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         Quality of Service Parameters for Usage with Diameter

Abstract

   This document defines a number of Quality of Service (QoS) parameters
   that can be reused for conveying QoS information within Diameter.

   The defined QoS information includes data traffic parameters for
   describing a token bucket filter, a bandwidth parameter, and a per-
   hop behavior class object.

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

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Table of Contents

1. Introduction

   This document defines a number of Quality of Service (QoS) parameters
   that can be reused for conveying QoS information within the Diameter
   protocol [RFC3588]. The current set of QoS parameters defined in
   this document are a core subset determined to be useful for a wide
   range of applications. Additional parameters may be defined in
   future documents as the need arises and are for future study. The
   parameters are defined as Diameter-encoded Attribute Value Pairs
   (AVPs), which are described using a modified version of the Augmented
   Backus-Naur Form (ABNF), see [RFC3588]. The data types are also
   taken from [RFC3588].

   The traffic model (TMOD) AVPs are containers consisting of four AVPs
   and provide a way to describe the traffic source.

   o token rate (r)

   o bucket depth (b)

   o peak traffic rate (p)

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o minimum policed unit (m)

o maximum packet size (M)

The encoding of the <TMOD-1> and the <TMOD-2> AVPs can be found in
Sections 3.1 and 3.2. The semantics of these two AVPs are described
in Section 3.1 of [RFC2210] and in Section 3.6 of [RFC2215].

The <TMOD-2> AVP is, for example, needed by some DiffServ
applications.

   It is typically assumed that DiffServ expedited forwarding (EF)
   traffic is shaped at the ingress by a single-rate token bucket.
   Therefore, a single TMOD parameter is sufficient to signal
   DiffServ EF traffic. However, for DiffServ assured forwarding
   (AF) traffic, two sets of token bucket parameters are needed: one
   token bucket for the average traffic and one token bucket for the
   burst traffic. [RFC2697] defines a Single Rate Three Color Marker
   (srTCM), which meters a traffic stream and marks its packets
   according to three traffic parameters -- Committed Information
   Rate (CIR), Committed Burst Size (CBS), and Excess Burst Size
   (EBS) -- to be either green, yellow, or red. A packet is marked
   green if it does not exceed the CBS, yellow if it does exceed the
   CBS but not the EBS, and red otherwise. [RFC2697] defines
   specific procedures using two token buckets that run at the same
   rate. Therefore, two TMOD AVPs are sufficient to distinguish
   among three levels of drop precedence. An example is also
   described in the appendix of [RFC2597].

Resource reservations might refer to a packet processor with a
particular DiffServ per-hop behavior (PHB) (using the <PHB-Class>
AVP). A generic description of the DiffServ architecture can be
found in [RFC2475], and the Differentiated Services Field is
described in Section 3 of [RFC2474]. Updated terminology can be
found in [RFC3260]. Standardized per-hop behavior is, for example,
described in [RFC2597] ("Assured Forwarding PHB Group") and in
[RFC3246] ("An Expedited Forwarding PHB").

The above-mentioned parameters are intended to support basic
integrated and differentiated services functionality in the network.
Additional parameters can be defined and standardized if required to
support specific services in the future.

2. Terminology and Abbreviations

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 [RFC2119].

3. QoS Parameter Encoding

3.1. TMOD-1 AVP

   The TMOD-1 AVP is obtained from [RFC2210] and [RFC2215]. The
   structure of the AVP is as follows:

      TMOD-1 ::= < AVP Header: 495 >
                  { Token-Rate }
                  { Bucket-Depth }
                  { Peak-Traffic-Rate }
                  { Minimum-Policed-Unit }
                  { Maximum-Packet-Size }

3.1.1. Token-Rate AVP

   The Token-Rate AVP (AVP Code 496) is of type Float32.

3.1.2. Bucket-Depth AVP

   The Bucket-Depth AVP (AVP Code 497) is of type Float32.

3.1.3. Peak-Traffic-Rate AVP

   The Peak-Traffic-Rate AVP (AVP Code 498) is of type Float32.

3.1.4. Minimum-Policed-Unit AVP

   The Minimum-Policed-Unit AVP (AVP Code 499) is of type Unsigned32.

3.1.5. Maximum-Packet-Size AVP

   The Maximum-Packet-Size AVP (AVP Code 500) is of type Unsigned32.

