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Using International Standard Book Numbers as Uniform Resource Names
draft-ietf-urnbis-rfc3187bis-isbn-urn-00

Abstract

The International Standard Book Number, ISBN, is a widely used identifier for monographic publications. Since 2001, there has been a URN (Uniform Resource Names) namespace for ISBNs. The namespace registration was performed in RFC 3187 and applies to the ISBN as specified in the original ISO Standard 2108-1992. To allow for further growth in use, the successor ISO Standard, ISO 2108-2005, has defined an expanded format for the ISBN, known as "ISBN-13". This document defines how both the old and new ISBN standard can be supported within the URN framework and the syntax for URNs defined in RFC 2141[bis]. An updated namespace registration is included, which describes how both the old and the new ISBN format can share the same namespace.

This document replaces RFC 3187; it also obsoletes and moves to Historic status the predecessor thereof, RFC 2288.

Discussion

Comments are welcome and should be directed to the urn@ietf.org mailing list or the authors.

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1. Introduction

One of the basic permanent URI schemes (cf. RFC 3986 [RFC3986], [IANA-URI]) is 'URN' (Uniform Resource Name) as originally defined in RFC 2141 [RFC2141] and now being formally specified in RFC 2141bis [I-D.ietf-urnbis-rfc2141bis-urn]. Any identifier, when used within the URN system, needs its own namespace. As of this writing, there are roughly 40 registered URN namespaces (see [IANA-URN]), one of which belongs to ISBN, International Standard Book Number, as specified 2001 in RFC 3187 [RFC3187].

Since 2007, there have been two variants of ISBN in use; an outdated one based on ISO 2108-1992 [ISO1] and a new one defined in ISO 2108-2005 [ISO2]. These versions shall subsequently be called "ISBN-10" and "ISBN-13", respectively, in this document. For the time being, both ISBNs may still be printed on a book, but the ISBN-13 is the actual identifier. If what is said in this document applies to both ISBN versions, the generic term "ISBN" is used.

As part of the validation process for the development of URNs, the IETF URN working group agreed that it is important to demonstrate that a URN syntax proposal can accommodate existing identifiers from well established namespaces. One such infrastructure for assigning and managing names comes from the bibliographic community. Bibliographic identifiers function as names for objects that exist both in print and, increasingly, in electronic formats. RFC 2288 [RFC2288] investigated the feasibility of using three identifiers (ISBN, ISSN and SICI, see below) as URNs, with positive results; however, it did not formally register corresponding URN namespaces. This was in part due to the still evolving process to formalize criteria for namespace definition documents and registration, consolidated later in the IETF into RFC 3406 [RFC3406]. That RFC, in turn, is now being updated as well into RFC 3406bis [I-D.ietf-urnbis-rfc3406bis-urn-ns-reg].

URN Namespaces have subsequently been registered for both ISBN (International Standard Book Number) and ISSN (International Serial Standard Number) in RFCs 3187 [RFC3187] and 3044 [RFC3044], respectively, but not for SICI (Serial Item and Contribution Identifier), due to both the identifier's limited popularity and its complicated URN resolution process.

Guidelines for using ISBN-10s (based on ISO 2108-1992) as URNs and the original namespace registration have been published in RFC 3187 [RFC3187]. The RFC at hand replaces RFC 3187; sections related to ISBN-13 have been added, all ISBN-10 information has been updated and the namespace registration revised to make it compliant with both ISBN versions and stipulations of RFC 3406bis

[I-D.ietf-urnbis-rfc3406bis-urn-ns-reg], the work-in-progress successor of RFC 3406 [RFC3406], which in turn had replaced the legacy RFC 2611 [RFC2611] applied in the initial registration.

2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

"ISBN-10" refers to the original, 10-digit ISBN scheme specified in ISO 2108-1992 [ISO1].

"ISBN-13" refers to the current, 13-digit ISBN scheme specified in ISO 2108-2005 [ISO2].

