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Using The ISSN (International Serial Standard Number) as  
URN (Uniform Resource Names) within an ISSN-URN Namespace

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#### Abstract

This document presents how the ISSN - International Standard Serial Number - which is a persistent number for unique identification of serials widely recognised and used in the bibliographic world, can be supported within the Uniform Resource Name (URN) framework as a specific URN namespace identifier.

An ISSN URN resolution system using the ISSN identifier as Uniform resource Name within an ISN URN Namespace has been developed by the ISSN International Centre (ISSN-IC) and is operating as a demonstrator to evaluate all requirements to deploy it in an operational environment.

This proceeds from concepts and proposals developed in several IETF RFCs emphasising the way to implement and to use "recognised" existing numbering system within the URN framework (RFC 2248, RFC 2141, RFC 2611).

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## 1. Introduction

The ISSN International Centre has undertaken in 1999-2000 an URN implementation taking advantage of the functional compatibility between the ISSN and the URN.

The present implementation at the ISSN-IC Centre based on IETF RFCs on URN includes a centralised resolution system which allows direct access to electronic resources by using the ISSN identifiers as Uniform Resource Names within an ISSN URN Namespace.

It demonstrates that the URN can integrate existing identifiers from well established identification schemes used by the bibliographic community.

Nevertheless, to deploy this demonstrator into a wider operational system a responsible body or infrastructure is needed to assign namespaces and manage an RDS/NAPTR global resolution framework. It is intended here that serials refer to all forms of serials published in printed form as well as in form of electronic resources. Since this document contains a Registration form for an ISSN URN Namespace, this form also includes some paragraphs already present in other parts of this document.

All figures and descriptions are dated 13 July 2000.

## 2. The ISSN system

The ISSN system results from a joint UNESCO and ICSU-AB working group on bibliographic descriptions set up in 1967 in order to establish a world registry of serial titles currently issued, stored or archived.

Today, the ISSN system which is defined by an International standard (ISO 3297), relies on two main data elements:

The International Standard Serial Number which is a unique identifier for a specific serial publication.

The key-title, which is a unique name assigned to a serial, and is inseparably linked with its ISSN.

And on a well established framework: the ISSN International network.

### 2.1 The ISSN code

The ISSN - International Standard Serials Number is defined in the ISO standard 3297:1998 as a code for the unique identification of serials.

This standard states that:

Each ISSN is a unique identifier for a specific serial publication. ISSN are applicable to the entire population of serials, whether past, present or to be published in the foreseeable future, whatever the medium of publication.

Serials include periodicals, newspapers, annuals (such as reports, yearbooks, directories, etc.), and the journals, series, memoirs, proceedings, transactions, etc., of societies.

Today, ISSN are assigned to data bases and electronic serial resources. Further broadening of the scope to continuing resources is under discussion.

### 2.2 Construction of ISSN

The ISO 3297 standard states that:

An ISSN consists of eight digits in arabic numerals 0 to 9, except the last digit which is a check digit and can be sometimes an X. The ISSN has no internal meaningful elements to identify language, country, publisher [or medium.]

The check digit is always located in the extreme right position and is calculated on a modulus 11 basis with weights 8 to 2, using X in lieu of 10 where 10 would occur as a check digit.

Each ISSN is inseparably linked a "the key title". The Key title is a form of the title which is constructed in order to avoid duplicates so that each key title is unique in the ISSN Data base also named the ISSN Register. ISSN and key titles are equivalent, they both identify without ambiguity a same serial.

When printed or displayed the ISSN is preceded by the ISSN prefix and a space, and shall appear as two groups of four digits separated by a hyphen.

examples ISSN 0000-0019 ISSN 1560-1560

ISSN are constructed and distributed by the ISSN International Centre to National Centres for assignment.

### 2.3 The ISSN Bibliographic record

It contains in addition to the ISSN and key-title some thirty bibliographic data elements enabling the unambiguous and secure identification of a serial.

One characteristic of an ISSN bibliographic record is that it contains other ISSN in linking fields in order to establish relationships between the given serial and a set of other related serials already identified.

To recognise and to allow access to serial resources in digital form, the ISSN format has included additional data elements:

- A medium code which indicates the medium of the given serial
- A linking field to express relations between the different forms of "equivalent" serials on different media (from printed version to online as well as from online to printed)
- The location of an electronic resource: the URLs of a given resource.

