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P. Saint-Andre, Ed.
Cisco Systems, Inc.
L. Daigle
Thinking Cat Enterprises
D. van Gulik
WebWeaving
R. Iannella
Semantic Identity
P. Faltstrom
Netnod
July 12, 2013

Uniform Resource Name (URN) Namespace Definition Mechanisms
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Abstract

This document supplements the Uniform Resource Name (URN) syntax specification by defining the concept of a URN namespace, as well as mechanisms for defining and registering such namespaces. This document obsoletes RFC 3406.

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1. Introduction

A Uniform Resource Name (URN) [I-D.ietf-urnbis-rfc2141bis-urn] is a Uniform Resource Identifier (URI) [RFC3986] that is intended to serve as a persistent, location-independent resource identifier. This document supplements the Uniform Resource Name (URN) syntax specification [I-D.ietf-urnbis-rfc2141bis-urn] by defining the following:

- o The concept of a URN namespace.
- o A mechanism for defining URN namespaces and associating each namespace with a public identifier (called a Namespace ID or "NID").
- o Procedures for registering namespace identifiers with the Internet Assigned Numbers Authority (IANA).

This document rests on two key assumptions:

1. Assignment of a URN is a managed process.

A string that conforms to the URN syntax is not necessarily a valid URN, because a URN needs to be assigned according to the rules of a particular namespace (in terms of syntax, semantics, and process).

2. The space of URN namespaces is itself managed.

A string in the namespace identifier slot of the URN syntax is not necessarily a valid URN namespace identifier, because in order to be valid a namespace needs to be defined and registered in accordance with the rules of this document.

URN namespaces were originally defined in [RFC2611], which was obsoleted by [RFC3406]. Based on experience with defining and registering URN namespaces since that time, this document specifies URN namespaces with the smallest reasonable set of changes from [RFC3406]. This document obsoletes RFC 3406.

2. Terminology

Several important terms used in this document are defined in the URN syntax specification [I-D.ietf-urnbis-rfc2141bis-urn].

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

3. What is a URN Namespace?

For the purposes of URNs, a "namespace" is a collection of unique identifiers that are consistently assigned according to a common definition.

The uniqueness constraint means that an identifier within the namespace is never assigned to more than one resource and never re-assigned to a different resource (however, a single resource can have more than one URN assigned to it for different purposes).

The consistent assignment constraint means that an identifier within the namespace is assigned by an organization or in accordance with a process that is always followed (e.g., in the form of an algorithm).

The common definition constraint means that both the syntax for identifiers within the namespace and the process for assigning such identifiers are clearly defined in a specification.

A URN namespace is identified by a particular designator (which syntactically follows the 'urn' scheme name) in order to:

- o Ensure the global uniqueness of URNs.
- o Optionally provide a cue regarding the structure of URNs assigned within a namespace.

With regard to global uniqueness, using different designators for different collections of identifiers ensures that no two URNs will be the same for different resources (since each collection is required to uniquely assign each identifier). For instance, some identifier systems use strings of numbers as identifiers (e.g., ISBN, ISSN, phone numbers). It is conceivable that some numbers might be valid identifiers in two different established identifier systems, where the namespace identifier differentiates between the resulting URNs.

With regard to the structure of URNs assigned within a namespace, the development of an identifier structure, and thereby a collection of identifiers, is a process that is inherently dependent on the requirements of the community defining the identifiers, how they will be assigned, and the uses to which they will be put. All of these issues are specific to the individual community seeking to define a namespace (e.g., a publishing community, an association of booksellers, developers of particular application protocols, etc.); therefore these issues are beyond the scope of URN syntax and the rules regarding URN namespaces in general.

URN namespaces inherit certain rights and responsibilities, including:

- o They uphold the general principles of a well-managed URN namespace by providing persistent identification of resources and unique assignment of identifier strings.
- o They can be registered in global registration services.

4. URN Namespace Types

There are two types of URN namespace: formal and informal. These are distinguished by the expected level of service, the information necessary to define the namespace, and the procedures for registration. To date, the vast majority of the registered namespaces have been formal, so this document concentrates on formal namespaces.