3.2. TMOD-2 AVP

   A description of the semantics of the parameter values can be found
   in [RFC2215]. The coding for the TMOD-2 AVP is as follows:

      TMOD-2 ::= < AVP Header: 501 >
                  { Token-Rate }
                  { Bucket-Depth }
                  { Peak-Traffic-Rate }
                  { Minimum-Policed-Unit }
                  { Maximum-Packet-Size }

3.3. Bandwidth AVP

   The Bandwidth AVP (AVP Code 502) is of type Float32 and is measured
   in octets of IP datagrams per second. The Bandwidth AVP represents a
   simplified description of the following TMOD setting whereby the
   token rate (r) = peak traffic rate (p), the bucket depth (b) = large,
   and the minimum policed unit (m) = large when only bandwidth has to
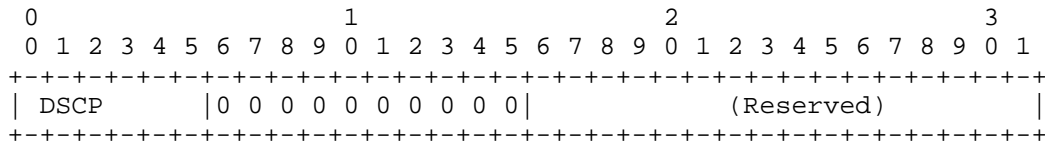   be expressed.

3.4. PHB-Class AVP

   The PHB-Class AVP (AVP Code 503) is of type Unsigned32.

   A description of the semantics of the parameter values can be found
   in [RFC3140]. The registries needed for usage with [RFC3140] already
   exist and hence a new registry is not required for this purpose. The
   encoding requires that three cases be differentiated. All bits
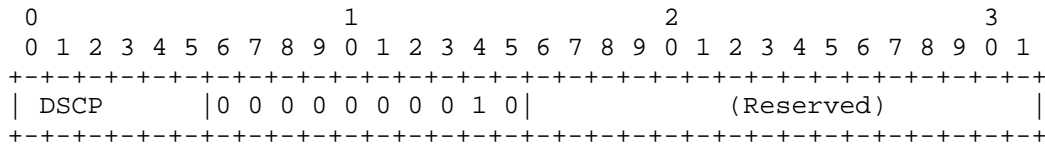   indicated as "reserved" MUST be set to zero (0).

3.4.1. Case 1: Single PHB

   As prescribed in [RFC3140], the encoding for a single PHB is the
   recommended Differentiated Services Code Point (DSCP) value for that
   PHB, left-justified in the 16-bit field with bits 6 through 15 set to
   zero.

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | DSCP      |0 0 0 0 0 0 0 0 0 0|          (Reserved)          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

3.4.2. Case 2: Set of PHBs

   The encoding for a set of PHBs is the numerically smallest of the set
   of encodings for the various PHBs in the set, with bit 14 set to 1.
   (Thus, for the AF1x PHBs, the encoding is that of the AF11 PHB, with
   bit 14 set to 1.)

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | DSCP      |0 0 0 0 0 0 0 0 1 0|          (Reserved)          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
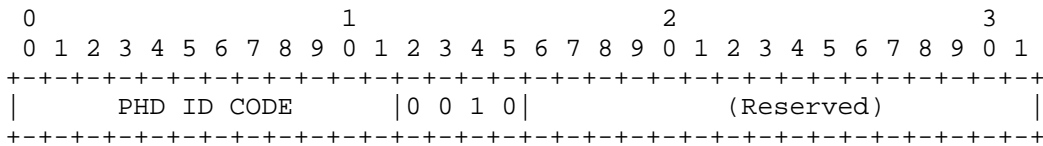
3.4.3. Case 3: Experimental or Local Use PHBs

   PHBs may not be defined by standards actions i.e., experimental or
   local use PHBs as allowed by [RFC2474]. In this case, an arbitrary
   12-bit PHB identification code, assigned by the IANA, is left-
   justified in the 16-bit field. Bit 15 is set to 1, and bit 14 is
   zero for a single PHB or 1 for a set of PHBs. Bits 12 and 13 are
   zero.

   Bits 12 and 13 are reserved either for expansion of the PHB
   identification code or for other, future use.

