INTERNATIONAL STANDARD

ISO 26324

Second edition
2022-08

Information and documentation — Digital object identifier system

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

Reference number
ISO 26324:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

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 ISO documents 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).

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. 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).

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.

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

This second edition cancels and replaces the first edition (ISO 26324:2012), which has been technically revised. The main changes are as follows.

— The requirement that the directory indicator be “10” has been removed.

— The registration authority now has the ability to assign DOI prefixes with a directory indicator other than “10” (including prefixes consisting of a directory indicator alone), allowing existing identification schemes with a compatible syntax to request that those schemes become part of the DOI system.

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.

Introduction

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

DOI is an initialism for "digital object identifier", meaning a "digital identifier of an object" rather than an "identifier of a digital object". In this document, the term "digital object identifier" refers to the system defined in this document, 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 offers a useful set of functionalities, including:

— persistence, if material is moved, rearranged, or bookmarked,

— interoperability with other data from other sources,

— extensibility by adding new features and services through management of groups of DOI names,

— single management of data for multiple output formats (platform independence),

— class management of applications and services, and

— dynamic updating of metadata, applications and services.

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. The Handbook published by the ISO 26324 Registration Authority (see Clause 8) contains information on trademark issues. The name and contact information of the ISO 26324 Registration Authority can be found at https://www.iso.org/maintenance_agencies.html.

Information and documentation — Digital object identifier system

1 Scope

This document specifies the syntax, description and resolution functional components of the digital object identifier system. It specifies the general principles for the creation, registration and administration of DOI names (where DOI is an initialism for "digital object identifier").

This document 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 document 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 or the DOI syntax or both.

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

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.

UNICODE CONSORTIUM *The Unicode® Standard*. Mountain View, California: Unicode Consortium. Latest edition available at: https://www.unicode.org/versions/latest/

3 Terms and definitions

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

ISO and IEC maintain terminological 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/

3.1
DOI system
social and technical infrastructure for the assignment and administration of *DOI names* (3.2) as identifiers in computer-readable form through assignment, resolution, referent description, administration, etc.

3.2
DOI name
string that specifies a unique *object* (3.3) within the *DOI system* (3.1)

Note 1 to entry: Names consist of characters in a sequence specified by the *DOI syntax* (3.4).

Note 2 to entry: 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 such as *DOI name* (3.2) or *DOI system* (3.1) unless the meaning is sufficiently clear from an earlier mention or the specific context.

3.3
object
entity within the scope of the *DOI system* (3.1) that can be digital, physical or abstract

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

Note 2 to entry: A particular object identified by a specific *DOI name* (3.2) is the *referent* (3.16) of that DOI name.

3.4
DOI syntax
rules for the form and sequence of characters comprising any *DOI name* (3.2), specifically the form and character of a prefix element, separator and suffix element

3.5
directory indicator
unique string allocated to a registrant for the purpose of assignment of DOI names, forming part of the prefix element of the *DOI syntax* (3.4) but having no other implied meaning

3.6
registrant code
unique string assigned to a registrant, forming part of the prefix element of the *DOI syntax* (3.4) but having no other implied meaning

3.7
DOI metadata
specific data associated with a referent within the *DOI system* (3.1), based on a structured data model that enables the referent of the *DOI name* (3.2) to be associated with data of any desired degree of precision and granularity to support identification, description and services

Note 1 to entry: DOI metadata is specified in Annex B.

3.8
DOI kernel metadata
subset of *DOI metadata* (3.7) that is common to all DOI name assignments

Note 1 to entry: DOI kernel metadata is specified in Annex B.

3.9
application profile
set of *DOI names* (3.2) that share some common characteristics

Note 1 to entry: A DOI application profile is a grouping mechanism for *DOI names* (3.2); the functional specification of the application profile includes a set of DOI metadata, comprising the DOI 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.

3.10
data dictionary
repository for all data elements and *allowed values* (3.11) of those elements used in DOI metadata specifications

3.11
allowed value
item which may be used as a value of an element

3.12
opaque string
syntax string that has no meaning discernible by simple inspection

Note 1 to entry: To discover meaning, there is a need to refer to metadata.

