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## **Considerations for Assigning a new Recommended DiffServ Codepoint (DSCP)**

### **Abstract**

This document discusses considerations for assigning a new recommended DiffServ Code Point (DSCP). It considers the common remarking behaviours that the Diffserv field might be subjected to along an Internet path. It also notes some implications of using a specific DSCP.

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## Table of Contents

|  |  |
|--|--|
| <a href="#">1. Introduction</a>  |  |
| <a href="#">2. Requirements Language</a>   |  |
| <a href="#">3. Current usage of DSCPs</a>  |  |
| <a href="#">3.1. IP-Layer Semantics</a>  |  |
| <a href="#">3.2. Network Control Traffic</a>   |  |
| <a href="#">4. Remarking the DSCP</a>  |  |
| <a href="#">4.1. Bleaching the DSCP Field</a>  |  |
| <a href="#">4.2. IP Type of Service manipulations</a>                                  |  |
| <a href="#">4.2.1. Impact of ToS Precedence Bleaching</a>                              |  |
| <a href="#">4.2.2. Impact of ToS Precedence Remarking</a>                              |  |
| <a href="#">4.3. Remarking to a Particular DSCP</a>                                    |  |
| <a href="#">5. Interpretation of the IP DSCP at Lower Layers</a>                       |  |
| <a href="#">5.1. Mapping Specified for IEEE 802</a>                                    |  |
| <a href="#">5.1.1. Mapping Specified for IEEE 802.1</a>                                |  |
| <a href="#">5.1.2. Mapping Specified for IEEE 802.11</a>                               |  |
| <a href="#">5.2. Mappings Specified for MPLS</a>                                       |  |
| <a href="#">5.2.1. Mappings Specified for MPLS</a>                                     |  |
| <a href="#">5.2.2. Mappings Specified for MPLS Short Pipe</a>                          |  |
| <a href="#">5.3. Mapping Specified for Mobile Networks</a>                             |  |
| <a href="#">5.4. Mappings Specified for Carrier Ethernet</a>                           |  |
| <a href="#">5.5. Remarking as a Side-effect of Another Policy</a>                      |  |
| <a href="#">5.6. Summary</a>   |  |
| <a href="#">6. Considerations for DSCP Selection</a>                                   |  |
| <a href="#">6.1. Effect of Bleaching</a>   |  |
| <a href="#">6.2. Where the proposed DSCP &gt; 0x07 (7)</a>                             |  |
| <a href="#">6.3. Where the proposed DSCP &lt; 0x07 (7)</a>                             |  |
| <a href="#">6.3.1. Where the proposed DSCP &amp; 0x07 = 0x01</a>                       |  |
| <a href="#">6.4. Impact on deployed infrastructure</a>                                 |  |
| <a href="#">6.5. Questions to guide discussion of a proposed new DSCP</a>              |  |
| <a href="#">7. Acknowledgments</a>   |  |
| <a href="#">8. IANA Considerations</a>   |  |
| <a href="#">9. Security Considerations</a>   |  |
| <a href="#">10. References</a>   |  |
| <a href="#">10.1. Normative References</a>   |  |
| <a href="#">10.2. Informative References</a>   |  |
| <a href="#">Appendix A. Revision Notes</a>   |  |
| <a href="#">Appendix B. Table of DSCP Values</a>                                       |  |
| <a href="#">Appendix C. Example of operational practice and operator requirements.</a> |  |
| <a href="#">Authors' Addresses</a>   |  |

## 1. Introduction

The Differentiated Services (DiffServ) architecture has been deployed in many networks. It provides differentiated traffic forwarding based on the value of the Diffserv field [[RFC2474](#)] carried in the IP packet header.

Internet traffic can be associated with a service class, and categorised into Behavior Aggregates [[RFC4594](#)]. In IP networks, these are associated with a DiffServ Code Point (DSCP) [[RFC2474](#)]. Each DSCP is mapped to a Per Hop Behaviour (PHB). A treatment aggregate is concerned only with the forwarding treatment of the aggregated traffic, which could be marked with multiple DSCPs [[RFC5127](#)]. Treatment differentiation can be realised using a variety of schedulers and queues, and also by algorithms that implement access to the physical media.