Note: [RFC3406] defined a third type of "experimental namespaces", denoted by prefixing the namespace identifier with the string "X-". Consistent with [RFC6648], this specification removes the experimental category.

4.1. Formal Namespaces

A formal namespace can be requested, and IETF review sought, in cases where the publication of the NID proposal and the underlying namespace will provide benefit to some subset of users on the Internet. That is, a formal NID proposal, if accepted, needs to be functional on and with the global Internet, not limited to users in communities or networks not connected to the Internet. For example, consider a NID that is meant for naming of physics research; if that NID request effectively forced someone to use a proprietary network or service that was not at all open to the general Internet user, then it would make a poor request for a formal NID. The intent is that, while the community of those who might actively use the names assigned within that NID might be small (but no less important), the potential use of names within that NID is open to any user on the Internet.

It is expected that formal NIDs might be applied to namespaces where some aspects are not fully open. For example, a namespace might make use of a fee-based, privately managed, or proprietary registry for assignment of URNs in the namespace. However, it might still provide benefit to some Internet users if the services associated have openly-published access protocols.

In addition to the basic information specified in the namespace definition template (see Section 7), a formal namespace request needs to be accompanied by documented considerations of the need for a new namespace and of the community benefit from formally establishing the

proposed URN namespace.

Additionally, since the goal of URNs is to provide persistent identification, a formal namespace request needs to give some consideration as to the longevity and maintainability of the namespace. Possible factors to consider with regard to an organization that will assign URNs within a namespace include the following:

- o It ought to demonstrate stability and the ability to maintain the URN namespace for a long time; absent such evidence, it ought to be clear how the namespace can remain viable if the organization can no longer maintain the namespace.
- o It ought to demonstrate competency in name assignment. This will improve the likelihood of persistence (e.g. to minimize the likelihood of conflicts).
- o It ought to commit to not re-assigning existing names and to allowing old names to continue to be valid, even if the owners or assignees of those names are no longer members or customers of that organization. With regard to URN resolution, this does not mean that there needs to be resolution of such names, only that the names will not resolve to false or stale information.

4.2. Informal Namespaces

Informal namespaces are full-fledged URN namespaces, with all the rights and responsibilities associated thereto. Informal namespaces differ from formal namespaces in the process for assigning a NID: IANA will assign an alphanumeric NID (e.g., "urn-7") to informal namespaces, per the process outlined under Section 6.

5. Defining a URN Namespace

A URN namespace is defined by the following factors:

- o The syntax of URNs assigned within the namespace, in conformance with the fundamental URN syntax [I-D.ietf-urnbis-rfc2141bis-urn].
- o The process for assigning URNs within the namespace.
- o Optionally, the process for resolving URNs issued within the namespace.

Processes for resolution of URNs assigned within a namespace (if any) are out of scope for this document. The following sections provide guidelines for (1) defining the syntax of URNs within a namespace and (2) specifying how URNs will be assigned within a namespace.

5.1. Formal Namespaces

Formal NIDs are assigned as a result of IETF Review as defined in the "IANA Considerations" document [RFC5226]. Thus an application for a formal NID is made by publishing an RFC in the IETF stream, either as the product of an IETF working group or as an individual submission sponsored by an Area Director. The RFC need not be standards track (indeed, to date most RFCs registering URN namespaces have been informational), but it will be subject to IESG review and approval pursuant to the guidelines provided here (as well as standard RFC publication guidelines).

5.1.1. Syntax

A formal namespace registration requests a particular NID, subject to the following constraints (above and beyond the syntax rules specified in [I-D.ietf-urnbis-rfc2141bis-urn]):

- o It MUST NOT be an already-registered NID.
- o It MUST NOT start with "urn-" (which is reserved for informal namespaces).
- o It MUST be more than two characters long.
- o It MUST NOT start with "XY-", where "XY" is any combination of two ASCII letters.

All two-letter combinations, and all two-letter combinations followed by "-" and any sequence of valid NID characters, are reserved for potential use as countrycode-based NIDs for eventual national registrations of URN namespaces. The definition and scoping of rules for allocation of responsibility for such countrycode-based namespaces is beyond the scope of this document.