3.13
registrant
person or organization that has requested and received the registration of a particular *DOI name* (3.2)

3.14
interoperability
ability of independent systems to exchange meaningful information and initiate actions from each other, in order to operate together to mutual benefit

Note 1 to entry: In particular, interoperability constitutes the ability for loosely-coupled independent systems to be able to collaborate and communicate. See Reference [14] for further information about interoperability.

3.15
resolution
process of submitting a *DOI name* (3.2) 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 of the object or of metadata

Note 1 to entry: 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.

3.16
referent
particular *object* (3.3) identified by a *DOI name* (3.2)

3.17
unique identification
specification by a *DOI name* (3.2) of one and only one *referent* (3.16)

3.18
persistent
existence, and ability to be used in services outside the direct control of the issuing assigner, without a stated time limit

3.19
first class
having an identity of itself, not as some attribute of an object

Note 1 to entry: An address is an attribute of something, whereas the thing that has this attribute is a first class object. A DOI name references an entity as a first-class object, not simply the place where the object is located. It may then resolve to a location.

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 shall be case-insensitive and shall contain only printable characters from the legal graphic characters specified by the Unicode Standard. 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) shall be unique. This allows the de-centralized allocation of DOI names. The registration of the combination of the prefix and suffix in the DOI system also serves to validate the DOI syntax for a given DOI name.

The DOI name shall be regarded as an opaque string by users of the DOI system. No definitive information shall be inferred from the specific character string of a DOI name. In particular, the inclusion in a DOI name of any DOI prefix 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. The mere assignment of a DOI name to a referent shall not imply endorsement of the referent by any party. Such information may be asserted in the associated DOI 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 optionally followed by a registrant code. Where a registrant code is present, the two components shall be separated by a full stop (period).

The DOI prefix is a unique string allocated to a registrant.

4.1.2.1.2 Directory indicator

The directory indicator shall be allocated, optionally with a registrant code, to a registrant by the ISO 26324 Registration Authority for the purpose of the assignment of DOI names.

Where a registrant code was allocated to a registrant under a previous edition of this document, the assignment of “10” as the directory indicator shall be assumed.

Information on the implications of allocating a directory indicator other than “10” is contained in Annex D.

A user of the DOI system can determine whether a directory indicator is valid for use in DOI names by consulting the register managed by the ISO 26324 Registration Authority in accordance with the requirement in C.2.

4.1.2.1.3 Registrant code

Where present, the second element of the DOI prefix shall be the registrant code allocated by the ISO 26324 Registration Authority. A registrant code shall always be used with the directory indicator with which it is allocated.

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

10.1000.11 DOI prefix in which the registrant code (“1000.11”) has a subdivision “11”.

The registrant code shall be omitted where a directory indicator has been assigned without one.

EXAMPLE 3

15434 DOI prefix consisting of only a directory indicator where no registrant code has been assigned.

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, such as ISAN[5][6], ISRC[3], ISSN[2], ISNI[10]; in such cases, a preferred construction for such a suffix may be specified by the ISO 26324 Registration Authority as in Example 2. When constructing DOI names from other identifier systems, including schemes where the DOI prefix is affected, the procedures in Annex A shall be followed.

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. According to the construction used here, a DOI suffix is assembled using an ISSN by preceding the ISSN (including the hyphen) with the lowercase letters “issn” and a period. This hypothetical example is 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 syntax of IETF specification, RFC 3986,[13] 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 "https://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.

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] ISNI[10] and other commonly recognized identifiers. When constructing DOI names from other identifier systems, including schemes where the DOI prefix is affected, the procedures in Annex A shall be followed. It also contains requirements for an alternative approach where the identifier from another system is indicated in DOI metadata.

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

"DOI" shall be 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 DOI metadata through a DOI application profile.

5.2 Granularity

A DOI name may be assigned to any object, regardless of the extent to which that object might be a component part of some larger entity. DOI names may be assigned at any desired degree of precision and granularity that a registrant deems to be appropriate.

EXAMPLE For granularity in textual materials, separate DOI names can be assigned to:

— a novel as an abstract work,

— a specific edition of that novel,

— a specific chapter within that edition of the novel,

— a single paragraph,

— a specific image, or

— a quotation,

as well as to each specific manifestation in which any of those entities are published or otherwise made available.

