                    Format for Literal IPv6 Addresses in URL's

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

   This document defines the format for literal IPv6 Addresses in URL's
   for implementation in World Wide Web browsers. This format has been
   implemented in the IPv6 versions of several widely deployed browsers
   including Microsoft Internet Explorer, Mozilla, and Lynx. It is also
   intended to be used in the IPv6 version of the service location
   protocol.

   This document incudes an update to the generic syntax for Uniform
   Resource Identifiers defined in RFC 2396 [URL]. It defines a syntax
   for IPv6 addresses and allows the use of "[" and "]" within a URI
   explicitly for this reserved purpose.

1. Introduction

   The textual representation defined for literal IPv6 addresses in
   [ARCH] is not directly compatible with URL's. Both use ":" and "."
   characters as delimiters. This document defines the format for
   literal IPv6 Addresses in URL's for implementation in World Wide Web
   browsers. The goal is to have a format that allows easy "cut" and
   "paste" operations with a minimum of editing of the literal address.

The format defined in this document has been implemented in the IPv6
versions of several widely deployed browsers including Microsoft
Internet Explorer, Mozilla, and Lynx. It is also intended to be used
in the IPv6 version of the service location protocol.

1.1 Requirements

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD,
SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, if and where they appear
in this document, are to be interpreted as described in [KEYWORDS].

World Wide Web browsers SHOULD implement the format of IPv6 literals
in URL's defined in this document. Other types of applications and
protocols that use URL's MAY use this format.

2. Literal IPv6 Address Format in URL's Syntax

To use a literal IPv6 address in a URL, the literal address should be
enclosed in "[" and "]" characters. For example the following
literal IPv6 addresses:

    FEDC:BA98:7654:3210:FEDC:BA98:7654:3210
    1080:0:0:0:8:800:200C:4171
    3ffe:2a00:100:7031::1
    1080::8:800:200C:417A
    ::192.9.5.5
    ::FFFF:129.144.52.38
    2010:836B:4179::836B:4179

would be represented as in the following example URLs:

    http://[FEDC:BA98:7654:3210:FEDC:BA98:7654:3210]:80/index.html
    http://[1080:0:0:0:8:800:200C:417A]/index.html
    http://[3ffe:2a00:100:7031::1]
    http://[1080::8:800:200C:417A]/foo
    http://[::192.9.5.5]/ipng
    http://[::FFFF:129.144.52.38]:80/index.html
    http://[2010:836B:4179::836B:4179]

3. Changes to RFC 2396

This document updates the generic syntax for Uniform Resource
Identifiers defined in RFC 2396 [URL]. It defines a syntax for IPv6
addresses and allows the use of "[" and "]" within a URI explicitly
for this reserved purpose.

The following changes to the syntax in RFC 2396 are made:
(1) change the 'host' non-terminal to add an IPv6 option:

```
host           = hostname | IPv4address | IPv6reference
ipv6reference = "[" IPv6address "]"
```

where IPv6address is defined as in RFC2373 [ARCH].

(2) Replace the definition of 'IPv4address' with that of RFC 2373, as
it correctly defines an IPv4address as consisting of at most three
decimal digits per segment.

(3) Add "[" and "]" to the set of 'reserved' characters:

```
reserved    = ";" | "/" | "?" | ":" | "@" | "&" | "=" | "+" |
              "$" | "," | "[" | "]"
```

and remove them from the 'unwise' set:

```
unwise      = "{" | "}" | "|" | "\" | "^" | "`"
```

4. Security Considerations

The use of this approach to represent literal IPv6 addresses in URL's
does not introduce any known new security concerns.

5. IANA Considerations

None.

6. Authors' Addresses

   Robert M. Hinden
   Nokia
   313 Fairchild Drive
   Mountain View, CA 94043
   USA

   Phone: +1 650 625 2004
   EMail: hinden@iprg.nokia.com
   Web: http://www.iprg.nokia.com/˜hinden

   Brian E. Carpenter
   IBM
   iCAIR, Suite 150
   1890 Maple Avenue
   Evanston IL 60201
   USA

   EMail: brian@icair.org

   Larry Masinter
   AT&T Labs
   75 Willow Road
   Menlo Park, CA 94025

   EMail: LMM@acm.org
   Web: http://larry.masinter.net

7. References

   [ARCH]   Hinden, R. and S. Deering, "IP Version 6 Addressing
              Architecture", RFC 2373, July 1998.

   [STD-PROC] Bradner, S., The Internet Standards Process -- Revision 3,
              BCP 9, RFC 2026, October 1996.

   [URL]   Fielding, R., Masinter, L. and T. Berners-Lee, "Uniform
              Resource Identifiers: Generic Syntax", RFC 2396, August
              1998.

8. Full Copyright Statement

   Copyright (C) The Internet Society (1999). All Rights Reserved.

   This document and translations of it may be copied and furnished to
   others, and derivative works that comment on or otherwise explain it
   or assist in its implementation may be prepared, copied, published
   and distributed, in whole or in part, without restriction of any
   kind, provided that the above copyright notice and this paragraph are
   included on all such copies and derivative works. However, this
   document itself may not be modified in any way, such as by removing
   the copyright notice or references to the Internet Society or other
   Internet organizations, except as needed for the purpose of
   developing Internet standards in which case the procedures for
   copyrights defined in the Internet Standards process must be
   followed, or as required to translate it into languages other than
   English.

   The limited permissions granted above are perpetual and will not be
   revoked by the Internet Society or its successors or assigns.

   This document and the information contained herein is provided on an
   "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING
   TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING
   BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION
   HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF
   MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

   Funding for the RFC Editor function is currently provided by the
   Internet Society.