### 2.4 The ISSN network

It is the operational structure, main functions of which are:

- collecting the material which needs to be identified
- assigning the ISSN and the key title to a serial for unambiguous identification
- creating and editing bibliographic records in ISSN format

- making available the bibliographic records

It consists of:

- National Centres - 69 centres - responsible for the identification of serials published in their respective countries. Records created by National Centres are transmitted to the ISSN-IC for validation and update of the ISSN Register.
- The International Centre which co-ordinates the network and acts as a National Centre for serials published by International institutions and by countries with no National Centre. It collects and checks all bibliographic records to update in a consistent way the ISSN Register.

It maintains the ISSN Register and makes it available.

## 2.5 The ISSN Register

It is a data base controlled and maintained by the ISSN-IC. It consists in 970 000 bibliographic records stored in ISSN-MARC format (a subset of USMARC format ) which are available on different media (CD-ROM, DAT, and on the Internet).

## 3. THE ISSN AND URN

### 3.1 ISSN compliance with URN requirements

The different specifications and requirements on URNs have been studied from the following documents:

URN Syntax

(RFC 2141, May 1997 - R. Moats)

Using Existing Bibliographic Identifiers as Uniform Resource Names

(RFC 2288 February 1998 - C. Lynch, R. Daniel)

Functional Requirements for Uniform Resource Names

(RFC 1737, December 1994 - K. Sollins, L. Masinter)

URN Namespace Definition Mechanisms

(RFC 2611, June 1999 - L. Daigle, R. Iannella)

A URN Namespace for IETF Documents

(RFC 2648, August 1999 - R. Moats)

Requirements for URNs' functional capabilities (from RFC 1737)

Global scope: A URN is a name with global scope which does not imply a location. It has the same meaning everywhere.

- Applicable for ISSN. Accordingly to ISO standard 3297 there is no limitations for serial resource identification.

Global uniqueness: The same URN will never be assigned to two different resources.

- Applicable for ISSN. By definition an ISSN is assigned to one and only one serial resource. Once assigned, an ISSN is never re-assigned.

Persistence: The lifetime of a URN is permanent.

- Applicable for ISSN. All ISSN are registered in the ISSN Register data base which covers current serial resources as well as ceased.

Scalability: URNs can be assigned to any resource that might conceivably be available on the network, for hundreds of years.

- Applicable for ISSN. More than 98500000 ISSN have yet been assigned.

Legacy support: The scheme must permit the support of existing legacy naming systems.

- Applicable for ISSN. By definition the ISSN system is a legacy identification system for serial resources.

Independence: It is solely the responsibility of a name issuing authority to determine the conditions under which it will issue a name.

- Applicable for ISSN. By definition of the ISSN system.

Resolution: For URNs that have corresponding URLs, there must be some feasible mechanism to translate a URN to a URL.

- Applicable for ISSN. The ISSN-IC has developed an ISSN URN resolver which translates one given ISSN into one or several URLs.

In addition to these basic requirements on the functional elements of the URNs, there are other requirements for how they are encoded in a string:

Single encoding, Simple comparison, Simple human transcribability, Transport friendliness, Machine consumption, Text recognition.

- Applicable to ISSN. As defined in the ISO standard the ISSN is a very simple and short character string which fully responds to those requirements.

Considering the aim of the ISSN, its framework and new developments for electronic serial resources identification, we can state that the ISSN fulfills all expressed URN requirements.

#### Syntax requirements

Considering syntax requirements (RFC2141) for an URN namespace and the URN syntax, an ISSN based URN namespace is compliant with such requirements since it does not use any reserved characters.

In RFC 2288 (4.2 Encoding Considerations and Lexical Equivalence) it is stated that:

There is no problem representing ISSN in the namespace - specific string of URNs since all characters valid in the ISSN are valid in the namespace-specific URN string, and %-encoding is never required.

Example: urn:ISSN:1046-8188

Supplementary comparison rules are also appropriate for the ISSN namespace, hyphens should be dropped prior to comparison and occurrences of 'x' normalised to uppercase.

### 3.2 Identification and access

The role of an URN is also to provide safe access to the characteristics of a resource and to the resource itself. One may view an ISSN bibliographic record as a metadata since it contains different data information on the resource which is to be identified, described, located and/or accessed.

