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Updating the IANA MPLS LSP Ping Parameters
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Abstract

   This document updates RFC 8029 and RFC 8611 which both define IANA
   registries for MPLS Label Switched Path (LSP) Ping. It also updates
   the description of the procedures for the responses sent when an
   unknown or erroneous code point is found.

   The updates are to clarify and align this namespace with recent
   developments, e.g. new RFCs using the new registration procedure
   terminology from RFC 8126 (e.g. RFC 8611) instead of the terminology
   from the obsoleted RFC 5226.

Status of This Memo

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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1. Introduction

   There were a number of reasons to start the work that has led to this
   document, e.g.:

   o When the LSP Ping registry was created it was incorrectly assumed
      that code points allocated by Experimental RFCs would be
      'experimental' code points; a code point made available in a
      public IANA registry is not limited by the type of RFC that made
      the allocation but is available for any document.

   o The number of 'experimental' code points was also too large, as
      compared to what is normally allocated for "Experimental Use".

   o RFC 8029 uses the words "mandatory" and "optional" differently to
      how other RFC do. RFC 8029 for example talks about mandatory TLVs
      to indicate that it is mandatory to take a certain action if the
      TLV is found in a message but not recognized, other RFCs uses
      "mandatory TLV" to indicate a TLV that must be present in a
      message.

   Over time there hav been attempts to administratively update some of
   the registries, but it was soon decided that an RFC was needed.
   Other, often minor, potential updates were found, e.g. reserving the
   value 0 (zero) in registries where that is possible.

   When RFC 8029 [RFC8029] was published it contained updates to the
   "Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs)
   Ping Parameters" IANA namespace [IANA-LSP-PING].

   RFC 8611 [RFC8611] created LSP Ping IANA registries that match RFC
   8126. This document further clarifies the entries in those
   registries and makes the definitions more precise.

   This document updates RFC 8029 [RFC8029] and RFC 8611 [RFC8611] by
   updating two groups of registries as follows:

   First the registries for Message Types [IANA-MT], Reply Modes
   [IANA-RM] and Return Codes [IANA-RC] are updated. The changes to
   these registries are minor.

   Second, this document updates the TLV and sub-TLV registries.

   o TLVs [IANA-TLV-reg].

o Sub-TLVs for TLVs 1, 16 and 21 [IANA-Sub-1-16-21].

o Sub-TLVs for TLV Type 6 [IANA-Sub-6].

o Sub-TLVs for TLV 11 [IANA-Sub-11].

o Sub-TLVs for TLV 20 [IANA-Sub-20].

o Sub-TLVs for TLV 23 [IANA-Sub-23].

o Sub-TLVs for TLV 27 [IANA-Sub-27].

It should be noted that RFC 8029 was published before RFC 8126 and
uses the old terminology for some registration procedures, e.g
"Vendor Private Use". RFC 8611 was published after RFC 8126 and uses
the new terminology, e.g. "Private Use". Both "Vendor Private Use"
and "Private Use has been removed and replaced with "First Come,
First Served" code points.

One reason to change from code point allocated by Vendor Private Use
or Private Use is that such code points are allowed in production
network. Theoretically it is possible that to vendors might use the
same nummeric value for dode point with different meaning. If such
code is ever deployed in the same network this lead to proocal
failure and tough de-bugging.

With First Come. First served this will not happen. Vendors that
have code using Vendor Private or Private code points should register
that code point as soon as this document is published as an RFC.

The registry for sub-TLVs for TLV 9 [IANA-Sub-9] is not updated.

Third, according to RFC 8029 some code points (TLVs and sub-TLVs) are
called "mandatory" or "optional". Contrary to how other RFCs use
these words, indicating that it is mandatory or optional to include
the code points in a message, RFC 8029 uses these words to indicate
that an action might or might not be mandatory. This document
updates RFC 8029 to drop the words "mandatory" and "optional", and
the text is changed to focus on what should be done.

1.1. Requirement Language

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.