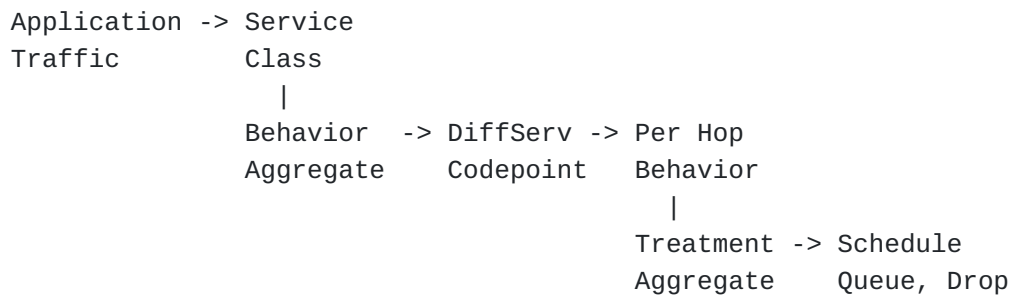


Figure showing the role of DSCPs in classifying IP traffic for differential network treatment.

This document discusses considerations for assigning a new DSCP. It considers some commonly observed DSCP remarking behaviours that might be experienced along an Internet path. It also describes some packet forwarding treatments that a packet with a specific DSCP can expect to receive when forwarded across a link or subnetwork.

The document is motivated by new opportunities to use DiffServ end-to-end across multiple domains, such as [[I-D.ietf-tsvwg-nqb](#)], proposals to build mechanisms using DSCPs in other standards-setting organisations, and the desire to use a common set of DSCPs across a range of infrastructure (e.g., [[RFC8622](#)], [[I-D.ietf-tsvwg-nqb](#)], [[I-D.learmonth-rfc1226-bis](#)]).

## 2. Requirements Language

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](#) [[RFC2119](#)].

### 3. Current usage of DSCPs

This section describes current usage of DSCPs.

#### 3.1. IP-Layer Semantics

The DiffServ architecture specifies use of the Diffserv field in the IPv4 and IPv6 packet headers to carry one of 64 distinct DSCP values. Within a given administrative boundary, each DSCP value can be mapped to a distinct PHB [[RFC2474](#)]. When a new PHB is standardized, a recommended DSCP value among those 64 values is normally reserved for that PHB.

The DSCP space is divided into three pools for the purpose of assignment and management [[DSCP-registry](#)]. The pools are defined in the following table (where 'x' refers to either a bit position with value '0' or '1').

**DSCP Pool 1** A pool of 32 codepoints with a format 0bxxxxx0, to be assigned by IANA Standards Action [[RFC8126](#)].

**DSCP Pool 2** A pool of 16 codepoints with a format 0bxxxx11, reserved for experimental or local (private) use by network operators (see sections 4.1 and 4.2 of [[RFC8126](#)]).

**DSCP Pool 3** A pool of 16 codepoints with a 0bxxxx01. This was initially available for experimental or local use, but which was originally specified to be preferentially utilised for standardized assignments if Pool 1 is ever exhausted. Pool 3 codepoints are now utilised for standardized assignments and are no longer available for experimental or local use [[RFC8436](#)].

The DiffServ architecture allows forwarding treatments to be associated with each DSCP, and the RFC series describes some of these as PHBs. Although DSCPs are intended to identify specific treatment requirements, multiple DSCPs might also be mapped (aggregated) to the same forwarding treatment. Several IP standards map treatment aggregates to DSCPs, that might result in remarking: [RFC5160](#) [[RFC5160](#)] suggests Meta-QoS-Classes to help enable deployment of standardized end-to-end QoS classes.

Note: A DSCP is sometimes referred to by name, such as "CS1", and sometimes by a decimal, hex, or binary value [[DSCP-registry](#)].

#### 3.2. Network Control Traffic

Network Control Traffic is defined as packet flows that are essential for stable operation of the administered network (see [[RFC4594](#)], Section 3). This traffic is marked using a set of Class Selector (CS) DSCPs. Such network control traffic is often a special

case within a provider network, and ingress traffic with these DSCP markings can be remarked.

