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Update to IANA Registration Procedures for Pool 3 Values in the Differentiated Services Field Codepoints (DSCP) Registry

Abstract

The Differentiated Services (Diffserv) architecture specifies use of the DS field in the IPv4 and IPv6 packet headers to carry one of 64 distinct differentiated services field codepoint (DSCP) values. The Internet Assigned Numbers Authority (IANA) maintains a registry of assigned DSCP values.

This update to RFC 2474 changes the IANA registration policy for Pool 3 of the registry (i.e., DSCP values of the form xxxx01) to Standards Action, i.e., values are assigned through a Standards Track or Best Current Practice RFC. The update also removes permission for experimental and local use of the codepoints that form Pool 3 of the DSCP registry; Pool 2 Codepoints (i.e., DSCP values of the form xxxx11) remain available for these purposes.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8436.

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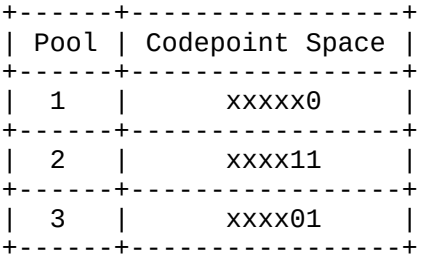
1. Introduction

The Differentiated Services (Diffserv) [RFC2475] architecture (updated by [RFC3260]) provides scalable service differentiation in the Internet. Diffserv uses the six most significant bits of the former IPv4 Type of Service (TOS) octet or the former IPv6 Traffic Class octet to convey the field, which is used to carry the DSCP. This DSCP value is used to select a Diffserv per-hop behavior (PHB).

The six-bit field is capable of conveying 64 distinct codepoints, and this codepoint space has been divided into three pools for the purpose of codepoint assignment and management (as shown in Figure 1). Pool 1 comprises 32 codepoints [RFC2474]. These are assigned by Standards Action, as defined in [RFC8126]. Pool 2 comprises a pool of 16 codepoints reserved for Experimental or Local Use (EXP/LU) as defined in [RFC2474]. Pool 3 comprises 16 codepoints, which were originally specified as "initially available for experimental or local use, but which should be preferentially utilized for standardized assignments if Pool 1 is ever exhausted" by [RFC2474].



Pool	Codepoint Space
1	xxxxx0
2	xxxx11
3	xxxx01

Figure 1: Format of the Field for Codepoints Allocated in the Three IANA Pools (Where "x" Refers to Either "0" or "1")

At the time of writing this document, 22 of the 32 Pool 1 codepoints have been assigned.

Although Pool 1 has not yet been completely exhausted, there is a need to assign codepoints for particular PHBs that are unable to use any of the unassigned values in Pool 1. This document changes the IANA registration policy of Pool 3 to assignment by Standards Action. (Section 4.9 of [RFC8126] defines this as "assigned only through Standards Track or Best Current Practice RFCs in the IETF Stream".)

An example is the need to assign a suitable recommended default codepoint for the Lower Effort (LE) PHB [LE-PHB]. The LE PHB is designed to protect best-effort (BE) traffic (packets forwarded with the default PHB) from LE traffic in congestion situations (when resources become scarce, best-effort traffic has precedence over LE traffic and is allowed to preempt it). In deployed networks, bleaching (i.e. intentionally setting to zero) of the IP Precedence field continues to be used. (Setting the IP Precedence field to zero disables any class-based flow management by routers configured with TOS-based packet processing.) This causes the first three bits of the former TOS byte (now the upper part of the DSCP field) to become zero. Therefore, there is a need to avoid this remapping of the DSCP for the LE PHB by assigning a codepoint that already has a zero value in the first three bits [LE-PHB].

Furthermore, if the LE PHB were to have been assigned one of the currently unused Pool 1 codepoints with a zero value in the first three bits, any bleaching of the IP Precedence field would result in other (higher assurance) traffic being also remapped to the assigned DSCP. This remapping could then cause Diffserv-marked traffic to receive an unintentional LE treatment for the remainder of the Internet path. Therefore, it is important to avoid the resulting priority inversion. The absence of unassigned codepoints in Pool 1 that exhibit these important properties motivates assigning a Pool 3 codepoint as the default that is recommended for use with this PHB.