5.3 Description

The assignment of a DOI name requires that the registrant shall provide DOI kernel metadata describing the object to which the DOI name is being assigned. Such metadata shall describe the object to the degree that is necessary to distinguish it as a separate entity within the DOI system and shall conform to the DOI Kernel Metadata Declaration in Annex B.

5.4 Uniqueness

Each DOI name shall specify one and only one referent in the DOI system. While a referent can be specified by more than one DOI name, it is recommended that each referent have only one DOI name.

5.5 Persistence

No time limit for the existence of a DOI name shall be assumed in any assignment, service or application.

The assignment of a DOI name to its referent shall be unaffected by changes in the rights associated with the referent, or changes in the management responsibility of the referent.

The DOI system provides a means to continue interoperability through exchange of information about identified entities (at a minimum, the DOI name and a description of the referent).

6 Resolution of DOI name

6.1 General

Resolution of a DOI name can include, but is not restricted to, resolution to associated values such as a location (URL), an e-mail address, another DOI name and descriptive metadata. The referent can be of various types (e.g. abstract “works”, physical “manifestations”, or performances) and are not always directly accessible in the form of a digital file or other manifestation; i.e. resolution might or might not return an instance of the object. Resolution can also involve one or more intermediate mapping operations.

DOI resolution records can include one or more URLs, where the object can be located, and other information provided about the object to which a DOI name has been assigned, optionally including but not restricted to:

— names,

— identifiers,

— descriptions,

— types,

— classifications,

— locations,

— times,

— measurements, and

— relationships to other entities.

6.2 Functionality

The technology deployed to manage the resolution of the DOI name shall support the functions listed in a) to l) as follows.

a) Internet compatible — Transmission via the global information system that is logically linked by a globally unique address space and communications.

b) First class naming — Identifiers resolved by the system shall have an identity independent of any other object.

c) Unique identification — The specification by an identifier string of one and only one referent.

d) Functional granularity — It shall be possible to separately resolve an object whenever it needs to be distinguished.

e) Data typing — The extensible definition of constraints placed upon the interpretation of certain data entries in a resolution record, such that data values with similar constraints can be grouped and treated in the same way (e.g. for application profile definition).

f) Multiple resolution — The simultaneous return as output of several pieces of current information related to the object, in defined typed data structures. Resolution requests should be capable of returning all associated values of current information, individual values or all values of one data type.

g) Designated authority — The administrator of an identifier shall be securely identified and capable of transfer.

h) Appropriate access to resolution records — Changes to a resolution record shall be recorded and shall be capable of providing access to the data on which the administrator depends and privacy and confidentiality from those who are not dependent on it.

i) DNS independent but compatible — Not reliant on the Domain Name System (DNS), but capable of working with DNS domain naming and resolution services.

j) Granularity of administration — DOI names can be administered individually or in groups.

k) Scalability:

   1) efficient and infinitely scalable protocol;

   2) no limitations on absolute number of identifiers assigned or length of identifier string.

l) Unicode compliant.

7 DOI metadata

7.1 General

The object shall be described unambiguously and precisely by DOI metadata, based on a structured data model that enables the referent of a DOI name to be associated with metadata of any desired degree of precision and granularity to support unique identification, description and services associated with a referent. This is designed to do the following.

a) Promote interoperability within networks of DOI users by enabling independent systems to exchange information and initiate actions from each other in transactions involving DOI names. Since DOI names can be assigned to any type of object, such interoperability can be across different types of content (e.g. audiovisual, music and text).

b) Ensure minimum standards of quality of administration of DOI names by registrants and facilitate the administration of the DOI system as a whole.

7.2 Functionality

DOI metadata should support the following functions.

a) Generic mechanism for handling complex metadata for all different types of intellectual property.

EXAMPLE Instead of treating sound carriers, books, videos, and photographs as fundamentally different things with different (if similar) characteristics, they are all recognized as creations with different values of the same higher-level attributes, whose metadata can be supported in a common environment.

b) Interoperability of metadata across applications, with reference to:

1) media (e.g. books, serials, audio, audiovisual, software, abstract works, visual material),

2) functions (e.g. cataloguing, discovery, workflow, and rights management),

3) levels of metadata (from simple to complex),

4) semantic barriers, and

5) linguistic barriers.

c) Functional granularity, making it possible to uniquely identify an object whenever it needs to be distinguished.

