                    IANA Allocation Guidelines For Values In
                   the Internet Protocol and Related Headers

Status of this Memo

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Abstract

   This memo provides guidance for the IANA to use in assigning
   parameters for fields in the IPv4, IPv6, ICMP, UDP and TCP protocol
   headers.

1. Introduction

   For many years the Internet Assigned Numbers Authority (IANA)
   (www.iana.org) has allocated parameter values for fields in protocols
   which have been created or are maintained by the Internet Engineering
   Task Force (IETF). Starting a few years ago the IETF began to
   provide the IANA with guidance for the assignment of parameters for
   fields in newly developed protocols. Unfortunately this type of
   guidance was not consistently provided for the fields in protocols
   developed before 1998. This memo attempts to codify existing IANA
   practice used in the assignment of parameters in the specific case of
   some of these protocols. It is expected that additional memos will
   be developed in the future to codify existing practice in other
   cases.

   This memo addresses the fields within the IPv4, IPv6, ICMP, UDP and
   TCP protocol headers for which the IANA assigns values.

   The terms "Specification Required", "Expert Review", "IESG Approval",
   "IETF Consensus", and "Standards Action", are used in this memo to
   refer to the processes described in [CONS].

2. Temporary Assignments

   From time to time temporary assignments are made in the values for
   fields in these headers for use in experiments. IESG Approval is
   required for any such temporary assignments.

3. Version field in the IP header.

   The first field in the IP header of all current versions of IP is the
   Version field. New values in the Version field define new versions
   of the IP protocol and are allocated only after an IETF Standards
   Action. It should be noted that some of the Version number bits are
   used by TCP/IP header compression schemes. Specifically, the hi-order
   bit of the Version field is also used by TCP/IP header compression
   [HC], while the three hi-order bits are used by IP Header Compression
   [IPHC].

4. IANA Considerations for fields in the IPv4 header

   The IPv4 header [V4] contains the following fields that carry values
   assigned by the IANA: Version, Type of Service, Protocol, Source
   Address, Destination Address, and Option Type.

4.1 IPv4 IP Version field

   The IPv4 Version field is always 4.

4.2 IPv4 Type of Service field

   The Type of Service field described in [V4] has been superseded[DIFF]
   by the 6-bit Differentiated Services (DS) field and a 2-bit field
   which is currently reserved. The IANA allocates values in the DS
   field following the IANA Considerations section in [DIFF]. [ECN]
   describes an experimental use of the 2-bit "currently unused" field.
   Other experimental uses of this field may be assigned after IESG
   Approval processes. Permanent values in this field are allocated
   following a Standards Action process.

4.3 IPv4 Protocol field

   IANA allocates values from the IPv4 Protocol name space following an
   Expert Review, IESG Approval or Standards Action process. The Expert
   Review process should only be used in those special cases where non-
   disclosure information is involved. In these cases the expert(s)
   should be designated by the IESG.

4.4 IPv4 Source and Destination addresses

   The IPv4 source and destination addresses use the same namespace but
   do not necessarily use the same values. Values in these fields fall
   into a number of ranges defined in [V4] and [MULT].

4.4.1 IPv4 Unicast addresses

   The Internet Corporation for Assigned Names and Numbers (ICANN)
   recently accepted responsibility for the formulation of specific
   guidelines for the allocation of the values from the IPv4 unicast
   address space (values 0.0.0.0 through 223.255.255.255) other than
   values from the ranges 0/8 (which was reserved in [AN80]) and 127/8
   (from which the loopback address has been taken) along with other
   values already assigned by the IETF for special functions or
   purposes. (For example, the private addresses defined in RFC 1918.)
   Further assignments in the 0/8 and 127/8 ranges require a Standards
   Action process since current IP implementations may break if this is
   done.

4.4.2 IPv4 Multicast addresses

   IPv4 addresses that fall in the range from 224.0.0.0 through
   239.255.255.255 are known as multicast addresses. The IETF through
   its normal processes has assigned a number of IPv4 multicast
   addresses for special purposes. For example, [ADSCP] assigned a
   number of IPv4 multicast address to correspond to IPv6 scoped
   multicast addresses. Also, the values in the range from 224.0.0.0 to
   224.0.0.255 , inclusive, are reserved by the IANA for the use of
   routing protocols and other low-level topology discovery or
   maintenance protocols, such as gateway discovery and group membership
   reporting. (See the IANA web page) New values in this range are
   assigned following an IESG Approval or Standards Action process.
   Assignments of individual multicast address follow an Expert Review,
   IESG Approval or Standards Action process. Until further work is
   done on multicast protocols, large-scale assignments of IPv4
   multicast addresses is not recommended.

   From time to time, there are requests for temporary assignment of
   multicast space for experimental purposes. These will originate in
   an IESG Approval process and should be for a limited duration such as
   one year.

4.4.3 IPv4 Reserved addresses

   IPv4 addresses in the range from 240.0.0.0 through 255.255.255.254
   are reserved [AN81, MULT] and compliant IPv4 implementations will
   discard any packets that make use of them. Addresses in this range

are not to be assigned unless an IETF Standards Action modifies the
IPv4 protocol in such a way as to make these addresses valid.
Address 255.255.255.255 is the limited broadcast address.

4.5 IPv4 Option Type field

The IANA allocates values from the IPv4 Option Type name space
following an IESG Approval, IETF Consensus or Standards Action
process.

5. IANA Considerations for fields in the IPv6 header

The IPv6 header [V6] contains the following fields that carry values
assigned from IANA-managed name spaces: Version (by definition always
6 in IPv6), Traffic Class, Next Header, Source and Destination
Address. In addition, the IPv6 Hop-by-Hop Options and Destination
Options extension headers include an Option Type field with values
assigned from an IANA-managed name space.