DSCP CS2 is recommended for the OAM (Operations, Administration, and Maintenance) service class (see [\[RFC4594\]](#), Section 3.3).

The DSCP CS6 is recommended for local network control traffic. This includes routing protocols and OAM traffic that are essential to network operation administration, control and management. Section 3.2 of [RFC4594](#) [\[RFC4594\]](#) recommends that "CS6 marked packet flows from untrusted sources (for example, end user devices) SHOULD be dropped or remarked at ingress to the DiffServ network".

DSCP CS7 is reserved for future use by network control traffic. "CS7 marked packets SHOULD NOT be sent across peering points" [\[RFC4594\]](#).

#### 4. Remarking the DSCP

It is a feature of the DiffServ architecture that the Diffserv field of packets can be remarked at domain boundaries (see section 2.3.4.2 of [RFC2475](#) [\[RFC2475\]](#)). A DSCP can be remarked at the ingress of a DiffServ domain. This can be with or without restoring the initial DSCP marking at the egress of the same domain. The Diffserv field can also be re-marked based upon common semantics and agreements between providers at an exchange point.

If packets are received that are marked with an unknown or an unexpected DSCP, [RFC2474](#) [\[RFC2474\]](#) recommends forwarding the packet using a default (best effort) treatment, but without changing the DSCP. This seeks to support incremental DiffServ deployment in existing networks as well as preserving DSCP markings by routers that have not been configured to support DiffServ. (See also [Section 4.3](#)).

Reports measuring existing deployments have categorised DSCP remarking [\[Custura\]](#) [\[Barik\]](#) into the following five behaviours:

**Bleach:** bleaches all traffic (sets the DSCP to zero);

**Bleach-ToS-Precedence:** set the first three bits of the DSCP field to 0b000 (reset the 3 bits of the former ToS Precedence field) ;

**Bleach-some-ToS:** set the first three bits of the DSCP field to 0b000 (reset the 3 bits of the former ToS Precedence field), unless the first two bits of the DSCP field are 0b11;

**Remark-ToS:** set the first three bits of the DSCP field to any value different than 0b000 (replace the 3 bits of the former ToS Precedence field);

**Bleach-low:**

set the last three bits of the DSCP field to 0b000;

**Bleach-some-low:** set the last three bits of the DSCP field to 0b000, unless the first two bits of the DSCP field are 0b11;

**Remark:** remarks all traffic to one or more particular (non-zero) DSCP values.

**4.1. Bleaching the DSCP Field**

A specific form of remarking occurs when the DiffServ field is re-assigned to the default treatment, CS0 (0x00). This results in traffic being forwarded using the BE PHB. For example, AF31 (0x1a) would be bleached to CS0.

Resetting all the bits of the DiffServ field to 0 is more prevalent at the edge of the network, and rather less common in core networks [[Custura](#)].

**4.2. IP Type of Service manipulations**

The IETF first defined ToS precedence for IP packets [[RFC0791](#)], updated by specification as a part of the ToS Field [RFC1349](#) [[RFC1349](#)]. Since 1998, this practice has been deprecated by [RFC2474](#) [[RFC2474](#)]. RFC 2474 defines codepoints 0x xxx000 as the Class Selector codepoints, where PHBs selected by these codepoints MUST meet the Class Selector PHB Requirements" described in Sec. 4.2.2.2 of that RFC.

However, practices based on ToS semantics have not yet been eliminated from Internet, and need to still be considered when making new DSCP assignments.

**4.2.1. Impact of ToS Precedence Bleaching**

ToS Precedence Bleaching (/Bleach-ToS-Precedence/) is a practice that resets to zero the upper 3 bits of the DSCP field (the former ToS Precedence field), leaving the lower bits unchanged (see section 4.2.1 of [RFC2474](#) [[RFC2474](#)]). This behaviour is distinctive of non-DiffServ aware routers and one of the more common manipulations of the DiffServ field.

```

+-+--+--+--+
|0 0 0|x x x|
+-+--+--+--+

```

Figure showing the ToS Precedence Bleaching (/Bleach-ToS-Precedence/) pathology, based on Section 3 of [RFC1349](#) [[RFC1349](#)].