1.2. Terminology

This section list terms that are used when discussing the hierarchy of IANA registers (Section 1.2.1) and abbreviations used in IANA registries update in this document (Section 1.2.2).

1.2.1. Terminology Used in this Document

This document uses some terms that relates to IANA registries in this way:

IANA Name Space,
a namespace is a top level registry. An example could be "Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs) Ping Parameters" [IANA-LSP-PING]. A namespace is most often a container for registries that hold code points that share some affinity.

IANA Registry,
an IANA registry holds code points, and lists the registration procedures and allocation these code points. One example would be the "TLVs" registry [IANA-TLV-reg].

IANA Sub-registry,
a sub-registry is used when a code point, or a set of code points allocated in a single registry, needs "sub-code points" scoped by the code point or the set of code points. An example of a sub-registry that holds code points for more than one TLV is "Sub-TLVs for TLV Types 1, 16, and 21" [IANA-Sub-1-16-21]

1.2.2. Abbreviations

This section list abbreviations used in the unchanged part of the registries updated by this document. These abbreviations were originally expanded in the document defining the registries. They are listed here following the requirement to expand any abbreviation that is not well-known. All these abbreviations are from the Return Codes registry [IANA-RC].

BFD - Bidirectional Forwarding Detection

DDMAP - Downstream Detailed Mapping

FEC - Forwarding Equivalence Class

OAM - Operation, Administration and Maintenance

PM - Performance Monitoring

      RSC - Return Subcode

2. Updating the Message Types, Reply Mode and Return Codes Registries

   The following changes are made to the Message Types [IANA-MT], Reply
   Modes [IANA-RM] and Return Codes [IANA-RC] registries.

   o In the listing of assigned code points the term "Vendor Private
      Use" is changed to "Private Use".

   o The registration procedure "Specification Required" is changed to
      "RFC Required" and the note "Experimental RFC needed" is removed.

   o A small set of code points (4 code points) for Experimental Use is
      added by reducing the "RFC Required" range.

   o The registration procedures "Private Use" and "Experimental Use"
      are added to the table of registration procedures.

   o A note "Not to be assigned" is added for the registration
      procedures "Private Use" and "Experimental Use".

   o In the lists that capture the assignment status, the fields that
      are reserved, i.e., 0 (zero), Private Use and Experimental Use are
      clearly marked as such.

      * Note that in the Return Codes registry [IANA-RC] the code point
         "0" has already been assigned. This assignment is not changed
         and in this registry the code point "0" continues to be
         assigned as "No Return Code".

   The new Registration Procedures, the registry layouts and the new
   assignments for these registries are found in Section 6.1.

3. Updating the TLV and Sub-TLV Registries

3.1. General Principles for the LSP Ping TLV and Sub-TLV registries

   The following principles apply to the processing of any TLV from any
   of the LSP Ping TLVs and sub-TLVs IANA registries.

   o All TLVs and sub-TLVs with a type in the range 0-32767 require a
      response if they are not recognized.

   o All TLVs and sub-TLVs in the range 32768-65535 may be silently
      dropped, stepped over or an error message sent if they are not
      recognized.

Each of the blocks has code point spaces with the following
registration procedures:

o Standards Action.

o RFC Required.

o Experimental Use.

o First Come First Served (FCFS).

The exact definitions of these procedures are found in [RFC8126].

3.1.1. Unrecognized Experimental Use TLVs and Sub-TLVs

Unrecognized TLVs and sub-TLVs in the Experimental Use, and FCFS
ranges are handled as any other unrecognized TLV or sub-TLV.

o If the unrecognized TLV or sub-TLV is from the Experimental Use
   range (31740-31743) or from the FCFS range (31744-32767) a Return
   Code of 2 ("One or more of the TLVs was not understood") must be
   sent in the echo response.

o If the unrecognized TLV or sub-TLV is from the Experimental Use
   range (64508-64511) or from the FCFS range (64512-65535) the TLVs
   may be silently ignored, stepped over or an error message sent.