7.3 Registration of DOI metadata

7.3.1 DOI metadata describing and identifying the object to which the DOI name is being assigned shall be recorded promptly and accurately.

7.3.2 Data elements and allowed values used in DOI metadata specifications shall be placed in a repository to facilitate interoperability across selected existing schemes. The data dictionary described in B.1 shall be used as the repository for all data elements and allowed values.

7.3.3 The DOI metadata shall meet the minimum requirements of the DOI Kernel Metadata Declaration described in B.2.

8 Administration of the DOI system

The DOI system shall be administered by the ISO registration authority for this document (i.e. ISO 26324), hereafter referred to as the ISO 26324 Registration Authority, as specified in Annex C.

The name and contact information of the registration authority for this document can be found at https://www.iso.org/maintenance_agencies.html.

Annex A
(normative)

Relationship between the DOI system and other identifier schemes

A.1 Principles

A DOI name shall not be used as a replacement for other identifier schemes such as ISAN,[5][6] ISBN,[1] ISRC[3], ISSN[2], ISNI[10] and other commonly recognized identifiers, but when used with them it can enhance the identification functionality provided by those systems with additional DOI system functionality.

The guiding principles for referencing other identifier schemes within the DOI system are to maximize utility to potential users and to maximize its internal management efficiency.

A.2 Expression of the relationship within the DOI system of DOI names to other identifier schemes

A.2.1 Referent of a DOI name having an existing identifier within other identifier schemes

Where the referent of a DOI name also has an existing identifier within a commonly recognized identifier scheme or schemes, at least one of the following methods shall be used to express the relationship.

a) The other existing identifier(s) is(are) indicated in the DOI metadata field "referentIdentifier(s)," denoting other identifier(s) commonly referencing the same referent, irrespective of whether the identifier(s) is(are) incorporated into the syntax of the DOI name.

b) An existing identifier can be incorporated as an explicit part of the DOI name for the referent.

Examples 1 and 2 show the incorporation of an ISBN and an ISSN into a DOI name. Other agreed syntaxes for integration are also possible. Example 3 shows that the DOI name is not a replacement for the other identifier scheme.

EXAMPLE 1

10.978.8612/345672 shows a possible incorporation of an ISBN (978-86-12-34567-2) into a DOI prefix and suffix.

EXAMPLE 2

10.1038/issn.1476-4687 shows a DOI suffix using an ISSN.

EXAMPLE 3

10.978.1234/599997 is a DOI name; it cannot be validly submitted to an ISBN point-of-sale ordering system or converted to a GS1 bar code for use as an ISBN bar code; it does not conform to the ISBN syntax.

978-1-234-59999-7 is an ISBN. It cannot be validly submitted to a DOI resolution service; it does not conform to the DOI syntax.

However, both identifier strings have the same referent.

A.2.2 Incorporation of an existing identifier into a DOI name

Where syntax rules permit the incorporation of an existing identifier from another scheme as part of the DOI name, such rules do not form part of this document. In such cases, attention is drawn to the following points.

a) The same referent shall be denoted by both the DOI name and the included identifier string, to the degree that is necessary to distinguish it as a separate entity within each identifier scheme.

b) To users of the DOI system, the DOI name shall be regarded as an opaque string. No definitive information relating to the other identifier scheme shall be inferred from the specific character string used for a DOI name and the DOI name is not guaranteed to be usable in any non-DOI applications designed for the other identifier scheme (see Example 3 in A.2.1).

c) The existence of multiple (third, fourth, etc.) identifiers should be recognized in the DOI metadata field "referentIdentifier(s)," denoting other identifier(s) commonly referencing the same referent by multiple values, rather than by incorporation in the DOI name.

d) Specific syntax rules for the incorporation of an existing identifier from another scheme shall be maintained by the ISO 26324 Registration Authority.

A.3 Additional functionality

The DOI system functionality can be offered to complement other identifier services which are available through other parties, e.g. for the resolution of identifiers in a variety of contexts. Services using an identifier can be offered by multiple providers. Rules of certain identifier systems can necessitate the use of only specified preferred service providers; in such cases, the application of the identifier shall follow the rules of the relevant registration authority. Each registration authority for an identifier scheme shall retain autonomy in determining rules for usage within its own scheme or community.