3. Fundamental Namespace and Community Considerations

3.1. The URN:ISBN Namespace

ISBN is a well established standard identifier system for monographic publications. Therefore, any useful and deployable method to identify these entities for network-wide reference and make their metadata available on the Internet needs to be based on that system.

Section 4 below, and there in particular Section 4.1, presents a detailed overview of the history and the structure of the ISBN namespace, related institutions, and the identifier assignment principles used, and Section 4.3 gives an overview of existing and emerging resolution systems for the URN:ISBN namespace.

3.2. Community Considerations for ISBNs

ISBNs are assigned under the auspices of the International ISBN Agency [ISBNORG].

ISBNs identify finite objects, but sometimes these objects might be so large that resolution into a hierarchical system is appropriate. The materials identified by an ISBN may exist only in printed or other physical form, not electronically. In such a case, the URN: ISBN resolver should nevertheless be able to supply bibliographic data, possibly including information about where the physical resource is stored in the owning institution's holdings. There may be other resolution services supplying a wide variety of information resources or services related to the identified books.

National libraries and large publishers are the key organizations providing persistent URN resolution services for resources identified with ISBNs, independent of their form.

For library users and Internet-based supply chain management for the delivery of monographic work, URN-based identification and resolution services offer more efficient, uniform, and reliable access to resources in general. No special tools are needed for this; Web browsers are sufficient.

Section 4 below, and in particular Section 4.3 therein, presents a detailed overview of the application of the URN:ISBN namespace and the principles, and systems used, for the resolution of ISBN-based URNs.

4. International Standard Book Numbers

4.1. Overview / Namespace Considerations

An International Standard Book Number (ISBN) identifies a product form or edition of a monographic publication.

4.1.1. ISBN-10 Structure

The ISBN-10 is defined by the ISO Standard 2108-1992 [ISO1]. It is a ten-digit number (the last "digit"can be the letter "X" as well) that is divided into four variable length parts usually separated by hyphens when printed. The parts are as follows (in this order):

- a group identifier that specifies a group of publishers, based on national, geographic, or some other criteria;

- the publisher identifier;

- the title identifier; and

- a modulo 11 check digit, using X instead of 10; the details of the calculation are specified in [ISO1].

ISBN-10 was in use from 1970s until ISBN-13 replaced it in January 2007.

4.1.2. ISBN-13 Structure

ISBN-13 is defined by the ISO Standard 2108-2005 [ISO2]. The ISBN-13 is a thirteen-digit number that is divided into five parts usually separated by hyphens when printed. The first and the last part have a fixed lenght, but the other parts have variable length. These parts are as follows (in this order):

- o a prefix element of ISBN-13 is a 3 digit prefix specified by the International ISBN Agency; at the time of this writing, legal values were 978 and 979; future versions of the standard may define additional values;

- o a registration group element that specifies the registration group; it identifies the national, geographic, language, or other such grouping within which one or more ISBN Agencies operate;

- o the registrant element;

- o the publication element; and

- o a modulo 10 check digit; the details of the calculation are specified in [ISO2].

4.1.3. Relation between ISBN-10 and ISBN-13

The structural differences between the ISBN-10 and ISBN-13 are the prefix element (which did not exist in the old ISBN) and the check digit calculation algorithm, which was modulo 11 in ISBN-10 and is now modulo 10.

Terminology in ISBN-10 differs substantially from the terminology applied in ISBN-13. In this document, ISBN-13 terminology shall be used from now on; for a reader used to ISBN-10 terminology, the following mapping may be useful:

- o ISBN-10 group identifier <-> ISBN-13 registration group element;

- o ISBN-10 publisher identifier <-> ISBN-13 registrant element;

- o ISBN-10 title identifier <-> ISBN-13 publication element.

Any ISBN-10 can be converted to ISBN-13 form, and retrospective conversion is indeed a recommended practice in ISO 2108-2005. Any application that processes ISBN-based URNs should however be prepared to deal with both ISBNs, since ISBN-10 numbers may not be converted to the new form. ISBN-13s using prefix element 979 can not be converted back to ISBN-10, since in these ISBNs group identifiers will be re-assigned. New books may still have ISBN-10 alongside ISBN-13 for practical reasons, but only as long as the prefix element in ISBN-13 is 978.