If ToS Precedence Bleaching occurs, packets with a DSCP 'x' would be remarked and then would be treated according to the PHB specified for 'x' & 0x07. For example, AF31 (0x1a) would be remarked to DSCP 2 (0x02).

A variation of this behaviour clears the top three bits of a DSCP, unless these have values 0b110 or 0b111 (corresponding to the CS6 and CS7 codepoints). As a result, a DSCP value greater than 48 decimal (0x30) is less likely to be impacted by ToS Precedence Bleaching.

#### 4.2.2. Impact of ToS Precedence Remarking

Practices based on ToS Precedence Remarking (/Remark-ToS/) [RFC1349](#) [[RFC1349](#)] were deprecated by [RFC2474](#) [[RFC2474](#)]. These practices based on ToS semantics have not yet been eliminated from deployed networks.

```
+--+--+--+--+
|0 0 1|x x x|
+--+--+--+--+
```

Figure showing an example of ToS Remarking (/Remark/) pathology, based on Section 3 of [RFC1349](#) [[RFC1349](#)].

A less common behaviour, ToS precedence remarking sets the upper three bits of the DSCP field to a non-zero value corresponding to a CS PHB. This behaviour is distinctive of non-DiffServ aware routers.

If remarking occurs, packets are treated using the PHB specified for the resulting codepoint. For example, the AF31 DSCP (0x1a) could be remarked to either AF11 or AF21.

#### 4.3. Remarking to a Particular DSCP

A network device might remark the Diffserv field of an IP packet based on a local policy with a specific (set of) DSCPs, /Remark/. This is sometimes performed using a Multi-Field (MF) classifier [[RFC2475](#)] [[RFC3290](#)] [[RFC4594](#)]. For example, a common behaviour is to mark all traffic to a single DSCP, thus removing any traffic differentiation (see [Section 4.1](#)). Bleaching (/Bleach/) is a specific example of this that remarks to CS0 (0x00).

In another example, some networks do not follow the recommendation in [RFC2475](#) [[RFC2475](#)], and instead remark packets with an unknown or unexpected DSCP to the default class, CS0 (0x00) to ensure that appropriate DSCPs are used within a DiffServ domain. (e.g., see [[RFC8100](#)]).

## 5. Interpretation of the IP DSCP at Lower Layers

Transmission systems and subnetworks can, and do, utilise the Diffserv field in an IP packet to select a lower layer forwarding treatment. In many cases, this use is constrained by designs that utilise fewer than 6 bits to express the service class, and therefore infer mappings to a smaller L2 QoS field, for example, WiFi or Multi-Protocol Label Switching (MPLS).

### 5.1. Mapping Specified for IEEE 802

<< This section is currently seeking more input. >>

#### 5.1.1. Mapping Specified for IEEE 802.1

A 3-bit Priority Code Point (PCP) is specified in the IEEE 802.1Q tag to mark Ethernet frames to one of eight priority values [[IEEE-802-1Q](#)]. The value zero indicates the default best effort treatment, and the value one indicates a background traffic class. The remaining values indicate increasing priority. Internet control traffic can be marked as six, and network control is marked as seven.

The mapping specified in [[IEEE-802-1Q](#)] revises a previous standard [[IEEE-802-1D](#)], in an effort to align with Diffserv practice: the traffic types are specified to match the first three bits of a suitable DSCP (for example, Voice, which has PCP value 5, matches the first three bits of EF). However, [[IEEE-802-1D](#)] maps both PCP1 (Background) and PCP2 (Spare) to indicate lower priority than PCP0, RFC 8622. Therefore, different behaviour is expected depending on the age of deployed devices.

#### 5.1.2. Mapping Specified for IEEE 802.11

Section 6 of [RFC 8325](#) [[RFC8325](#)] provides a brief overview of IEEE 802.11 QoS. The IEEE [802.11 standards](#) [[IEEE-802-11](#)] provide MAC functions to support QoS in WLANs using Access Classes (AC). The upstream User Priority (UP) in the 802.11 header has a 3-bit QoS value. A DSCP can be mapped to the UP. Most existing WiFi implementations [[RFC8325](#)] use a default mapping that utilises the three most significant bits of the DiffServ Field to the 802.11 UP. This is then in turn mapped to the four WiFi Multimedia (WMM) Access Categories.

```
+--+--+--+--+
|x x x|. . .|
+--+--+--+--+
```

Figure showing the DSCP bits commonly mapped to the UP in 802.11.