Annex B
(normative)

DOI metadata specification

B.1 Data dictionary

The data dictionary used as the repository for all data elements and allowed values (the items which may be used as values of each element) used in DOI metadata specifications shall enable the definition within an ontology of all such metadata elements to be available to all registrants and provide the mappings to support metadata integration and transformations required for data interchange.

If desired, metadata may be consolidated for a specific service; in this case, the data dictionary shall provide the data mappings such that the consolidated metadata are presented as if from a single set.

All allowed values used by a registrant in DOI kernel metadata (see B.2) shall be registered in the data dictionary.

B.2 DOI Kernel Metadata Declaration

The assignment of a DOI name shall require that the registrant provide DOI metadata describing the object to which the DOI name is being assigned. At minimum, such metadata shall consist of a DOI Kernel Metadata Declaration (also known as the DOI Kernel) as specified in Table B.1. A specification of data elements (with sub-elements, cardinality, etc.), current allowed values and XML expression shall be maintained by the ISO 26324 Registration Authority.

Table B.1 — Descriptive elements of the DOI Kernel Metadata Declaration

Kernel element(s)	Description
DOI name	Specific DOI name allocated to the identified referent.
referentIdentifier(s)[a]	Other identifier(s) referencing the same referent (e.g. ISAN[5][6], ISBN[1], ISRC[3], ISSN[2], ISNI[10]).
referentName(s)	Name(s) by which the referent is usually known (e.g. *title*).
primaryReferentType	The primary type of the referent (e.g. *creation, party, event*). This is an open list; new primaryReferentTypes may be registered.
structuralType	The primary structuralType of a referent. For *creations*, there are four mutually exclusive structuralTypes (*physical, digital, performance, abstraction*) that allow classification according to overall form. Where structuralTypes may be contained within one another, the referent's structuralType is defined by the overall form. Thus, a CD (*physical*) may contain files (*digital*) which contain recordings of performances of songs (*abstractions*). Elements of content can be further classified, if necessary, under referentType. For *parties* there are three mutually exclusive structuralTypes (*person, animal, organization*).
mode(s)	For *creations* only, the principal sensory mode(s) by which a referent is intended to be perceived (*audio, visual, tangible, olfactory, tasteable, none*). Mode identifies only the principal intended modes of perception; most physical resources are perceivable with all five senses, but some of these perceptions may be trivial. For example, a printed book may be touched or smelled, but these are supplementary or incidental to *visual* mode, the intended function as a content carrier. For a Braille book, however, *tangible* would be a principal mode.

[a] This shall be included separately even if incorporated into a DOI name as the suffix (see A.2).

Table B.1 *(continued)*

Kernel element(s)	Description
character(s)	For *creations* only, a fundamental form of communication in which the content of a referent is expressed. There are four values: *music, language, image, other*.
referentType	Specification of type(s) of referent (e.g. for creations: audio file, scientific journal, musical composition, dataset, serial article, eBook, PDF; for parties: author, composer, book publisher, library, university, financial institution, film studio). For creations, the abstract nature of the content of a referent, irrespective of its structuralType, is typically described by referentType; for parties, referentType is a role with which the party is associated. referentType may be extended as needed (e.g. for creations, to include format and genre elements, such as "medical journal article pdf"). This is an open list; new referentTypes may be registered.
principalAgent(s), agentRole(s)	For *creations* only, the entity or entities principally responsible for the creation or publication of the referent, with specification of the agent's role(s).
[a] This shall be included separately even if incorporated into a DOI name as the suffix (see A.2).	

Table B.2 shows the basic administrative elements in a DOI Kernel Metadata Declaration. These elements relate to the issuance of the DOI name and to the registration record itself.

Table B.2 — Administrative elements of the DOI Kernel Metadata Declaration

Kernel element	Description
registrationAuthority Code	Code assigned to denote the name of an entity authorized by the ISO 26324 Registration Authority to assist a registrant in issuing this DOI name. This is not the registrant code (3.14).
issueDate	Date when this DOI name was issued.
issueNumber	Number or other designation associated with the specific version of the DOI Kernel Metadata Declaration

For other elements and sub-elements beyond the DOI Kernel Metadata Declaration, values as needed may be developed. Such value sets shall be registered in the data dictionary under the responsibility of the ISO 26324 Registration Authority in order to facilitate the integration of DOI data from different sources by a common application.