5.1.2. Specification

The specification defining a formal namespace MUST include a completed namespace definition template (see Section 7).

The specification also MUST include the following sections.

First, the "Namespace Considerations" section outlines the perceived need for a new namespace (e.g., by describing where existing namespaces fall short of the proposer's requirements). Potential considerations include:

- o The type of resources to be identified
- o The type of services to be supported

- o Procedures for assigning URNs within this namespace
- o Processes for resolving URNs assigned within this namespace, if any

It is expected that more than one namespace might serve the same "functional" purpose; the intent of the "Namespace Considerations" section is to provide a record of the proposer's "due diligence" in exploring existing possibilities, for the consideration by the Internet community, expert reviewers, and the IESG.

Second, the "Community Considerations" section explains how the intended community will benefit by assignment of this namespace, as well as how a general Internet user will be able to use the space if they care to do so. Potential considerations include:

- o Methods and benefits for using the assigned URNs
- o Methods and benefits for resolving the assigned URNs (if any)
- o The kinds of software applications that can use or resolve the assigned URNs (e.g., by differentiating among disparate namespaces, identifying resources in a persistent fashion, or meaningfully resolving and accessing services associated with the namespace)

Third, the "Security Considerations" section describes any potential security-related issues with regard to assignment, use, and resolution of identifiers within the namespace. Examples of such issues include the consequences of producing false negatives and false positives during comparison for lexical equivalence (see also [RFC6943]), leakage of private information when identifiers are communicated on the public Internet, the potential for directory harvesting, and the issues discussed in [RFC3552].

Fourth, the "IANA Considerations" section indicates that the document includes a URN NID registration that is to be entered into the IANA registry of URN NIDs.

5.2. Informal Namespaces

Informal namespaces are directly requested of IANA and are assigned based on a policy of First Come First Served [RFC5226].

The namespace identifier assigned by IANA has the following syntax:

```
"urn-" <number>
```

The <number> is chosen by IANA. The only restrictions on <number> are that it (1) consist strictly of ASCII digits and (2) not cause the NID to exceed the length limitations defined in the URN syntax

specification [I-D.ietf-urnbis-rfc2141bis-urn].

6. Registering a URN Namespace

6.1. Formal Namespaces

The registration policy for formal namespaces is IETF Review [RFC5226]. The key steps for registration of a formal namespace are:

1. Submit an Internet-Draft that includes all of the information described under Section 5.1.2 and Section 7 of this document.
2. Send the completed namespace definition template, along with a pointer to the Internet-Draft, to the urn-nid@ietf.org discussion list for technical review.
3. If necessary to address comments received, repeat steps 1 and 2.
4. Ask the responsible Area Director to process the Internet-Draft for publication as an RFC. Note that the IESG can request further changes or direct discussion to designated working groups, area experts, etc.
5. If the IESG approves the document for publication as an RFC, the IANA will register the requested NID.

A registration can be revised by updating the RFC through normal IETF processes [RFC2606]. The authors of the revised document need to follow the same steps outlined above for new registrations.

6.2. Informal Namespaces

The registration policy for informal namespaces is First Come First Served [RFC5226]. The key steps for registration of an informal namespace are:

1. Write a completed namespace definition template (see Section 7). This can be done as part of an Internet-Draft.
2. Send the completed template to the urn-nid@ietf.org discussion list for technical review.
3. If necessary to address comments received, repeat steps 1 and 2.
4. Once comments have been addressed and the review period has expired, send a registration request to IANA (via the iana@iana.org email address) with the final template.

Informal namespaces can also be revised by updating the template and processing it as outlined above for new registrations.

7. URN Namespace Definition Template

Definition of a URN namespace is accomplished by completing the following template. In addition to providing a mechanism for defining the structure of URNs assigned within the namespace, this information is designed to be useful for:

- o entities seeking to have a URN assigned in a namespace (if applicable)
- o entities seeking to provide URN resolvers for a namespace (if applicable)

Providing a complete and accurate template is particularly helpful to communities that are evaluating the possibility of using a portion of an existing URN namespace rather than creating a new namespace.