[RFC8325](#) [[RFC8325](#)] notes inconsistencies that can result from such remarking, and recommends how to perform this remarking. It proposes several recommendations for mapping a DSCP to an IEEE 802.11 UP for wired-to-wireless interconnection. The recommendation includes mapping network control traffic CS6 and CS7, as well unassigned codepoints, to UP 0.

In the upstream direction (wireless-to-wired interconnections, this mapping can result in a specific DSCP remarking pathology. Some Access Points (APs) currently use a default UP-to-DSCP mapping [RFC8325](#) [[RFC8325](#)], wherein "DSCP values are derived from the layer 2 UP values by multiplying the UP values by eight (i.e., shifting the three UP bits to the left and adding three additional zeros to generate a 6 bit DSCP value). This derived DSCP value is then used for QoS treatment between the wireless AP and the nearest classification and marking policy enforcement point (which may be the centralized wireless LAN controller, relatively deep within the network). Alternatively, in the case where there is no other classification and marking policy enforcement point, then this derived DSCP value will be used on the remainder of the Internet path." This behaviour can result in remarking /Reset-low/.

```
+--+--+--+--+
|x x x|0 0 0|
+--+--+--+--+
```

Figure showing the pathology resulting from deriving from UP-to-DSCP mapping in some 802.11 networks.

An alternative to UP-to-DSCP remapping is using the DSCP value of a downstream IP packet (e.g., the Control And Provisioning of Wireless Access Points (CAPWAP) protocol, RFC5415, maps an IP packet Diffserv field to the Diffserv field of outer IP header in a CAPWAP tunnel).

Some current constraints of WiFi mapping are discussed in section 2 of [RFC8325](#). A QoS profile can be used to limit the maximum DSCP value used for the upstream and downstream traffic.

## 5.2. Mappings Specified for MPLS

<< This section is currently seeking more input. >>

Multi-Protocol Label Switching (MPLS) specified eight MPLS Traffic Classes (TCs), which restricts the number of different treatments (e.g., see [RFC5129](#)). RFC 5127 describes aggregation of DiffServ TCs [RFC5127](#), and introduces four DiffServ Treatment Aggregates. Traffic marked with multiple DSCPs can be forwarded in a single MPLS TC.

There are three Label-Switched Router (LSR) behaviors: the Pipe, the Short Pipe and the Uniform Model [[RFC3270](#)]. These only differ when a LSP performs a push or a pop.

#### 5.2.1. Mappings Specified for MPLS

[RFC3270](#) [[RFC3270](#)] defines a flexible solution for support of DiffServ over MPLS networks. This allows an MPLS network administrator to select how BAS (marked by DSCPs) are mapped onto Label Switched Paths (LSPs) to best match the DiffServ, Traffic Engineering and protection objectives within their particular network.

Mappings from the IP DSCP to the MPLS header are defined in Section 4.2 of [[RFC3270](#)].

Using the Pipe Model, the "LSP Diff-Serv Information" is conveyed to the LSP Egress so that its forwarding treatment can be based on the IP DSCP.

When Penultimate Hop Popping (PHP) is used, the Penultimate LSR needs to be aware of the set of PHB to encapsulation mappings for the label corresponding to the exposed header to perform DiffServ Information Encoding (Section 2.5.2 of [RFC3270](#) [[RFC3270](#)]).

#### 5.2.2. Mappings Specified for MPLS Short Pipe

<< This section is currently seeking more input. >>

The Short Pipe Model is an optional variation of the Pipe Model [[RFC3270](#)].

ITU-T [Y.1566](#) [[ITU-T-Y-1566](#)] further defined a set of four common QoS classes and four auxiliary classes to which a DSCP can be mapped when interconnecting Ethernet, IP and MPLS networks. [RFC8100](#) [[RFC8100](#)] proposes four treatment aggregates for interconnection with four defined DSCPs. This was motivated by the requirements of MPLS network operators that use Short-Pipe tunnels, but can be applicable to other networks, both MPLS and non-MPLS.

