of ISO/IEC 10646:2011.

3.3
data dictionary
repository for all data elements and allowed values of those elements used in DOI metadata specifications

3.4
DOI name
string that specifies a unique **object** (3.9) within the **DOI system** (3.6)

NOTE 1 Names consist of characters in a sequence specified by the **DOI syntax** (3.5).

NOTE 2 The terms “identifier” and “number” are sometimes but not always used in the same sense and are to be avoided where ambiguity can arise. The unqualified use of “DOI” alone can also be ambiguous. Therefore “DOI” is always used in conjunction with a specific noun [e.g. **DOI name** (3.4), **DOI system** (3.6)] unless the meaning is sufficiently clear from an earlier mention or the specific context.

3.5
DOI syntax
rules for the form and sequence of characters comprising any **DOI name** (3.4), specifically the form and character of a prefix element, separator and suffix element

3.6
DOI system
social and technical infrastructure for the assignment and administration of **DOI names** (3.4) as identifiers in computer-readable form through assignment, resolution, referent description, administration, etc.

3.7
interoperability
ability of independent systems to exchange meaningful information and initiate actions from each other, in order to operate together to mutual benefit

NOTE In particular, interoperability constitutes the ability for loosely-coupled independent systems to be able to collaborate and communicate. See References [17] and [18] for further information about interoperability.

3.8
metadata
specific data associated with a referent within the **DOI system** (3.6), based on a structured data model that enables the referent of the **DOI name** (3.4) to be associated with data of any desired degree of precision and granularity to support identification, description and services

NOTE This can involve one or more intermediate mapping operations. The resolution might or might not return an instance of the object. *Multiple resolution* is the simultaneous return as output of several pieces of current information related to the object, in defined data structures.

3.9
object
entity within the scope of the **DOI system** (3.6) that can be digital, physical or abstract

NOTE 1 Digital, physical or abstract forms of an entity can be of relevance in information and documentation (e.g. resources, people or agreements).

NOTE 2 A particular object identified by a specific **DOI name** (3.4) is the **referent** (3.12) of that DOI name.

3.10
opaque string
syntax string that has no meaning discernible by simple inspection

NOTE To discover meaning, metadata are required.

3.11
persistent
existence, and ability to be used in services outside the direct control of the issuing assigner, without a stated time limit

3.12
referent
particular **object** (3.9) identified by a **DOI name** (3.4)

3.13
registrant
person or organization that has requested and received the registration of a particular **DOI name** (3.4)

3.14
registrant code
unique string assigned to a registrant, forming part of the prefix element of the **DOI syntax** (3.5) but having no other implied meaning

3.15
resolution
process of submitting a **DOI name** (3.4) to a network service and receiving in return one or more pieces of current information related to the identified object such as metadata or a location (URL) of the object or of metadata

3.16
unique identification
specification by a **DOI name** (3.4) of one and only one **referent** (3.12)

4 DOI name

4.1 Syntax

4.1.1 General characteristics

The DOI syntax shall be made up of a DOI prefix and a DOI suffix separated by a forward slash.

There is no defined limit on the length of the DOI name, or of the DOI prefix or DOI suffix.

The DOI name is case-insensitive and can incorporate any printable characters from the legal graphic characters of Unicode. Further constraints on character use (e.g. use of language-specific alphanumeric characters) can be defined for an application by the ISO 26324 Registration Authority.

The combination of a unique DOI prefix (assigned to a particular DOI registrant) and a unique DOI suffix (provided by that registrant for a specific object) is unique, and so allows the de-centralized allocation of DOI names.

The DOI name is an opaque string for the purposes of the DOI system. No definitive information may be inferred from the specific character string of a DOI name. In particular, the inclusion in a DOI name of any registrant code allocated to a specific registrant does not provide evidence of the ownership of rights or current management responsibility of any intellectual property in the referent. Such information may be asserted in the associated metadata.

4.1.2 DOI prefix

4.1.2.1 Elements

4.1.2.1.1 General

The DOI prefix shall be composed of a directory indicator followed by a registrant code. These two components shall be separated by a full stop (period).

4.1.2.1.2 Directory indicator

The directory indicator shall be “10”. The directory indicator distinguishes the entire set of character strings (prefix and suffix) as digital object identifiers within the resolution system.