Annex C
(normative)

Administration of the DOI system

C.1 General

The DOI system shall be administered by the ISO 26324 Registration Authority[2)] in accordance with the specifications outlined in C.2.

C.2 ISO 26324 Registration Authority

The ISO 26324 Registration Authority shall provide the following services.

a) Promote, coordinate and supervise the DOI system in accordance with the specifications of this document.

b) Supply technology and infrastructure for resolution, metadata and registration functionality according to the specifications of this document and ensure that any changes in selected technology will be compatible with earlier DOI applications.

c) Allocate unique DOI prefixes to registrants and maintain an accurate register of the DOI prefixes that have been assigned, ensuring so far as possible uniqueness with respect to other identification schemes with a similar syntax.

d) Secure the maintenance of DOI names and associated DOI resolution records through the maintenance of a single logical directory of all registered DOI names, the DOI directory.

e) Enable the registration and mapping of DOI metadata through the maintenance of, or agreed use of, an appropriate data dictionary.

f) Implement policies and procedures governing the process of DOI registration, including rules to aid persistence of DOI names and interoperability within networks of DOI users.

g) Develop, maintain and make available documentation for users of the DOI system, including the provision of a User Manual for registrants which shall specify implementation details in conformance with this document.

h) Review relevant technology developments and maintain current information on appropriate syntax character encoding, resolution software implementations, etc.

i) Where multiple DOI names are assigned to the same referent, e.g. through assignment of DOI names by two different registrants, provide a unifying record for that referent.

C.3 Conditions for registration

The ISO 26324 Registration Authority shall ensure that each registrant conforms with the following conditions.

a) The DOI suffix assigned within their DOI prefix is unique, thereby ensuring that each DOI name is unique within the DOI system.

2) ISO maintains an online list of maintenance agencies and registration authorities relevant to their standards at https://www.iso.org/maintenance_agencies.html. Users are encouraged to consult this webpage for the most up-to-date information concerning maintenance agencies and registration authorities.

b) Each referent registered is assigned only one DOI name. Where multiple DOI names are inadvertently assigned to the same referent, provide a unifying record for that referent.

c) Each DOI name assigned is registered with the required DOI Kernel Metadata Declaration (see Annex B) in the DOI resolution system, following the specifications established by the ISO 26324 Registration Authority and any further rules established for its internal management.

C.4 Technical duties of ISO 26324 Registration Authority

The ISO 26324 Registration Authority shall provide the following technical services by means of a User Manual.

a) Maintain a list of approved proxy servers (such as https://doi.org/) that resolve DOI names in web browsers.

b) Provide current information on appropriate encoding of characters (see also 4.2).

c) Provide current information on resolution technology (see also Clause 6).

d) Maintain a list of representations used in other schemes (see also 4.2).

e) Provide information on common encodings (see also 4.2).

f) Specify, if required, more constrained rules for the assignment of DOI names to objects for services which make use of the DOI system. Where specified, these rules shall be compatible with the overall DOI system specification and shall not form part of this document (see also 5.3).

g) Publish rules to aid persistence of identification (e.g. requirements for maintenance of records, default resolution services).

h) Publish the DOI Kernel Metadata Declaration that specifies the DOI kernel metadata elements for each DOI name.

i) Provide output metadata to support the services of the DOI system.

j) Establish format and schema specifications for input and service metadata declarations.

k) Provide a data dictionary as the repository for all data elements and allowed values (the items which may be used as values of each element) used in DOI metadata specifications (see also Annex B).

l) Provide the data dictionary mappings of other relevant schemes, as determined by the ISO 26324 Registration Authority (such as ISO codes for territories, currencies and languages).

m) Specify a set of allowed values of each kernel element (see also Annex B).

n) Specify an XML schema of the DOI Kernel Metadata Declaration (see also Annex B).

o) Register sets of other metadata elements and sub-elements as needed (see also Annex B).

p) Prevent duplication of a DOI name once registered.

C.5 Delegation to DOI Registration Agencies

The ISO 26324 Registration Authority may delegate certain tasks and services listed in C.2 to registration agencies. Potential registrants are advised to consult the website of the ISO 26324 Registration Authority to find information concerning the most appropriate registration agency to contact and the tasks and services it has been delegated with.