The ISSN is widely used as an identification number for serial resources. Since the ISSN Network provides the URLs corresponding to the identified resources the ISSN is now also a tool for the location and access to resources on the Internet. This is achieved by an ISSN URN resolution system.

### 4. RESOLUTION

The different specifications and requirements on URN resolution have been studied from the following documents:

URI Resolution Services Necessary for URN Resolution  
(RFC 2483, January 1999 - M. Mealling)

Resolution of Uniform Resource Identifiers using the Domain Name System

(RFC 2168 June 1997 - R. Daniel, M. Mealling )

Architectural Principles of Uniform Resource Name Resolution

(RFC 2276, January 1998 - K. Sollins )

#### 4.1. Overview of the ISSN URN Resolution system

Using ISSN as Uniform Resource Name implies that some mapping mechanism is provided to ensure a reliable access to available resources when using Internet tools like a standard Web browser.

From the technical point of view this has led to develop within our system the different pieces of software and services required to fulfill such aim.

The resolution software be able to translate a given ISSN-URN into electronic locations:

- location of the bibliographic description or metadata
- location of the periodical itself (if it is in electronic form).

These electronic locations are expressed in form of URLs for which persistence is not ensured. As a consequence the URLs which are stored for resolution have to be checked and updated to ensure relevant mapping with the corresponding URNs.

The URLs which are stored in the database must be checked regularly for accuracy and if changes occur they have to be reported in the ISSN-URN resolver database.

The browser has to include the URN facility which allows to express the location of a given resource in form of an ISSN, this means that if the standard browsers do not include the URN option a "plug-in" is to be developed.

Thus, four types of developments have been considered:

Design and implementation of a resolver:

- In a first step a global centralised resolution system has been developed and implemented on one resolution server located at the ISSN International Centre.

It ensures effective mapping between a given ISSN and one or several URL(s) which implies that "multiple resolution" is performed by design and implementation of an ISSN-URL mapping file.



- Today, the principal method to map ISSN with URLs is to extract them from ISSN registered records and to store them in a separate file structured specially for the resolution process. Besides, other ways to get URLs for bibliographic resources identified by ISSN are tested. Management data as well as attributes are linked to URLs in order to recognise objects handled by the resolver.

Design and implementation of an URL checker:

- In order to control the persistence and the accessibility to ISSN-URN a robot called the "URL Watcher" has been written to control the status of all URLs stored in the ISSN-URL mapping file. Broken or redirected URLs are detected and stored to permit efficient resolution.

Design and implementation of a browser plug-in:

- The existing browsers do not include today the URN "protocol" functionality. One expect to have it implemented in a near future. A plug-in for Netscape communicator and MS-Explorer has been developed and is available.

This enables to enter directly the ISSN preceded by the string "urn:ISSN:" in the browsers address box instead of typing the URL and as result to get displayed the bibliographic record or/and the online resource. Clicking on an ISSN on an HTML page gives the same result.

example: urn:ISSN:1560-1560

## 4.2 Global resolution

Since the ISSN system is not addressing a local environment (like a given Library) and is expected to be linked to other URNs (or other identification services) for identification of serial related resources having other levels of granularity, we have to consider an evolution of the present resolution implementation to a global resolution system.

Resolution and especially global resolution is considered as a major issue for becoming an ISSN URN Namespace.

This is expressed in the following statement (from RFC 2611, "URN Namespace Definition Mechanisms"):

#### Process for identifier resolution:

If a namespace is intended to be accessible for global resolution, it must be registered in an RDS (Resolution Discovery System, see [RFC2276]) such as NAPTR. Resolution then proceeds according to standard URI resolution processes, and the mechanisms of the RDS.

Our present views and evaluations to be integrated in such RDS System for global resolution for an ISSN URN Namespace are mainly based on concepts and proposals from the following RFCs:

RFC 2276 for RDS architecture for global resolution,  
RFC 2168 for the NAPTR DNS extension,

From a technical point of view our present resolution system is flexible enough to take place in a RDS/NAPTR resolution framework.

#### 5. Namespace registration

Namespace ID:

ISSN

Registration Information:

Version 1

Date: 2000-08-28

Declared registrant of the namespace:

Name: S. ROZENFELD (Mr.)