4.2. Encoding Considerations

Embedding ISBNs within the URN framework does not present encoding problems, since all of the characters that can appear in an ISBN are

valid in the namespace-specific string (NSS) part of the URN. %-encoding, as described in RFC 2141 [RFC2141] and RFC 2141bis [I-D.ietf-urnbis-rfc2141bis-urn], is never needed.

Example 1: URN:ISBN:978-0-395-36341-6

Example 2: URN:ISBN:951-0-18435-7

Example 3: URN:ISBN:951-20-6541-X

4.3. Resolution of ISBN-based URNs

4.3.1. General

For URN resolution purposes, all elements except the check digit (now 0-9, previously 0-9 or X) must be taken into account. The registration group and registrant element assignments are managed in such a way that the hyphens are not needed to parse the ISBN unambiguously into its constituent parts. However, the ISBN is normally transmitted and displayed with hyphens to make it easy for humans to recognize these elements without having to make reference to or have knowledge of the number assignments for registration group and registrant elements. In ISBN-10, registration group element codes such as 91 for Sweden were unique. In ISBN-13, only the combination of prefix and registration group elements is guaranteed to be unique. 978-951 and 978-952 both mean Finland, but 979-951 and 979-952 almost certainly will not (once they will be assigned in the future); at the time of this writing, registration group element(s) for Finland are not yet known for ISBNs starting with 979.

The Finnish URN registry is maintained by the national library. The service is capable of resolving ISBN-based URNs. URNs starting with URN:ISBN:978-951 or URN:ISBN:978-952 are mapped into appropriate URL addresses in a table maintained within the registry. Applications, such as the national bibliography or the open archive of a university, can use the URN as the address of the resource. There is just one place (the registry) where the location information must be kept up to date.

ISBN-13 prefix / registration group element combinations (and the corresponding ISBN-10 registration group identifiers, if any) usually designate a country, but occasionally a single combination / ISBN-10 group identifier is used to indicate a language area. For instance, "978-3" (or "3" in ISBN-10) is utilised in Germany, Austria, and the German speaking parts of Switzerland. As of this writing, there are two regional registration groups: "978-976" is used in the Caribbean community and "978-982" in the South Pacific (see [PREFIX]).

Note that the prefix and registration group element combination "979-3" has not yet been assigned. There is no intention to allocate the registration group elements in the same way as was done with ISBN-10.

The registrant element may or may not be used for resolution purposes, depending on whether individual publishers have set up their resolution services.

The publication element shall enable targeting the individual publication.

4.3.2. Practical Aspects

Due to the lack of URN support in, e.g., web browsers, the URNs are usually expressed as URLs when embedded in documents. The Finnish URN registry is located at <http://urn.fi/>, and URNs are therefore expressed in the form http://urn.fi/<URN>. For example, the URI <http://urn.fi/URN:ISBN:978-952-10-3937-9> identifies Sami Nurmi's doctoral dissertation "Aspects of Inflationary Models at Low Energy Scales".

The Finnish URN registry can not resolve URN:ISBNs with non-Finnish registration group element values until other countries establish their registries, and all these services become aware of each other and their respective registration group responsibility domains and are able to communicate with each other. Thus the Finnish registry can deal with URN:ISBN instances with registration group element value 91 (indicating Sweden) if and only if the Swedish registry exists, its address is known to the Finnish peer and the Swedish service is capable of receiving and processing requests from other registries.

If a registration group element does not identify a single country but a language area, there are at least two means for locating the correct national bibliography. First, it is possible to define a cascade of URN registries - for instance, German, Austrian and Swiss national registries, in this order - which should collectively be aware of resolution services such as national bibliographies for ISBN-13s starting with "978-3". If the German registry is not able to find an authoritative resolution service, the request could be passed to the Austrian one, and if there are still no hits, finally to the Swiss service.