Annex D
(informative)

Transition from ISO 26324:2012 to ISO 26324:2022

D.1 General

Existing registrants will not be affected by the changes introduced in this revision of this document. The requirement in C.2 c) has not been revised and has always required registrants to be informed of the allocation of the full prefix and before this revision, the assignment will already have included the "10" directory indicator.

Future registrants can in principle be allocated any prefix at the discretion of the ISO 26324 Registration Authority which will, under C.2 c) maintain a list of valid prefixes so that users can determine whether a code is a DOI name or not. In doing this, the registration authority ensures that the prefix is unique and functional within the resolution system operated under C.2 b). Information about this resolution system is published in the DOI Handbook.

D.2 Incorporation of existing systems of identification

Where an existing system has a syntax compatible with this edition of this document, and the operator of the system has had the prefix element of this syntax allocated by the ISO 26324 Registration Authority as a DOI prefix, existing and future codes using that existing syntax become DOI names.

Where the syntax of the existing system includes a prefix with two or more elements, the first becomes the directory indicator and the others become the registrant code.

EXAMPLE 1 an identification system using Handles[15] has the prefix *20.9999* which is allocated as a DOI prefix to that system.

Codes assigned with this prefix such as *20.9999/abcdefg* are then DOI names.

Where the syntax of the existing system includes a prefix with a single element, that becomes the directory indicator and there is no registrant code.

EXAMPLE 2 an identification system using Handles has the (single level) prefix *15434* which is allocated as a DOI prefix to that system.

Codes assigned with this prefix such as *15434/abcdefg* are then DOI names.

D.3 Identifiers outside the DOI system

Where the registrant of an identifier has not been allocated a prefix by the ISO 26324 Registration Authority as a registrant in the DOI system, the codes it assigns are not DOI names, even if they look like other DOI names.

EXAMPLE An independent identification system using Handles assigned under the authority of CNRI has not become a registrant by applying to the ISO 26324 Registration Authority. It has the prefix within the Handle system: *20.9999*

Codes with this prefix such as *20.9999/abcdefg* are *not* then DOI names.

D.4 Character set issues

A DOI Name is case insensitive (see 4.1.1) and where an existing system is case sensitive, the arrangements made to ensure that, following the allocation of its prefix element as a DOI prefix, no ambiguity arises will be published by the ISO 26324 Registration Authority.

Bibliography

[1] ISO 2108, *Information and documentation — International Standard Book Number (ISBN)*

[2] ISO 3297, *Information and documentation — International standard serial number (ISSN)*

[3] ISO 3901, *Information and documentation — International Standard Recording Code (ISRC)*

[4] ISO 10957, *Information and documentation — International standard music number (ISMN)*

[5] ISO 15706-1, *Information and documentation — International Standard Audiovisual Number (ISAN) — Part 1: Audiovisual work identifier*

[6] ISO 15706-2, *Information and documentation — International Standard Audiovisual Number (ISAN) — Part 2: Version identifier*

[7] ISO 15707, *Information and documentation — International Standard Musical Work Code (ISWC)*

[8] ISO/IEC 10646:2011, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

[9] ISO/IEC 21000-6, *Information technology — Multimedia framework (MPEG-21) — Part 6: Rights Data Dictionary*

[10] ISO 27729, *Information and documentation — International standard name identifier (ISNI)*

[11] ISO 27730, *Information and documentation — International standard collection identifier (ISCI)*

[12] The DOI Foundation. *The DOI Handbook*. doi:10.1000/186. Available at: http://www.doi.org/hb.html

[13] Internet Engineering Task Force. RFC 3986, *Uniform Resource Identifiers (URI): Generic Syntax*. January 2005. Available at: https://www.ietf.org/rfc/rfc3986.txt

[14] Paskin N. Identifier Interoperability: A Report on Two Recent ISO Activities. *D-Lib Magazine*, April 2006, **12** (4). ISSN 1082-9873. doi:10.1045/april2006-paskin. Available at: http://www.dlib.org/dlib/april06/paskin/04paskin.html

[15] Internet Engineering Task Force. RFC 3650, *Handle System Overview.* Available at: https://www.ietf.org/rfc/rfc3650.txt

ICS 01.140.20

Price based on 18 pages