RFC8100 recommends preserving the notion of end-to-end service classes, and recommends that the original DSCP marking is not changed when treatment aggregates are used. The key requirement is that the DSCP at the network ingress is restored at the network egress. This is only feasible in general for a small number of DSCPs. In this design, packets marked with other DSCPs can be re-marked (This can result in the /Remark/ behaviour) or dealt with via an additional agreement(s) among the operators of the interconnected networks. Use of the MPLS Short Pipe Model favours re-marking unexpected DSCP values to zero in the absence of an additional

agreement(s), as explained in [RFC8100](#) [[RFC8100](#)]. This can result in bleaching (/Bleach/).

|                                       |        |
|---------------------------------------|--------|
| +-----+-----+                         |        |
| RFC8100                               | DSCP   |
| Agg. Class                            |        |
| +-----+-----+                         |        |
| Telephony Service Treatment Aggregate | EF     |
|                                       | VA     |
| +-----+-----+                         |        |
| Bulk Real-Time Treatment Aggregate    | AF41   |
| May be added                          | (AF42) |
| May be added                          | (AF43) |
| +-----+-----+                         |        |
| Assured Elastic Treatment Aggregate   | AF31   |
|                                       | AF32   |
| Reserved for the extension of PHBs    | (AF33) |
| +-----+-----+                         |        |
| Default / Elastic Treatment Aggregate | BE/CS0 |
| +-----+-----+                         |        |
| Network Control: Local Use            | CS6    |
| +-----+-----+                         |        |

Figure showing the short-pipe MPLS mapping from RFC 8100.

### 5.3. Mapping Specified for Mobile Networks

<< This section is currently seeking more input. >>

Mobile LTE and 5G standards have evolved from older UMTS standards, and are Diffserv aware. LTE (4G) and 5G standards [[SA-5G](#)] identify traffic classes at the interface between User Equipment (UE) and the mobile Packet Core network by QCI (QoS Class Identifiers) and 5QI (5G QoS Identifier). The 3GPP standards do not define or recommend any specific mappings between each QCI or 5QI and Diffserv (and mobile QCIs are based on several criteria service class definitions). The way packets are mapped at the Packet Gateway (P-GW) boundary is determined by operators. However, TS 23.107 (version 16.0.0, applies to LTE and below) mandates that Differentiated Services, defined by IETF, shall be used to interoperate with IP backbone networks.

The GSM Association (GSMA) has defined four aggregated classes and seven associated PHBs in their guidelines for IPX Provider networks [GSMA IR.34](#) [[GSMA-IR-34](#)]. This was previously specified as the Inter-Service Provider IP Backbone Guidelines, and provides a mobile ISP to ISP QoS mapping mechanism, and interconnection with other IP networks in the general Internet. This describes the case where the

DSCP marking from a Service Provider cannot be trusted (depending on the agreement between the Service Provider and its IPX Provider), allowing the IPX Provider to correct the DSCP value to a static default value.

|                |      |  |
|----------------|------|--|
| +-----+-----+  |      |  |
| GSMA IR.34     | PHB  |  |
| Agg. Class     |      |  |
| +-----+-----+  |      |  |
| Conversational | EF   |  |
| +-----+-----+  |      |  |
| Streaming      | AF41 |  |
| +-----+-----+  |      |  |
| Interactive    | AF31 |  |
| +-----+-----+  |      |  |
| (ordered by    | AF32 |  |
| +-----+-----+  |      |  |
| priority,      | AF21 |  |
| +-----+-----+  |      |  |
| AF3 highest)   | AF11 |  |
| +-----+-----+  |      |  |
| Background     | CS0  |  |
| +-----+-----+  |      |  |

Figure showing the PHB mapping from [GSMA IR.34](#) [[GSMA-IR-34](#)].

#### 5.4. Mappings Specified for Carrier Ethernet

<< This section is currently seeking more input. >>

Metro Ethernet Forum (MEF) provides mappings of DSCP codepoints at the IP layer to quality of service markings in the Ethernet frame headers [MEF 23.1](#) [[MEF23.1](#)].