The IETF does not prescribe how recognized or unrecognized
Experimental Use and Private Use TLVs and sub-TLVs are handled in
experimental or private networks; that is up to the agency running
the experimental or the private network. The statement above
describes how standards compliant implementations must treat the
unrecognized TLVs and sub-TLVs from these ranges.

3.2. Common Registration Procedures for TLVs and sub-TLVs

This section describes the new registration procedures for the TLV
and sub-TLV registries.

```
+-------------+------------------+--------------------------------+
| Range       | Registration     | Note                           |
|             | Procedures       |                                |
+-------------+------------------+--------------------------------+
| 0-16383     | Standards Action | This range is for TLVs and sub-|
|             |                  | TLVs that require an error      |
|             |                  | message if not recognized.      |
|             |                  | [This document, section 3.1]   |
| 16384-31739 | RFC Required     | This range is for TLVs and sub-|
|             |                  | TLVs that require an error      |
|             |                  | message if not recognized.      |
|             |                  | [This document, section 3.1]   |
| 31740-31743 | Experimental Use | Reserved, not to be assigned.  |
|             |                  | This range is for TLVs and sub-|
|             |                  | TLVs that require an error      |
|             |                  | message if not recognized.      |
|             |                  | [This document, section 3.1]   |
| 31744-32767 | FCFS             | This range is for TLVs and sub-|
|             |                  | TLVs that require an error      |
|             |                  | message if not recognized.      |
|             |                  | [This document, section 3.1]   |
| 32768-49161 | Standards Action | This range is for TLVs and sub-|
|             |                  | TLVs that can be silently       |
|             |                  | dropped if not recognized.      |
| 49162-64507 | RFC Required     | This range is for TLVs and sub-|
|             |                  | TLVs that can be silently       |
|             |                  | dropped if not recognized.      |
| 64508-64511 | Experimental Use | Reserved, not to be assigned.  |
|             |                  | This range is for TLVs and sub-|
|             |                  | TLVs that can be silently       |
|             |                  | dropped if not recognized.      |
| 64512-65535 | FCFS             | This range is for TLVs and sub-|
|             |                  | TLVs that can be silently       |
|             |                  | dropped if not recognized.      |
+-------------+------------------+--------------------------------+
```

               Table 1: TLV and sub-TLV Registration Procedures

3.3. Changes to the LSP Ping Registries

   This section lists the changes to each MPLS LSP Ping TLV and sub-TLV
   Registry. Section 6.2.1 to 6.2.7 describe how the new versions of
   the IANA registries should look, together with the registration
   procedures for each registry.

   The new Registration Procedures description and the new assignments
   for these registries are used to model the changed MPLS LSP Ping
   registries, see Section 6.

3.3.1. Common Changes to the TLV and Sub-TLV Registries

The following changes are made to the TLV and sub-TLV registries.

o The registration procedures "First Come First Served (FCFS)" and
   "Experimental Use" are added to the table of registration
   procedures.

o Two small sets of code points (4 code points each) for
   Experimental Use, are created. The first set is for the range
   that requires a response if the TLV or sub-TLV is not recognized;
   the second set is for the range where the TLV or sub-TLV that may
   be silently dropped if not recognized. The code points for
   experimental use are taken from the ranges previously (RFC 8029)
   called 'Specification Required' and (RFC 8611) "RFC Required".

o The registration procedure "Specification Required" is changed to
   "RFC Required" and the note "Experimental RFC needed" is removed.

o In the listing of assignments the term "Vendor Private Use" is
   changed to "First Come First Served (FCFS)".

o In the listing of assignments the range for "Experimental Use" is
   added.

o A note saying "Not to be assigned" is added for the registration
   procedures "Experimental Use".

o In the list that captures assignment status, the fields that are
   reserved, i.e., 0 (zero) and Experimental Use are clearly marked.