Second, the registrant element ranges assigned to the publishers in Germany, Austria and Switzerland by the ISBN Agencies could be defined directly into the national registries. This method would be more efficient than cascading, since the correct resolution service

would be known immediately. The choice between these two and possible other options should be made when the establishment of the European network of URN registries reaches this level of maturity.

In some exceptional cases -- notably in the US and in the UK, where international companies do a significant portion of publishing -- the information provided by the group identifier may not always be fully reliable. For instance, some monographs published in New York by international publishing companies may get an ISBN with the registration group element "3". This is technically appropriate when the headquarters or one of the offices of the publisher is located in Germany.

Information about such a book may not always be available in the German national bibliography, but via the Library of Congress systems. Unfortunately, the German/Austrian/Swiss URN registries that should in this case be contacted may not be aware of the appropriate resolution service.

However, the problem posed by the international publishers may well be less severe than it looks. Some international publishers (Springer, for example) give the whole production to the national library of their home country as legal deposit, no matter which country the book was published. Thus everything published by Springer in New York with registration group element "3" should be resolvable via the German national bibliography. On the other hand, when these companies give their home base also as a place of publication, the "home" national library requires the legal deposit.

A large union catalogue, such as WorldCat maintained by OCLC [OCLC-WC] could be used to complement the resolution services provided in the national level, or as the default service, if no national services exist or are known to the registry from which the query originates.

Due to the semantic structure of ISBN-13, even the registrant element can be used as a "hint". Technically, it is possible to establish a number of URN resolution services maintained by different kinds of organizations. For instance, "978-951-0" is the unique ISBN registrant element of the largest publisher in Finland, Sanoma-WSOY. Resolution requests for ISBNs starting with "978-951-0" can be passed to and dealt with the publisher's server, if and when it is made URN-aware. In such a case, resolving the same URN in multiple locations may provide different services; the national bibliography may be able to provide bibliographic information only, while the publisher can also provide the book itself, on its own terms. Different resolution services may co-exist and complement one another. Same ISBN may be resolved both as URN and as a Digital Object Identifier (DOI)

[DOIHOME]. URN-based services hosted by, e.g., a national library, might provide only bibliographic data, whereas a service based on the DOI system provided by the publisher might deliver the book, parts of the book or various services related to the work.

Persistence of resolution services is largely dependent on persistence of organizations providing them. Thus some services, independent on base technology chosen, may disappear or their content may change much sooner than some peer solutions.

4.4. Additional Considerations

The basic guidelines for assigning ISBNs to electronic resources are the following:

- o Format/means of delivery is irrelevant to the decision whether a product needs an ISBN or not. If the content meets the requirement, it gets an ISBN, no matter what the format of the delivery system.

- o Each format of a digital publication should have a separate ISBN. The definition of a new edition is normally based on one of the two criteria:

  - * A change in the kind of packaging involved: the hard cover edition, the paperback edition and the library-binding edition would each get a separate ISBN. The same applies to different formats of digital files.

  - * A change in the text, excluding packaging or minor changes such as correcting a spelling error. Again, this criterion applies regardless of whether the publication is in printed or in digital form.

Although these rules seem clear, their interpretation may vary. As already RFC 2288 [RFC2288] pointed out,

> The choice of whether to assign a new ISBN or to reuse an existing one when publishing a revised printing of an existing edition of a work or even a revised edition of a work is somewhat subjective. Practice varies from publisher to publisher (indeed, the distinction between a revised printing and a new edition is itself somewhat subjective). The use of ISBNs within the URN framework simply reflects these existing practices. Note that it is likely that an ISBN URN may resolve to many instances of the work (many URLs).

These instances may be fully identical, or there may be some minor differences between them. Publishers have also in some occasions re-used the same ISBN for another book. This reasonably rare kind of human error does not threaten or undermine the value of the ISBN system as a whole. Neither do they pose a serious threat to the URN resolution service based on ISBNs. An error should only lead into the retrieval of two or more bibliographic records describing two different monographic publications. Based on the information in the records, a user can choose the correct record from the result set.