#### 5.5. Remarking as a Side-effect of Another Policy

The result of applying a QoS policy (such as matching the IP address, or traffic reaching a rate limit) could also result in a packet being remarked to a different DSCP (/Remark/) when it is not admitted to a service. Traffic marked with an EF and VA DSCP are often policed by such policies.

Policies and L2 procedures can also result in remarking traffic as a side-effect of other functions (e.g., in response to DDos).

#### 5.6. Summary

<< This section might contain a summary table >>

## **6. Considerations for DSCP Selection**

This section provides advice for the assignment of a new DSCP value. It identifies known issues that might influence the finally assigned DSCP, followed by a summary of considerations for assignment of a new DSCP.

### **6.1. Effect of Bleaching**

New DSCP assignments should consider the impact of bleaching, which can limit the ability to provide the expected treatment end-to-end. This is particularly important for cases where the codepoint is intended to result in lower than best effort treatment, as was the case when defining the LE PHB [[RFC8622](#)]. In this case, bleaching, or remarking to "CS0" would result in elevating the lower effort traffic to the default class. This is an example of priority inversion.

### **6.2. Where the proposed DSCP > 0x07 (7)**

Although the IETF specifications require systems to use DSCP marking semantics in place of methods based on the former ToS field, the current recommendation is that any new assignment where the codepoint is greater than 0x07 should consider the semantics associated with the resulting DSCP when ToS precedence bleaching is experienced. For example, it can be desirable to avoid choosing a DSCP that could be remarked to LE, [Lower Effort](#) [[RFC8622](#)], which could otherwise potentially result in a priority inversion in the treatment.

### **6.3. Where the proposed DSCP < 0x07 (7)**

ToS bleaching can unintentionally result in extra traffic aggregated to the same DSCP. For example, after experiencing ToS Bleaching, all traffic marked AF11, AF21, AF31 and AF41 would be aggregated with traffic marked with DSCP 2 (0x02), increasing the volume of traffic which receives the treatment associated with DSCP 2. New DiffServ codepoint assignments should consider unexpected consequences arising from ToS bleaching.

#### **6.3.1. Where the proposed DSCP & 0x07 = 0x01**

As a consequence of assigning the LE PHB [[RFC8622](#)], the IETF allocated the DSCP 000001b from Pool 3.

When making assignments where the DSCP has a format: xxx 001b, the case of ToS Precedence Bleaching (/Bleach-ToS-Precedence/) of a DSCP to a value of 0x01 needs to be considered. ToS Precedence Bleaching will result in demoting the traffic to the lower effort traffic

class. Care should be taken to consider the implications that a DSCP in this category could be remarked as LE.

#### **6.4. Impact on deployed infrastructure**

Behaviour of deployed PHBs and conditioning treatments also needs to be considered when assigning a new DSCP. In some domains, a network operator can provide transparent transport of unknown or unassigned DSCPs across their domain. In other domains, policing can ensure that only traffic that matches a policy is permitted to use a specific DSCP (e.g., as in MPLS TC).

#### **6.5. Questions to guide discussion of a proposed new DSCP**

A series of questions emerge that need to be answered when considering a proposal to the IETF that requests a new assignment. These questions include:

- \*How is the proposed service class characterised? - What are the characteristics of the traffic to be carried? What are the expectations for treatment?
- \*Service Classes that can utilise existing PHBs should use assigned DSCPs to mark their traffic: Could the request be met by using an existing IETF DSCP? How would the proposed new DSCP be used to map traffic to a new or existing PHB?
- \*Diffserv domains can use the codepoints in Pool 2 for local or experimental use, without any IETF specification for the DSCP or associated PHB: Could the request be met by using a DSCP chosen from Pool 2? Or is the DSCP intended to be used at network interconnections?
- \*This documents describes some observed marking behaviors (see also below): What is the expected effect of currently-deployed remarking on the end-to-end service?
- \*Many DiffServ domains support only a small number of treatment aggregates: What are the effects of treatment aggregation on the proposed method?
- \*This documents describes some observed treatments by layers below IP: What are the implications of using the proposed DSCP on the expected lower layers over which the traffic may be forwarded?