To allow the IETF to utilize Pool 3 codepoints, this document requests IANA to manage Pool 3 assignments for DSCP values in Pool 3 via the Standards Action policy [RFC8126].

2. Terminology

This document assumes familiarity with the terminology used in [RFC2475] updated by [RFC3260].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. The Updates to RFC 2474

This document updates Section 6 of [RFC2474] in the following ways.

It updates the following text concerning the assignment policy:

OLD: which are initially available for experimental or local use, but which should be preferentially utilized for standardized assignments if Pool 1 is ever exhausted.

NEW: which are utilized for standardized assignments (replacing the previous availability for experimental or local use).

It removes the footnote in RFC 2474 relating to Pool 3:

DELETE: "(*) may be utilized for future Standards Action allocations as necessary"

The new registry assignment policy is shown in Figure 2.

Pool	Codepoint Space	Assignment Policy
1	xxxxx0	Standards Action
2	xxxx11	EXP/LU
3	xxxx01	Standards Action

Note for Pool 2: "Reserved for Experimental or Local Use"

Figure 2: Updated Assignment Policy for the DSCP Registry

4. Security Considerations

Security considerations for the use of DSCP values are described in the RFCs that define their usage. This document does not present new security considerations.

5. IANA Considerations

IANA has changed the use of Pool 3 in the "Differentiated Services Field Codepoints (DSCP)" registry and will manage this pool using Standards Action, as defined as Section 4.9 of [RFC8126].

IANA has made the following changes to the "Differentiated Services Field Codepoints (DSCP)" registry, made available at [Registry].

IANA has referenced RFC 2474 and Section 4 of RFC 3260 for the overall format of this registry.

IANA has referenced RFC 2474 and Section 4 of RFC 3260 for Pool 1.

This document does not modify the IANA registry text for Pool 2. This pool continues to preserve the note shown in Figure 2.

The previous registry text for Pool 3:

> 3 xxxx01 Experimental or local use may be utilized for future Standards Action allocations as necessary.

is replaced with the following registry text:

> 3 xxxx01 Standards Action.

To manage codepoints in Pool 3, IANA has created and will maintain the "DSCP Pool 3 Codepoints" subregistry. Pool 3 of the registry has been created initially empty, with a format identical to that used for "DSCP Pool 1 Codepoints".

IANA has referenced RFC 2474, Section 4 of RFC 3260, and the current document for Pool 3.

The registration procedure for use of Pool 3 is Standards Action, as defined as Section 4.9 of [RFC8126]. IANA is expected to normally make assignments from Pool 1, until this Pool is exhausted, but it MAY make assignments from Pool 3 when the format of the codepoint has properties that are needed for a specific PHB. The required characteristics for choosing a requested DSCP value MUST be explained in the IANA Considerations section of the document that requests any assignment from Pool 3.

6. References

6.1. Normative References

[Registry] IANA, "Differentiated Services Field Codepoints (DSCP)", <https://www.iana.org/assignments/dscp-registry/>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC2474] Nichols, K., Blake, S., Baker, F., and D. Black, "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", RFC 2474, DOI 10.17487/RFC2474, December 1998, <https://www.rfc-editor.org/info/rfc2474>.

[RFC3260] Grossman, D., "New Terminology and Clarifications for Diffserv", RFC 3260, DOI 10.17487/RFC3260, April 2002, <https://www.rfc-editor.org/info/rfc3260>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <https://www.rfc-editor.org/info/rfc8126>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

6.2. Informative References

[LE-PHB] Bless, R., "A Lower Effort Per-Hop Behavior (LE PHB)", Work in Progress, draft-ietf-tsvwg-le-phb-05, July 2018.

[RFC2475] Blake, S., Black, D., Carlson, M., Davies, E., Wang, Z., and W. Weiss, "An Architecture for Differentiated Services", RFC 2475, DOI 10.17487/RFC2475, December 1998, <https://www.rfc-editor.org/info/rfc2475>.

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