As described under Section 5.1.2, applications for formal URN namespaces MUST also document the "Namespace Considerations", "Community Considerations", "Security Considerations", and "IANA Considerations".

The information to be provided in the template is as follows:

Namespace ID:

Requested of IANA (formal) or assigned by IANA (informal).

Registration Information:

The version and date of the registration:

- Registration version number: starting with 1, incrementing by 1 with each new version
- Registration date: date submitted to the IANA, using the format YYYY-MM-DD

Declared registrant of the namespace:

This includes:

- Registering organization
 - Name
 - Address
- Designated contact person
 - Name
 - Contact information
 - (at least one of email address,

phone number, postal address)

Declaration of syntactic structure:

This section ought to outline any structural features of identifiers in this namespace. At the very least, this description can be used to introduce terminology used in other sections. This structure can also be used for determining realistic caching/shortcuts approaches; suitable caveats ought to be provided. If there are any specific character encoding rules (e.g., which character ought to always be used for single-quotes), these ought to be listed here. If the namespace allows use of the URI query component, URI fragment identifier component, or both, such usage needs to be described here (in addition to any other namespace-specific syntax, such as distinguishers for integral parts of resources identified by URNs within the namespace).

At a high level, answers might include, but are not limited to:

- A formal definition of the structure, e.g., in terms of Augmented BNF for Syntax Specifications (ABNF) as specified in [RFC5234]
- A regular expression for parsing the identifier into components, including naming authorities
- An algorithm for generating conformant URNs
- An explanation that the structure is opaque

Relevant ancillary documentation:

This section ought to list any RFCs, specifications, or other published documentation that defines or explains all or part of the namespace structure.

At a high level, answers might include, but are not limited to:

- Pointers to specifications that define the syntax and semantics of the namespace
- Mention of documentation that describes the processes followed by an organization that assigns URNs in the namespace
- Explanatory material describing the namespace

Identifier uniqueness considerations:

This section ought to address the requirement that URNs are assigned uniquely -- i.e., they are assigned to at most one

resource, and are not reassigned.

(Note that the definition of "resource" is fairly broad; for example, information on "Today's Weather" might be considered a single resource, although the content is dynamic.)

At a high level, answers might include, but are not limited to:

- Exposition of the structure of the identifiers, and partitioning of the space of identifiers amongst assignment authorities which are individually responsible for respecting uniqueness rules
- Description of a method for assignment of identifiers (e.g., identifiers are assigned sequentially)
- An explanation that this information is withheld (i.e., the namespace is opaque)

Identifier persistence considerations:

Although non-reassignment of URN identifiers ensures that a URN will persist in identifying a particular resource even after the "lifetime of the resource", some consideration ought to be given to the persistence of the usability of the URN. This is particularly important in the case of URN namespaces providing global resolution.

At a high level, answers could include, but are not limited to:

- Quality of service considerations

Process of identifier assignment:

This section ought to detail the mechanisms and/or authorities for assigning URNs to resources. It ought to make clear whether assignment is completely open or, if limited, how to become an assigner of identifiers or how to get an identifier assigned by existing assignment authorities.

At a high level, answers could include, but are not limited to:

- Assignment is completely open, following a particular algorithm
- Assignment is delegated to authorities recognized by a particular organization (e.g., the Digital Object Identifier Foundation controls the DOI assignment space and its delegation)
- Assignment is completely closed (e.g., for a private organization)

Process for identifier resolution:

If a namespace is intended to be accessible for global resolution, it needs to be registered in an RDS (Resolution Discovery System, see [RFC 2276]) such as DDDS. Resolution then proceeds according to standard URI resolution processes, and the mechanisms of the RDS. What this section ought to outline is the requirements for becoming a recognized resolver of URNs in this namespace (and being so listed in the RDS registry).

At a high level, answers might include, but are not limited to:

- The namespace is not listed with an RDS; therefore this section is not applicable
- Resolution mirroring is completely open, with a mechanism for updating an appropriate RDS
- Resolution is controlled by entities to which assignment has been delegated

Rules for lexical equivalence:

If there are particular algorithms for determining equivalence between two identifiers in the underlying namespace (hence, in the URN string itself), rules can be provided here. Such rules ought to always have the effect of eliminating false negatives that might otherwise result from comparison.