   In both cases, when a single PHBID is used to identify a set of PHBs
   (i.e., bit 14 is set to 1), that set of PHBs MUST constitute a PHB
   Scheduling Class (i.e., use of PHBs from the set MUST NOT cause
   intra-microflow traffic reordering when different PHBs from the set
   are applied to traffic in the same microflow). The set of AF1x PHBs
   [RFC2597] is an example of a PHB Scheduling Class. Sets of PHBs that
   do not constitute a PHB Scheduling Class can be identified by using
   more than one PHBID.

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |      PHD ID CODE     |0 0 1 0|            (Reserved)          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

4. Extensibility

   This document is designed with extensibility in mind, given that
   different organizations and groups are used to defining their own
   Quality of Service parameters. This document provides an initial QoS
   profile with a common set of parameters. Ideally, these parameters
   should be used whenever possible, but there are cases where
   additional parameters might be needed or where the parameters
   specified in this document are used with different semantics. In
   that case, it is advisable to define a new QoS profile that may
   consist of new parameters in addition to parameters defined in this
   document or an entirely different set of parameters. Finally, it is
   also possible to register a specific QoS profile that defines a
   specific set of QoS values rather than parameters that need to be
   filled with values in order to be used.

   To enable the definition of new QoS profiles, an 8-octet registry is
   defined as a field that is represented by 4-octet vendor and 4-octet
   specifier fields. The vendor field contains an Enterprise Number as
   defined in [RFC2578], taken from the values maintained in the IANA
   Enterprise Numbers registry. If the four octets of the vendor field

are 0x00000000 (reserved value for IANA), then the value in the
specifier field MUST be registered with IANA (see Section 5.2). If
the vendor field is other than 0x00000000, the value of the specifier
field represents a vendor-specific value, where allocation is the
responsibility of the enterprise indicated in the vendor field.

5. IANA Considerations

5.1. AVP Codes

   IANA allocated AVP codes in the IANA-controlled namespace registry
   specified in Section 11.1.1 of [RFC3588] for the following AVPs that
   are defined in this document.

   +--+
   | AVP Section |
   |AVP Name   Code Defined   Data Type |
   +--+
   |TMOD-1   495 3.1   Grouped |
   |Token-Rate   496 3.1.1   Float32 |
   |Bucket-Depth   497 3.1.2   Float32 |
   |Peak-Traffic-Rate   498 3.1.3   Float32 |
   |Minimum-Policed-Unit   499 3.1.4   Unsigned32 |
   |Maximum-Packet-Size   500 3.1.5   Unsigned32 |
   |TMOD-2   501 3.2   Grouped |
   |Bandwidth   502 3.3   Float32 |
   |PHB-Class   503 3.4   Unsigned32 |
   +--+

5.2. QoS Profile

   The QoS profile refers to a 64-bit field that is represented by
   4-octet vendor and 4-octet specifier fields. The vendor field
   indicates the type as either standards-specified or vendor-specific.

   If the four octets of the vendor field are 0x00000000, then the value
   is standards-specified and a registry will be created to maintain the
   QoS profile specifier values. The specifier field indicates the
   actual QoS profile. Depending on the value requested, the action
   needed to request a new value is:

      0 to 511: Standards Action

      512 to 32767: Specification Required

      32768 to 4294967295: Reserved

Standards action is required to add, depreciate, delete, or modify
QoS profile values in the range of 0-511, and a specification is
required to add, depreciate, delete, or modify existing QoS profile
values in the range of 512-32767.

IANA created such a registry and allocated the value zero (0) for the
QoS profile defined in this document.

Alternative vendor-specific QoS profiles can be created and
identified with an Enterprise Number taken from the IANA registry
created by [RFC2578] in the vendor field, combined with a vendor-
specific value in the specifier field. Allocation of the specifier
values is the responsibility of the vendor.

6. Security Considerations

This document does not raise any security concerns as it only defines
QoS parameters and does not yet describe how they are exchanged in an
Authentication, Authorization, and Accounting (AAA) protocol.
Security considerations are described in documents using this
specification.

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              Diffserv", RFC 3260, April 2002.

Appendix A.   ABNF Code Fragment

```
   TMOD-1  ::= < AVP Header: 495 >
              { Token-Rate }
              { Bucket-Depth }
              { Peak-Traffic-Rate }
              { Minimum-Policed-Unit }
              { Maximum-Packet-Size }


   TMOD-2  ::= < AVP Header: 501 >
              { Token-Rate }
              { Bucket-Depth }
              { Peak-Traffic-Rate }
              { Minimum-Policed-Unit }
              { Maximum-Packet-Size }
```

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