Most national bibliographies and especially the Books in Print correct ISBN mistakes. The systems then provide cross references "incorrect ISBN -> correct ISBN"). This should be taken into account in the URN resolution process. Further details on the process of assigning ISBNs can be found in section 5 (Namespace registration) below.

5. URN Namespace Registration and Use

The formal URN Namespace Identifier Registration for the pre-2005 version of the International Standard Book Number (ISBN) was done in RFC 3187 [RFC3187].

The new ISBN standard does not require a new namespace, but the registration is renewed here, as the registrant organization has moved from Staatsbibliothek zu Berlin - Preussischer Kulturbesitz to The International ISBN Agency, London, U.K, and the syntax and resolution details are amended.

5.1. URN Namespace ID Registration for the International Standard Book Number (ISBN)

This registration describes how International Standard Book Numbers (ISBN) can be supported within the URN framework.

[RFC Editor: please replace "XXXX" in all instances of "RFC XXXX" below by the RFC number assigned to this document.]

Namespace ID: ISBN

This Namespace ID has already been assigned to the International Standard Book Number in January 2001 when the namespace was registered for the first time.

Registration Information:

Version: 2
Date: 2010-12-17

Declared registrant of the namespace:

Registering Organization: The International ISBN Agency

Designated Contact Person:
Name: Mr. Brian Green
Affiliation: Director, The International ISBN Agency
Email: brian@isbn-international.org
Postal: EDItEUR, 39-41 North Road, London, N7 9DP, U.K.
Web URL: <http://www.isbn-international.org/>

Declaration of syntactic structure of NSS part:

The namspace-specific string of 'ISBN' URNs is either an ISBN-13 (see Section 4.1.2 of RFC XXXX) or an ISBN-10 (see Section 4.1.1 of RFC XXXX); the former is preferred.

Example 1: URN:ISBN:978-0-395-36341-6
Example 2: URN:ISBN:951-0-18435-7
Example 3: URN:ISBN:951-20-6541-X

Relevant ancillary documentation:

The ISBN (International Standard Book Number) is a unique machine-readable identification number, which marks any edition of a book unambiguously. This number is defined in ISO Standard 2108. The number has been in use now for 30 years and has revolutionised the international book-trade. 170 countries and territories are officially ISBN members, and more of them are joining the system.

The administration of the ISBN system is carried out on three levels:
International agency,
Group agencies,
Publisher levels.

The International ISBN agency is located in London. The main functions of the Agency are:

* To promote, co-ordinate and supervise the world-wide use of the ISBN system.

* To approve the definition and structure of group agencies.

* To allocate group identifiers to group agencies.

* To advise on the establishment and functioning of group agencies.

* To advise group agencies on the allocation of international publisher identifiers.

* To publish the assigned group numbers and publisher prefixes in up-to-date form.

Information about ISBN usage in general can be found from the ISBN FAQ, available at <http://www.isbn-international.org/en/faqs>.

Conformance with URN Syntax:

Legal ISBN characters are 0-9 and hyphen for ISBN-13 and 0-9, hyphen, and X for ISBN-10. No percent-encoding is needed.

[[Editorial Note: Need to discuss new specification requirements from the RFC 2141bis draft!]]

Rules for Lexical Equivalence of NSS part:

ISBN numbers are usually printed with the letters 'ISBN' and a single blank preceding them (for instance: ISBN 951-746-795-8). The data preceding the actual number must be removed before the ISBNs are analysed. The ISBN serves directly as the namespace-specific string (NSS) of 'ISBN' URNs.

Prior to comparing the NSS of two ISBN-based URNs for equivalence, all hyphens MUST be removed and letter 'X' capitalized. Prior to comparing a URN based on ISBN-10 with a URN based on ISBN-13, the ISBN-10 MUST be converted to the ISBN-13 form. This step is necessary since the ISBN-10s may or may not be already converted to the new form; libraries SHOULD keep the old ISBN since it is the one printed in books published prior to 2007, while publishers may convert the old identifiers originally assigned in ISBN-10 form and use the equivalent ISBN-13s in unchanged reprints of the books, which according to the ISBN assignment rules should not receive a new ISBN.