4.1.2.1.3 Registrant code

The second element of the DOI prefix shall be the registrant code. The registrant code is a unique string assigned to a registrant.

EXAMPLE 1

10.1000 DOI prefix comprising a directory indicator “10” followed by registrant code “1000”.

The registrant code may be further divided into sub-elements for administrative convenience if desired. Each sub-element of the registrant code shall be preceded by a full stop. Such subdivision implies no hierarchical relationship; each registrant code, whether subdivided or not, has equal status in the DOI system. However a subdivided registrant code can have technical resolution implications. It is recommended that registrants consult the ISO 26324 Registration Authority for further information about assignment of registrant codes.

EXAMPLE 2

10.1000.10 DOI prefix in which the registrant code has a subdivision “10” (cf. Example 1).

4.1.2.2 Changes

Once a DOI name has been assigned it shall not be changed, regardless of any changes in the ownership or management of the referent.

NOTE: The original registrant might no longer have any role in maintaining a DOI name and its associated records even though its registrant code remains a permanent element of that DOI name.

4.1.3 DOI suffix

The DOI suffix shall consist of a character string of any length chosen by the registrant. Each suffix shall be unique to the prefix element that precedes it. The unique suffix can be a sequential number, or it might incorporate an identifier generated from or based on another system used by the registrant, e.g. ISAN[5][6], ISBN[1], ISRC[3], ISSN[2], ISTC[10], ISNI[11]; in such cases, a preferred construction for such a suffix can be specified, as in Example 2. See Annex A for further details.

EXAMPLE 1

10.1000/123456 DOI name with the DOI prefix “10.1000” and the DOI suffix “123456”.

EXAMPLE 2

10.1038/issn.1476-4687 DOI suffix using an ISSN. To construct a DOI suffix using an ISSN, precede the ISSN (including the hyphen) with the lowercase letters “issn” and a period, as in this hypothetical example of a DOI for the electronic version of *Nature*.

4.2 Visual presentation and other representation of DOI names

4.2.1 Screen and print presentation

When displayed on screen or in print, a DOI name shall be preceded by a lowercase “doi:” unless the context clearly indicates that a DOI name is implied. The "doi:” label is not part of the DOI name value.

EXAMPLE

The DOI name “10.1006/jmbi.1998.2354” is displayed and printed as “doi:10.1006/jmbi.1998.2354”.

4.2.2 URI presentation

The use of the lowercase string “doi” complies with the IETF specification, RFC 3986[14], for representation as a URI (uniform resource identifier), such as “ftp:” and “http:”.

When displayed in web browsers, the DOI name can be attached to the address for an appropriate proxy server, to enable resolution of the DOI name via a standard web hyperlink. To resolve a DOI via a standard web hyperlink, the DOI name itself should be appended to the address for the proxy server.

EXAMPLE

The DOI name “10.1006/jmbi.1998.2354” would be made an actionable link as “http://dx.doi.org/10.1006/jmbi.1998.2354”.

DOI names so represented in a URL and transported by the HTTP protocol are constrained to follow standard IETF guidelines for URI representations. The syntax for URIs is more restrictive than the syntax for DOIs; some characters are reserved and will need percent-encoding.

NOTE: Certain client or server software might be able to process DOIs using native resolution technology (i.e. *doi:10.1006/jmbi.1998.2354* would be interpreted by the browser and automatically resolved without the addition of the proxy server address).

4.2.3 Other representations

DOI names can be represented in other forms in certain contexts (e.g. in the info URI scheme RFC 4452[15]).

Characters which cannot be handled directly in a specific network or reference context, or where ambiguity can arise (e.g. minus sign, the hyphen, and the en-dash all look similar on the screen but carry different character values) should be avoided or encoded in an appropriate way (e.g. for URLs convert to UTF-8 and then percent-encode).

5 Assignment of DOI name

5.1 Principles of assignment

A DOI name shall not be used as a replacement for other ISO identifier schemes such as ISAN[5][6], ISBN[1], ISRC[3], ISSN[2], ISTC[10], ISNI[11] and other commonly recognized identifiers. See Annex A for further details.

A DOI name can be assigned to any object whenever there is a functional need to distinguish it from other objects.

“DOI” is construed as “digital identifier of an object” (not “identifier of a digital object”).

Rules for assignment of DOI names can include a functional definition of scope based on appropriate metadata through a DOI application profile.