URN Syntax

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

Abstract

   Uniform Resource Names (URNs) are intended to serve as persistent,
   location-independent, resource identifiers. This document sets
   forward the canonical syntax for URNs. A discussion of both existing
   legacy and new namespaces and requirements for URN presentation and
   transmission are presented. Finally, there is a discussion of URN
   equivalence and how to determine it.

1. Introduction

   Uniform Resource Names (URNs) are intended to serve as persistent,
   location-independent, resource identifiers and are designed to make
   it easy to map other namespaces (which share the properties of URNs)
   into URN-space. Therefore, the URN syntax provides a means to encode
   character data in a form that can be sent in existing protocols,
   transcribed on most keyboards, etc.

2. Syntax

   All URNs have the following syntax (phrases enclosed in quotes are
   REQUIRED):

                   <URN> ::= "urn:" <NID> ":" <NSS>

   where <NID> is the Namespace Identifier, and <NSS> is the Namespace
   Specific String. The leading "urn:" sequence is case-insensitive.
   The Namespace ID determines the _syntactic_ interpretation of the
   Namespace Specific String (as discussed in [1]).

RFC 1630 [2] and RFC 1737 [3] each presents additional considerations
for URN encoding, which have implications as far as limiting syntax.
On the other hand, the requirement to support existing legacy naming
systems has the effect of broadening syntax. Thus, we discuss the
acceptable syntax for both the Namespace Identifier and the Namespace
Specific String separately.

2.1 Namespace Identifier Syntax

The following is the syntax for the Namespace Identifier. To (a) be
consistent with all potential resolution schemes and (b) not put any
undue constraints on any potential resolution scheme, the syntax for
the Namespace Identifier is:

```
<NID>         ::= <let-num> [ 1,31<let-num-hyp> ]

<let-num-hyp> ::= <upper> | <lower> | <number> | "-"

<let-num>     ::= <upper> | <lower> | <number>

<upper>       ::= "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" |
                  "I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" |
                  "Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" |
                  "Y" | "Z"

<lower>       ::= "a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" |
                  "i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" |
                  "q" | "r" | "s" | "t" | "u" | "v" | "w" | "x" |
                  "y" | "z"

<number>      ::= "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" |
                  "8" | "9"
```

This is slightly more restrictive that what is stated in [4] (which
allows the characters "." and "+"). Further, the Namespace
Identifier is case insensitive, so that "ISBN" and "isbn" refer to
the same namespace.

To avoid confusion with the "urn:" identifier, the NID "urn" is
reserved and MUST NOT be used.

2.2 Namespace Specific String Syntax

As required by RFC 1737, there is a single canonical representation
of the NSS portion of an URN.   The format of this single canonical
form follows:

```
<NSS>          ::= 1*<URN chars>

<URN chars>   ::= <trans> | "%" <hex> <hex>

<trans>        ::= <upper> | <lower> | <number> | <other> | <reserved>

<hex>          ::= <number> | "A" | "B" | "C" | "D" | "E" | "F" |
                   "a" | "b" | "c" | "d" | "e" | "f"

<other>        ::= "(" | ")" | "+" | "," | "-" | "." |
                   ":" | "=" | "@" | ";" | "$" |
                   "_" | "!" | "*" | "'"
```

Depending on the rules governing a namespace, valid identifiers in a
namespace might contain characters that are not members of the URN
character set above (<URN chars>). Such strings MUST be translated
into canonical NSS format before using them as protocol elements or
otherwise passing them on to other applications. Translation is done
by encoding each character outside the URN character set as a
sequence of one to six octets using UTF-8 encoding [5], and the
encoding of each of those octets as "%" followed by two characters
from the <hex> character set above. The two characters give the
hexadecimal representation of that octet.

2.3 Reserved characters

The remaining character set left to be discussed above is the
reserved character set, which contains various characters reserved
from normal use. The reserved character set follows, with a
discussion on the specifics of why each character is reserved.

The reserved character set is:

```
<reserved>    ::= '%" | "/" | "?" | "#"
```

2.3.1 The "%" character

The "%" character is reserved in the URN syntax for introducing the
escape sequence for an octet. Literal use of the "%" character in a
namespace must be encoded using "%25" in URNs for that namespace.
The presence of an "%" character in an URN MUST be followed by two
characters from the <hex> character set.

   Namespaces MAY designate one or more characters from the URN
   character set as having special meaning for that namespace. If the
   namespace also uses that character in a literal sense as well, the
   character used in a literal sense MUST be encoded with "%" followed
   by the hexadecimal representation of that octet. Further, a
   character MUST NOT be "%"-encoded if the character is not a reserved
   character. Therefore, the process of registering a namespace
   identifier shall include publication of a definition of which
   characters have a special meaning to that namespace.

2.3.2 The other reserved characters

   RFC 1630 [2] reserves the characters "/", "?", and "#" for particular
   purposes. The URN-WG has not yet debated the applicability and
   precise semantics of those purposes as applied to URNs. Therefore,
   these characters are RESERVED for future developments. Namespace
   developers SHOULD NOT use these characters in unencoded form, but
   rather use the appropriate %-encoding for each character.

