

Per Hop Behavior Identification Codes

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Abstract

[draft-brim-diffserv-phbid-00.txt](#)

This document defines a 16 bit encoding mechanism for the identification of differentiated services Per Hop Behaviors in protocol messages.

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Table of Contents:

Status of this Memo.....	1
1. Introduction.....	3
2. Encoding.....	3
3. IANA Considerations.....	4

4. Security considerations.....	5
Acknowledgements.....	5
References.....	5
Authors' Addresses.....	5
Intellectual Property.....	6
Full Copyright Statement.....	6

[1. Introduction](#)

Differentiated Services [RFC 2474, [RFC 2475](#)] introduces the notion of Per Hop Behaviors (PHBs) that define how traffic belonging to a particular behavior aggregate is treated at an individual network node. In IP packet headers, PHBs are not indicated as such; instead Differentiated Services Codepoint (DSCP) values are used. There are only 64 possible DSCP values, but there is no such limit on the number of PHBs. In a given network domain, there is a locally defined mapping between DSCP values and PHBs. Standardized PHBs recommend a DSCP mapping, but network operators may choose alternative mappings.

In some cases it is necessary or desirable to identify a particular PHB in a protocol message, such as a message negotiating bandwidth management or path selection. Examples where work is in progress include communication between bandwidth brokers, and MPLS support of diffserv.

In certain cases, what needs to be identified is not an individual PHB, but a set of PHBs. One example is a set of PHBs that must follow the same physical path to prevent re-ordering. An instance of this is the set of three PHBs belonging to a single Assured Forwarding class, such as the PHBs AF11, AF12 and AF13 [[Assured](#)].

This document defines a binary encoding to uniquely identify PHBs and/or sets of PHBs in protocol messages. This encoding MUST be used when such identification is required.

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 [[RFC2119](#)].

[2. Encoding](#)

PHBs and sets of PHBs are encoded in an unsigned 16 bit binary field, using the same encoding. It is determined by context whether the encoding represents a PHB or a set of PHBs.

The 16 bit field is arranged as follows:

Case 1: PHBs defined by standards action, as per [\[RFC 2474\]](#).

The encoding for a single PHB is the recommended DSCP value for that PHB, left-justified in the 16 bit field, with bits 6 through 15 set to zero. Note that the recommended DSCP value MUST be used, even if the network in question has chosen a different mapping.

The encoding for a set of PHBs is the numerically smallest of the set of encodings for the various PHBs in the set. (Thus for the AF1x PHBs, the encoding is that of the AF11 PHB.)

```

  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           DSCP           | 0  0  0  0  0  0  0  0  0  0 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Case 2: PHBs not defined by standards action, i.e. experimental or local use PHBs as allowed by [\[RFC 2474\]](#). In this case an arbitrary 12 bit PHB identification code, assigned by the IANA, is placed left-justified in the 16 bit field, and bits 12 through 15 contain the value 0x1.

A set of non-standard PHBs is identified by a single PHB identification code.

```

  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           PHB id code           | 0  0  0  1 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Bits 12 through 14 are reserved either for expansion of the PHB identification code, or for other use such as distinguishing PHB groups from individual PHBs, at some point in the future.

3. IANA Considerations

IANA is requested to create a new assignment registry for "Per-Hop Behavior Identification Codes", initially allowing values in the range 0 to 4095 decimal.

Assignment of values in this field require:

- the identity of the assignee

- a brief description of the new PHB, with enough detail to distinguish it from existing standardized and non-standardized PHBs. In the case of a set of PHBs, this description should cover all PHBs in the set.
- a reference to a stable document describing the PHB in detail.

During the first year of existence of this registry, IANA is requested to refer all requests to the IETF diffserv WG for review. Subsequently, requests should be reviewed by the IETF Transport Area Directors or by an expert that they designate.

If the number of assignments begins to approach 4096, the Transport Area Directors should be alerted.

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[Page 4]

Internet Draft Connection of IPv6 Domains via IPv4 Clouds

Apr 1999

[4. Security considerations](#)

This encoding in itself raises no security issues. However, users of this encoding should consider that modifying a PHB identification code may constitute theft or denial of service, so protocols using this encoding must be adequately protected.

Acknowledgements

Useful comments were made by Francois Le Faucheur and others.

References

[RFC 2119] Key words for use in RFCs to Indicate Requirement Levels, S. Bradner, [RFC 2119](#), March 1997.

[RFC 2474] Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers. K. Nichols, S. Blake, F. Baker, D. Black, [RFC 2474](#), December 1998.

[RFC 2475] An Architecture for Differentiated Services. S. Blake, D. Black, M. Carlson, E. Davies, Z. Wang, W. Weiss, [RFC 2475](#), December 1998.

[Assured] Assured Forwarding PHB Group, J. Heinanen, F. Baker, W. Weiss, J. Wroclawski, [draft-ietf-diffserv-af-06.txt](#), work in progress.

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Brim + Carpenter Expires October 1999 [Page 5]

Internet Draft Connection of IPv6 Domains via IPv4 Clouds Apr 1999

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Brim + Carpenter Expires October 1999 [Page 6]