Essential correction for IPv6 ABNF in RFC3261
draft-gurbani-sip-ipv6-abnf-fix-00

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Abstract

This memo corrects the Augmented Backus-Naur Form (ABNF) production rule associated with generating IPv6 literals in RFC3261
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1. Terminology

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.

2. Problem statement

The ABNF in RFC3261 is incorrect. When generating IPv4-mapped IPv6 addresses, the production rule may actually generate the following construct:

[2001:db8::192.0.2.1] - Note the extra colon before the IPv4 address.

The correct construct, of course, would only include two colons before the IPv4 address.

Historically, the ABNF pertaining to IPv6 references in RFC3261 was derived from Appendix B of RFC 2373, which was flawed to begin with (see also RFC2373 errata at http://www.rfc-editor.org/cgi-bin/errataSearch.pl?rfc=2373.) RFC2373 has been subsequently obsoleted by RFC 4291.

The ABNF for IPv6 reference is reproduced from RFC3261 below:

```
IPv6reference  =  ":" IPv6address ""
IPv6address    =  hexpart [ ":" IPv4address ]
IPv4address    =  1*3DIGIT "." 1*3DIGIT "." 1*3DIGIT "." 1*3DIGIT
hexpart        =  hexseq / hexseq ":" [ hexseq ] / "::" [ hexseq ]
hexseq         =  hex4 *( ":" hex4)
hex4           =  1*4HEXDIG
```

Note that the ambiguity occurs in the "IPv6address" production rule where the "IPv4address" non-terminal is prefixed by ":" token. Because the "hexpart" production rule is defined such that two of its alternatives already include the ":" token, this may yield to the faulty construction of an IPv6-mapped IPv4 address with an extra colon when expanding those alternatives.

3. Resolution

The resolution to this ambiguity is simply to use the correct ABNF for the "IPv6address" production rule from Appendix A of RFC3986. For the sake of completeness, it is reproduced below:
IPv6address = 6( h16 "::" ) ls32
   / "::" 5( h16 "::" ) ls32
   / [ h16 ] "::" 4( h16 "::" ) ls32
   / [ *1( h16 "::" ) h16 ] "::" 3( h16 "::" ) ls32
   / [ *2( h16 "::" ) h16 ] "::" 2( h16 "::" ) ls32
   / [ *3( h16 "::" ) h16 ] "::" h16 : ls32
   / [ *4( h16 "::" ) h16 ] "::" ls32
   / [ *5( h16 "::" ) h16 ] "::" h16
   / [ *6( h16 "::" ) h16 ] "::"

h16 = 1*4HEXDIG
ls32 = ( h16 "::" h16 ) / IPv4address
IPv4address = dec-octet "." dec-octet "." dec-octet "." dec-octet
dec-octet = DIGIT ; 0-9
   / %x31-39 DIGIT ; 10-99
   / "1" 2DIGIT ; 100-199
   / "2" %x30-34 DIGIT ; 200-249
   / "25" %x30-35 ; 250-255

Accordingly, following the SIP essential corrections process [7],
this memo RECOMMENDS that the "IPv6address" and "IPv4address"
production rules be deleted from RFC3261 and replaced with the
production rules of the same name in RFC3986 (and reproduced above.)
These changes, when made to RFC3261, will make "hexpart", "hexseq",
and "hex4" production rules obsolete. Thus this memo RECOMMENDS that
the "hexpart", "hexseq", and "hex4" production rules be deleted from
the ABNF of RFC3261.

4. Security Considerations

This document does not introduce any new security considerations.

5. IANA Considerations

This document does not include any IANA considerations.

6. Acknowledgments

The correct ABNF for IPv6 was developed by Andrew Main
(draft-main-ipaddr-text-rep) in 2005 and published in RFC3986.

7. References
7.1. Normative References


7.2. Informative References


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