5.1 IPv6 Version field

The IPv6 Version field is always 6.

5.2 IPv6 Traffic Class field

The IPv6 Traffic Class field is described in [DIFF] as a 6- bit
Differentiated Services (DS) field and a 2-bit field which is
currently reserved. See Section 4.2 for assignment guidelines for
these fields.

5.3 IPv6 Next Header field

The IPv6 Next Header field carries values from the same name space as
the IPv4 Protocol name space. These values are allocated as discussed
in Section 4.3.

5.4 IPv6 Source and Destination Unicast Addresses

The IPv6 Source and Destination address fields both use the same
values and are described in [V6AD]. The addresses are divided into
ranges defined by a variable length Format Prefix (FP).

5.4.1 IPv6 Aggregatable Global Unicast Addresses

The IANA was given responsibility for all IPv6 address space by the
IAB in [V6AA]. Recently the IANA agreed to specific guidelines for
the assignment of values in the Aggregatable Global Unicast Addresses
FP (FP 001) formulated by the Regional Internet Registries.

5.4.2 IPv6 Anycast Addresses

   IPv6 anycast addresses are defined in [V6AD]. Anycast addresses are
   allocated from the unicast address space and anycast addresses are
   syntactically indistinguishable from unicast addresses. Assignment
   of IPv6 Anycast subnet addresses follows the process described in
   [V6AD]. Assignment of other IPv6 Anycast addresses follows the
   process used for IPv6 Aggregatable Global Unicast Addresses.
   (section 5.4.1)

5.4.3 IPv6 Multicast Addresses

   IPv6 multicast addresses are defined in [V6AD]. They are identified
   by a FP of 0xFF. Assignment guidelines for IPv6 multicast addresses
   are described in [MASGN].

5.4.4 IPv6 Unassigned and Reserved IPv6 Format Prefixes

   The responsibility for assigning values in each of the "unassigned"
   and "reserved" Format Prefixes is delegated by IESG Approval or
   Standards Action processes since the rules for processing these
   Format Prefixes in IPv6 implementations have not been defined.

5.5 IPv6 Hop-by-Hop and Destination Option Fields

   Values for the IPv6 Hop-by-Hop Options and Destination Options fields
   are allocated using an IESG Approval, IETF Consensus or Standards
   Action processes.

5.6 IPv6 Neighbor Discovery Fields

   The IPv6 Neighbor Discovery header [NDV6] contains the following
   fields that carry values assigned from IANA- managed name spaces:
   Type, Code and Option Type.

   Values for the IPv6 Neighbor Discovery Type, Code, and Option Type
   fields are allocated using an IESG Approval or Standards Action
   process.

6. IANA Considerations for fields in the IPv4 ICMP header

   The IPv4 ICMP header [ICMP] contains the following fields that carry
   values assigned from IANA-managed name spaces: Type and Code. Code
   field values are defined relative to a specific Type value.

   Values for the IPv4 ICMP Type fields are allocated using an IESG
   Approval or Standards Action processes. Code Values for existing IPv4
   ICMP Type fields are allocated using IESG Approval or Standards

Action processes. The policy for assigning Code values for new IPv4
ICMP Types should be defined in the document defining the new Type
value.

7. IANA Considerations for fields in the IPv6 ICMP header

   The IPv6 ICMP header [ICMPV6] contains the following fields that
   carry values assigned from IANA-managed name spaces: Type and Code.
   Code field values are defined relative to a specific Type value.

   Values for the IPv6 ICMP Type fields are allocated using an IESG
   Approval or Standards Action processes. Code Values for existing IPv6
   ICMP Type fields are allocated using IESG Approval or Standards
   Action processes. The policy for assigning Code values for new IPv6
   ICMP Types should be defined in the document defining the new Type
   value.

8. IANA Considerations for fields in the UDP header

   The UDP header [UDP] contains the following fields that carry values
   assigned from IANA-managed name spaces: Source and Destination Port.

   Both the Source and Destination Port fields use the same namespace.
   Values in this namespace are assigned following a Specification
   Required, Expert Review, IESG Approval, IETF Consensus, or Standards
   Action process. Note that some assignments may involve non-
   disclosure information.

9. IANA Considerations for fields in the TCP header

   The TCP header [TCP] contains the following fields that carry values
   assigned from IANA-managed name spaces: Source and Destination Port,
   Reserved Bits, and Option Kind.

9.1 TCP Source and Destination Port fields

   Both the Source and Destination Port fields use the same namespace.
   Values in this namespace are assigned following a Specification
   Required, Expert Review, IESG Approval, IETF Consensus, or Standards
   Action process. Note that some assignments may involve non-
   disclosure information.

9.2 Reserved Bits in TCP Header

   The reserved bits in the TCP header are assigned following a
   Standards Action process.

9.3 TCP Option Kind field

   Values in the Option Kind field are assigned following an IESG
   Approval or Standards Action process.

10. Security Considerations

   Security analyzers such as firewalls and network intrusion detection
   monitors often rely on unambiguous interpretations of the fields
   described in this memo. As new values for the fields are assigned,
   existing security analyzers that do not understand the new values may
   fail, resulting in either loss of connectivity if the analyzer
   declines to forward the unrecognized traffic, or loss of security if
   it does forward the traffic and the new values are used as part of an
   attack. This vulnerability argues for high visibility (which the
   Standards Action and IETF Consensus processes ensure) for the
   assignments whenever possible.

11. References

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