E-mail: rozenfeld@issn.org

Affiliation: ISSN International Centre

Address: 20, rue Bachaumont  
75002 PARIS  
FRANCE

Declaration of syntactic structure:

In accordance with the ISO standard 3297 - Information and documentation International Standard Serial Number(ISSN)-(1998)

The ISSN consists of eight digits in Arabic numerals 0 to 9, except the last digit which is a check digit and can sometimes be an X. The ISSN has no internal meaningful elements to identify language, country, publisher.

The check digit is always located in the extreme right position and is calculated on a modulus 11 basis with weights 8 to 2, using X in lieu of 10 where 10 would occur as a check digit.

Each ISSN is inseparably linked to the serials title "the key title" which is a constructed form of the title in order to avoid duplicates so that each key title is unique within the ISSN Data base. ISSN and key titles are equivalent, they both identify without ambiguity a same serial.

When printed or displayed the ISSN is preceded by the ISSN prefix and a space, and shall appear as two groups of four digits separated by a hyphen

Therefore the ISSN structure is as follows:

NNNN-NNNC

where N is a Digit character [0..9]

C is either a Digit character or letter "X" [0..9,X]

C is the check character

An ISSN URN Namespace structure is conformant to URN syntax requirements (RFC 2141).

examples urn:ISSN:0259-000X

urn:ISSN:1560-1560

Relevant ancillary documentation:

ISO 3279 Information and documentation - International  
Standard Serial Number (ISSN)

The ISSN: an identifier for serials in digital form.  
Compatibility with the URN framework.  
(ISSN International Centre - January 1999)

The ISSN-URN project.  
(ISSN International Centre - October 1999)

Identifier uniqueness considerations:

Uniqueness is guaranteed by ISSN definition.

As defined in the ISO 3279 each ISSN is a "unique" identifier for a specific serial publication.

A different ISSN is assigned to each publication issued on different media.

An ISSN is never re-assigned.

#### Identifier persistence considerations:

Persistence of ISSN is guaranteed by the maintenance and update of the ISSN Register by the ISSN Centres.

Even records for "ceased" publications still remain in the ISSN database, and links between serials belonging to a same "family" are expressed with related ISSN within the records. This linking mechanism extends the current Identifier persistence concept.

#### Process of identifier assignment:

The ISSN network consisting in 68 National Centres and the International Centre:

- collects the material to be identified
- checks for identification all types of serials including electronic serial resources.
- assigns an ISSN to each different periodical.
- establish the bibliographic record.
- makes available the data.

The data consisting in bibliographic records is centralised at the ISSN International Centre for global uniqueness checking.

A given ISSN refers to one and only one form of the title, the key-title which is a key element of the bibliographic record as well as the ISSN.

Today, the ISSN database contains more than 950 000 bibliographic records and a special attention is given to electronic publication resources and related metadata, and the way to access them.

#### Process for identifier resolution:

As a first step the ISSN International Centre has developed a centralised ISSN-URN resolver with multiple resolution capabilities which runs as a demonstrator.

In a second step we expect the ISSN Namespace to be accessible for global resolution and to provide a set of resolution services compliant with the RDS/NAPTR proposals.

#### Rules for Lexical Equivalence:

The check digit if 'X' is case-sensitive.  
Thus, if "x" is found it must be translated in upper case.

The hyphen between the 4th and the 5th digit can be omitted

#### Conformance with URN Syntax:

There are no characters reserved.

#### Security Considerations

Because this namespace defines no additional reserved characters it does not add any security consideration.

#### Validation mechanism:

None specified today.

#### Scope:

Global.

#### 6. Security Considerations

Security issues are discussed in section 5.

#### 7. References

- [1] ISO 3279 Information and documentation - International Standard Serial Number (ISSN)
- [2] The ISDS Manual - ISSN International Centre (Paris, 1983) (under revision)
- [3] Moats, R., "URN Syntax", RFC 2141, May 1997.
- [4] Sollins, K. and L. Masinter, "Functional Requirements for Uniform Resource Names", RFC 1737, December 1994.
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- [6] Daniel, R. and M. Mealling, "Resolution of Uniform Resource Identifiers using the Domain Name System", RFC 2168, June 1997.

[7] Sollins, D., "Architectural Principles of Uniform Resource Name Resolution", RFC 2276, January 1998.

#### 8. Contact Information and useful links

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