Note that, according to RFC 2141bis, the prefix "URN:ISBN:" is case-insensitive; generic URI parsing and comparison software frequently uses lower case as the canonical (normalized) form.

The URNs are equivalent if the normalized forms obtained this way compare equal.

Identifier uniqueness and persistence considerations:

ISBN is a unique and persistent identifier. An ISBN, once it has been assigned, must never be re-used for another book. Moreover,

a single manifestation of a book must never get a new ISBN. 'ISBN' URNs inherit the uniqueness and persistence properties from the underlying ISBN namespace.

There may be multiple manifestations of a single literary work such as a novel. In such case each manifestation shall receive a different ISBN. ISO has developed a new standard, ISTC (International Standard Text Code, ISO 21047-2009) that enables identification of textual works. See <http://www.istc-international.org/> for more information. In the standard itself, annex E describes the relations between ISBN and other publication identifiers and ISTC.

Process of identifier assignment:

Assignment of ISBNs is controlled, and 'ISBN' URNs immediately inherit this property. There are three levels of control: the international agency, group agencies that typically operate in the national level, and finally each publisher is responsible of using the ISBN system correctly. Small publishers may demand ISBN numbers one at a time by contacting the ISBN group agency. Large publishers receive ISBN blocks from which they allocate ISBNs to the books according to the ISBN assignment rules.

Process for identifier resolution:

See Section 4.3 of RFC XXXX.

Validation mechanism:

The check digit helps to assure the correctness of an ISBN number assigned for a book when it has been entered or processed by a human. Applications processing bibliographic data such as integrated library systems typically can check the correctness of both ISBN-10 and ISBN-13 (and make conversions between the two). If the number is wrong due to, e.g., a typing error made by a publisher, a correct ISBN is usually assigned afterwards. Although the book will only contain the wrong number, national bibliography and system used by the book trade often will contain both the wrong and new, correct ISBN number.

Scope:

ISBN is a global identifier system used for identification of monographic publications. It is very widely used and supported by the publishing industry.

6. Security Considerations

This document proposes means of encoding ISBNs within the URN framework. An ISBN-based URN resolution service is depicted here both for ISBN-10 and ISBN-13, but only in a fairly generic level; thus questions of secure or authenticated resolution mechanisms are excluded. It does not deal with means of validating the integrity or authenticating the source or provenance of URNs that contain ISBNs. Issues regarding intellectual property rights associated with objects identified by the ISBNs are also beyond the scope of this document, as are questions about rights to the databases that might be used to construct resolvers.

7. IANA Considerations

IANA is asked to update the existing registration of the Formal URN Namespace 'ISBN' using the template given above in Section 5.1, which follows the outline specified in RFC 3406bis [I-D.ietf-urnbis-rfc3406bis-urn-ns-reg].

8. Acknowledgements

This draft version is the outcome of work started in 2008 and brought to the IETF in 2010 to launch a much larger effort to revise the basic URN RFCs as a part of project PersID (http://www.persid.org). PersID is developing tools for establishing an European network of URN resolvers concentrating on bibliographic identifiers. The aim in the IETF is to bring these RFCs in alignment with the current URI Standard (STD 63, RFC 3986), ABNF, and IANA guidelines. The discussion in PersID has contributed significantly to this work.

Leslie Daigle has provided valuable guidance in the initial draft stage of this memo.

Your name could go here ...

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[ISBNORG] International ISBN Agency, "", <http://www.isbn-international.org/>.

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[RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, RFC 3986, January 2005.

Appendix A. Draft Change Log

[[RFC-Editor: Whole section to be deleted before RFC publication.]]

A.1. draft-hakala-rfc3187bis-isbn-urn-00 to draft-ietf-urnbis-*-00

- formal updates for a WG draft;
- RFC 2288 now obsoleted and made Historic;
- added references to rfc2141bis and rfc3406bis;
- Sect.3 reorganized and amended: Namespace/Community Considerations;
- registrartion template adapted to rfc3406bis [-00];
- numerous editorial fixes and improvements.

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