

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

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Abstract

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

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[1](#). Introduction

For many years the Internet Assigned Numbers Authority (IANA) (www.iana.org) has allocated parameter values for fields in the network 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, TCP, UDP, ICMP and IPv6 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. IANA Considerations for fields in the IPv4 header

The IPv4 header [[V4](#)] contains the following fields that carry values assigned by the IANA: Version (by definition always 4 in IPv4), Type of Service, Protocol, Source Address, Destination Address, and Option Type.

3.1 IPv4 IP Version field

The IANA allocates values from the IP Version name space following a Standards Action process.

3.2 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The Type of Service field described in [[V4](#)] has been superseded [[DIFF](#)] by the 6-bit Differentiated Services (DS) field and a 2-bit "currently unused" field. 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 are assigned after IESG Approval processes. Permanent values in this field are allocated following a Standards Action process.

3.3 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 should be designated by the IESG.

3.4 IPv4 Source and Destination addresses

The IPv4 source and destination addresses use the same values. These values fall into a number of ranges defined in [\[V4\]](#) and [\[MULT\]](#).

3.4.1 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.

3.4.2 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 has assigned a number of IPv4 multicast addresses for special purposes. For example, the values in the range from 224.0.0.0 to 224.0.0.255 , inclusive, are reserved 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.

3.4.3 IPv4 Reserved addresses

IPv4 addresses in the range from 240.0.0.0 through 247.255.255.255 are reserved [\[MULT\]](#) 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.

3.5 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.

4. 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.

4.1 IPv6 Version field

The Version field in the IPv6 header uses the same name space as the Version field in the IPv4 header. Values in this field are allocated as described in [Section 3.1](#).

4.2 IPv6 Traffic Class field

The IPv6 Traffic Class uses the same namespace as the IPv4 6-bit DS field and 2-bit unused field. Values in these fields are allocated as described in [Section 3.2](#).

4.3 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 3.3](#).

4.4 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).

4.4.1 IPv4 Aggregatable Global Unicast Addresses

The Internet Corporation for Assigned Names and Numbers (ICANN) recently accepted responsibility for the formulation of specific guidelines for the assignment of values in the Aggregatable Global Unicast Addresses FP (FP 001).

4.4.2 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 addresses follows the process used for IPv6 Aggregatable Global Unicast Addresses. ([section 4.4](#))

4.4.3 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](#)].

4.4.4 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 processing rules for these Format Prefixes have not been defined.

4.5 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](#). IANA Considerations for fields in the ICMP header

The ICMP header [[ICMP](#)] contains the following fields that carry values assigned from IANA-managed name spaces: Type and Code.

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

[6](#). 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.

[7](#). 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.

7.1 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.

7.2 Reserved Bits in TCP Header

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

7.3 TCP Option Kind field

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

8. 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

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assignments whenever possible.

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