2.4 Excluded characters

   The following list is included only for the sake of completeness.
   Any octets/characters on this list are explicitly NOT part of the URN
   character set, and if used in an URN, MUST be %encoded:

   <excluded> ::= octets 1-32 (1-20 hex) | "\" | """ | "&" | "<"
                  | ">" | "[" | "]" | "^" | "`" | "{" | "|" | "}" | "~"
                  | octets 127-255 (7F-FF hex)

   In addition, octet 0 (0 hex) should NEVER be used, in either
   unencoded or %-encoded form.

   An URN ends when an octet/character from the excluded character set
   (<excluded>) is encountered. The character from the excluded
   character set is NOT part of the URN.

3. Support of existing legacy naming systems and new naming systems

   Any namespace (existing or newly-devised) that is proposed as an
   URN-namespace and fulfills the criteria of URN-namespaces MUST be
   expressed in this syntax. If names in these namespaces contain
   characters other than those defined for the URN character set, they
   MUST be translated into canonical form as discussed in section 2.2.

4. URN presentation and transport

   The URN syntax defines the canonical format for URNs and all URN
   transport and interchanges MUST take place in this format. Further,
   all URN-aware applications MUST offer the option of displaying URNs
   in this canonical form to allow for direct transcription (for example
   by cut and paste techniques). Such applications MAY support display
   of URNs in a more human-friendly form and may use a character set
   that includes characters that aren't permitted in URN syntax as
   defined in this RFC (that is, they may replace %-notation by
   characters in some extended character set in display to humans).

5. Lexical Equivalence in URNs

   For various purposes such as caching, it's often desirable to
   determine if two URNs are the same without resolving them. The
   general purpose means of doing so is by testing for "lexical
   equivalence" as defined below.

   Two URNs are lexically equivalent if they are octet-by-octet equal
   after the following preprocessing:

           1. normalize the case of the leading "urn:" token
           2. normalize the case of the NID
           3. normalizing the case of any %-escaping

   Note that %-escaping MUST NOT be removed.

   Some namespaces may define additional lexical equivalences, such as
   case-insensitivity of the NSS (or parts thereof). Additional lexical
   equivalences MUST be documented as part of namespace registration,
   MUST always have the effect of eliminating some of the false
   negatives obtained by the procedure above, and MUST NEVER say that
   two URNs are not equivalent if the procedure above says they are
   equivalent.

6. Examples of lexical equivalence

   The following URN comparisons highlight the lexical equivalence
   definitions:

           1- URN:foo:a123,456
           2- urn:foo:a123,456
           3- urn:FOO:a123,456
           4- urn:foo:A123,456
           5- urn:foo:a123%2C456
           6- URN:FOO:a123%2c456

URNs 1, 2, and 3 are all lexically equivalent. URN 4 is not
lexically equivalent any of the other URNs of the above set. URNs 5
and 6 are only lexically equivalent to each other.

[7](#). Functional Equivalence in URNs

Functional equivalence is determined by practice within a given
namespace and managed by resolvers for that namespeace. Thus, it is
beyond the scope of this document. Namespace registration must
include guidance on how to determine functional equivalence for that
namespace, i.e. when two URNs are the identical within a namespace.

[8](#). Security considerations

This document specifies the syntax for URNs. While some namespaces
resolvers may assign special meaning to certain of the characters of
the Namespace Specific String, any security consideration resulting
from such assignment are outside the scope of this document. It is
strongly recommended that the process of registering a namespace
identifier include any such considerations.

[9](#). Acknowledgments

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earlier drafts of this document. This document is partially
supported by the National Science Foundation, Cooperative Agreement
NCR-9218179.

[10](#). References

Request For Comments (RFC) and Internet Draft documents are available
from <URL:ftp://ftp.internic.net> and numerous mirror sites.

    [1]   Sollins, K. R., "Requirements and a Framework for
                 URN Resolution Systems," Work in Progress.

    [2]   Berners-Lee, T., "Universal Resource Identifiers in
                 WWW," [RFC 1630](#), June 1994.

    [3]   Sollins, K. and L. Masinter, "Functional Requirements
                 for Uniform Resource Names," [RFC 1737](#).
                 December 1994.

   [4]   Berners-Lee, T., R. Fielding, L. Masinter, "Uniform
                Resource Locators (URL)," Work in Progress.

   [5]   [Appendix A.2](#) of The Unicode Consortium, "The
                Unicode Standard, Version 2.0", Addison-Wesley
                Developers Press, 1996. ISBN 0-201-48345-9.

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Appendix A. **Handling of URNs by URL resolvers/browsers.**

   The URN syntax has been defined so that URNs can be used in places
   where URLs are expected. A resolver that conforms to the current URL
   syntax specification [3] will extract a scheme value of "urn:" rather
   than a scheme value of "urn:<nid>".

   An URN MUST be considered an opaque URL by URL resolvers and passed
   (with the "urn:" tag) to an URN resolver for resolution. The URN
   resolver can either be an external resolver that the URL resolver
   knows of, or it can be functionality built-in to the URL resolver.

   To avoid confusion of users, an URL browser SHOULD display the
   complete URN (including the "urn:" tag) to ensure that there is no
   confusion between URN namespace identifiers and URL scheme
   identifiers.