If it is appropriate and helpful to do so, reference can be made to the equivalence rules defined in the URI specification [RFC3986].

Some examples include:

- Equivalence between uppercase and lowercase characters in the Namespace Specific String
- Equivalence between hyphenated and non-hyphenated groupings in the identifier string
- Equivalence between single-quotes and double-quotes
- Namespace-defined equivalences between specific characters, such as "character X with or without diacritic marks".

Note that these are not normative statements for any kind of best practice related to handling of equivalences between characters in general; they are statements limited in scope to reflecting the rules for this specific namespace only.

Conformance with URN syntax:

This section ought to outline any special considerations necessary for conforming with the URN syntax. This is particularly applicable in the case of legacy naming systems that are used in the context of URNs.

For example, if a namespace is used in contexts other than URNs, it might make use of characters that are reserved in the URN syntax.

This section ought to flag any such characters, and outline necessary mappings to conform to URN syntax. Normally, this will be handled by percent-encoding the character as specified in the URI specification [RFC3986].

Validation mechanism:

Apart from attempting resolution of a URN, a URN namespace may provide mechanisms for "validating" a URN -- i.e., determining whether a given string is currently a validly-assigned URN. There are two issues here: 1) users ought not "guess" URNs in a namespace; 2) when the URN namespace is based on an existing identifier system, it might not be the case that all existing identifiers are assigned on Day 0. The reasonable expectation is that the resource associated with each resulting URN is somehow related to the thing identified by the original identifier system, but those resources might not exist for each original identifier. For example, even if a URN namespace were defined based on telephone numbers, it is not clear that all telephone numbers would immediately become "valid" URNs resolvable using whatever mechanisms are described as part of the namespace registration.

Validation mechanisms might be:

- A syntax grammar
- An online service
- An offline service

Scope:

This section ought to outline the scope of the use of the identifiers in this namespace. Apart from considerations of private vs. public namespaces, this section is critical in evaluating the applicability of a requested NID. For example, a namespace claiming to deal in "social security numbers" ought to have a global scope and address all social security number structures (unlikely). On the other hand, at a national level, it is reasonable to propose a URN namespace for "this

nation's social security numbers".

8. Security Considerations

This document largely focuses on providing mechanisms for the declaration of public information. Nominally, these declarations will be of relatively low security profile, however there is always the danger of "spoofing" and providing misinformation. Information in these declarations ought to be taken as advisory.

The definition of a URN namespace needs to account for potential security issues related to assignment, use, and resolution of identifiers within the namespace; see Section 5.1.2 for further discussion.

9. IANA Considerations

This document outlines the processes for registering URN namespaces, and has implications for the IANA in terms of registries to be maintained. In all cases, the IANA ought to assign the appropriate NID (formal or informal) once the procedures outlined in this document have been completed.

10. References

10.1. Normative References

- [I-D.ietf-urnbis-rfc2141bis-urn]
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10.2. Informative References

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Appendix A. Changes from RFC 3406

Although on the surface it might appear that this document is significantly different from [RFC3406], in general it only modifies the order of presentation, with the intent of making it easier for interested parties to define and register URN namespaces. In addition, some of the text was updated to be consistent with the definition of Uniform Resource Identifiers (URIs) [RFC3986] and the processes for registering information with the IANA [RFC5226], as well as more modern guidance with regard to security issues [RFC3552] and identifier comparison [RFC6943]. The only major substantive change was removing the category of experimental namespaces, consistent with [RFC6648].

Authors' Addresses

Peter Saint-Andre (editor)
Cisco Systems, Inc.
1899 Wynkoop Street, Suite 600
Denver, CO 80202
USA

Phone: +1-303-308-3282
Email: psaintan@cisco.com

Leslie Daigle
Thinking Cat Enterprises

Dirk-Willem van Gulik
WebWeaving

Renato Iannella
Semantic Identity

Patrick Faltstrom
Netnod