Specification of a new recommended DSCP requires Standards Action. RFC2474 states: "Each standardized PHB MUST have an associated RECOMMENDED codepoint". If approved, new IETF assignments are normally made by IANA in Pool 1, but the IETF can request assignments to be made from Pool 3 [[RFC8436](#)].

## 7. Acknowledgments

The authors acknowledge the helpful discussions and analysis by Greg White and Thomas Fossati in a draft concerning NQB. We look forward to further comments and review.

## 8. IANA Considerations

This memo provides information to assist in considering new assignments to the IANA DSCP registry (<https://www.iana.org/assignments/dscp-registry/dscp-registry.xhtml>).

This memo includes no request to IANA, or update to the IANA procedures.

## 9. Security Considerations

The security considerations are discussed in the security considerations of each cited RFC.

## 10. References

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### Appendix A. Revision Notes

Note to RFC-Editor: please remove this entire section prior to publication.

\*Individual draft -00

\*Individual draft -01; Comments from Martin Duke; Brian Carpenter; Ruediger Geib, and revisions to improve language consistency.

\*Individual draft -02; Revisions to improve language consistency.

\*Working Group -00, replacing draft-ietf-tsvwg-dscp-considerations-02.

### Appendix B. Table of DSCP Values

This table may help in the discussion of DSCP remarking. The current assignments are at: [Section 8](#).

|         |        |        |        |        |        |        |        |        |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| Hi \ Lo | 0b 000 | 0b 001 | 0b 010 | 0b 011 | 0b 100 | 0b 101 | 0b 110 | 0b 111 |
| 0b 000  | BE/DE  | LE     | CU     | Pool 3 | CU     | CU     | CU     | Pool 3 |
|         | CS0    |        |        | LU/EXP |        |        |        | LU/EXP |
| 0b 001  | CS1    | CU     | AF11   | LU/EXP | AF12   | CU     | AF13   | LU/EXP |
| 0b 010  | CS2    | CU     | AF21   | LU/EXP | AF22   | CU     | AF23   | LU/EXP |
| 0b 011  | CS3    | CU     | AF31   | LU/EXP | AF32   | CU     | AF33   | LU/EXP |
| 0b 100  | CS4    | CU     | AF41   | LU/EXP | AF42   | CU     | AF43   | LU/EXP |
| 0b 101  | CS5    | CU     | CU     | LU/EXP | VA     | CU     | EF     | LU/EXP |
| 0b 110  | CS6    | CU     | CU     | LU/EXP | CU     | CU     | CU     | LU/EXP |
| 0b 111  | CS7    | CU     | CU     | LU/EXP | CU     | CU     | CU     | LU/EXP |

LU/EXP - Local or Experimental Use

CU - Currently Unassigned (reserved for IANA allocation)

Table: Summary of Currently Assigned DSCP Values

## **Appendix C. Example of operational practice and operator requirements.**

RFC5127 backbone networks are often over provisioned under stable operating conditions. Operating and maintaining a plethora of differentiated, DSCP based service differentiations can be operationally difficult. Network Operations staff might not be happy to reconfigure all or a majority of the backbone routers in response to frequent DSCP-to-PHB mapping table configuration changes.

Instead, operational practice might prefer a simple to configure and operate, comprehensible with limited expertise for monitoring and debugging.

- For discussion:

There are a set of different expectations of traffic sources and sinks that set DSCP markings:

\*Is the setting behaviour intended to enable a local or sectional differential treatment, without expecting end-to-end service differentiation?

Example: A sender domain that sets DSCPs to influence stream playout priorities in receiver browsers, or any/many unknown intentions when setting DSCPs.

\*Is the setting behaviour intended to enable a local or sectional differential treatment, without expecting end-to-end service differentiation?

Example: A sender domain that sets DSCPs to influence stream playout priorities in receiver browsers, or any/many unknown intentions when setting a DSCP.

\*Is the setting behaviour intended to enable end-to-end service differentiation with an expectation of interconnection agreements in place?

Example: Provider interconnection agreements, e.g., for the public telephony service.

\*Is the setting behaviour intended to enable end-to-end service differentiation without an expectation of interconnection agreements in place?

Example: The Non-Queue-Building or Lower Effort PHBs.

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