4. Updates to Related RFCs

Some referenced RFCs use the concept "mandatory TLVs" and "mandatory
sub-TLVs" to indicate that, if a TLV or sub-TLV of the range 0-32767
in a message is not understood, an error message needs to be sent in
response.

The same RFCs use "optional TLVs" and "optional sub-TLVs" to mean
TLVs or sub-TLVs that can be silently ignored if not recognized.

Since other RFCs use "mandatory TLVs" and "mandatory sub-TLVs" to
indicate TLVs and sub-TLVs that must be present in a message, we want
to discontinue the use of "mandatory" to indicate TLVs and sub-TLVs
that require an error message in response if not understood. The
changes to the RFCs below align with this practice.

4.1. Updates to RFC 8029

Mandatory and optional are used to indicate whether a response is
needed if a TLV or sub-TLV is not understood on pages 15 and 16 in
Section 3 of RFC 8029.

The text in those two paragraphs is now updated to the following:

   TLV and sub-TLV Types less than 32768 (i.e., with the high-order
   bit equal to 0) are TLVs and sub-TLVs that MUST either be
   supported by an implementation or result in the Return Code of 2
   ("One or more of the TLVs was not understood") being sent in the
   echo response.

   An implementation that does not understand or support a received
   TLV or sub-TLV with Type greater than or equal to 32768 (i.e.,
   with the high-order bit equal to 1) SHOULD ignore and step over
   the TLV or sub-TLV, however an implementation MAY send an echo
   response with Return Code 2 ("One or more of the TLVs was not
   understood") as it would have done if the high order bit had been
   clear.

In Section 3.8 of RFC 8029 "mandatory" is used in the same way. The
first two paragraphs of this section are now updated to read as
follows:

   The following TLV is a TLV that MAY be included in an echo reply
   to inform the sender of an echo request that includes TLVs or sub-
   TLVs Types less than 32768 (i.e., with the high-order bit equal to
   0) that are either not supported by the implementation or parsed
   and found to be in error.

   The Value field contains the TLVs, including sub-TLVs, that were
   not understood, encoded as sub-TLVs.

4.2. Updates to RFC 8611

Section 13.4.1 of "Label Switched Path (LSP) Ping and Traceroute
Multipath Support for Link Aggregation Group (LAG) Interfaces
[RFC8611]" defines "Sub-TLVs for TLV Type 6" [IANA-Sub-6].

The "Sub-TLVs for TLV Type 6" registry is now updated to align with
changes defined in this document.

Section 13.4.1 of RFC 8611 is now updated as follows:

Section 13.4.1 Sub-TLVs for TLV Type 6

IANA has created a new sub-registry "Sub-TLVs for TLV Type 6"
[IANA-Sub-6] under the "TLVs" registry [IANA-TLV-reg] of the
"Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs)
Ping Parameters" namespace [lsp-ping-Namespace].

The "Sub-TLVs for TLV Type 6" sub-registry is now updated to align
with changes defined in this document.

Range	Registration Procedures	Note
0-16383	Standards Action	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
16384-31739	RFC Required	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31740-31743	Experimental Use	Reserved not to be assigned. This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31744-32767	FCFS	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
32768-49161	Standards Action	This range is for sub-TLVs that can be silently dropped if not recognized.
49162-64507	RFC Required	This range is for sub-TLVs that can be silently dropped if not recognized.
64508-64511	Experimental Use	Reserved not to be assigned. This range is for sub-TLVs that can be silently dropped if not recognized.
64512-65535	FCFS	This range is for sub-TLVs that can be silently dropped if not recognized.

Table 2: Sub-TLVs for TLV Type 6 Registration Procedures

5. Security Considerations

This document updates IANA registries. It also updates terminology
used to define, and clarifies the terminology related to, the code
points in the registries. The document does not change how the code-
points in the registries are used. This should not create any new
threats.

However, the updated terminology and the clarifications improve
security because it makes it more likely that implementations will be
consistent and harder to attack.

6. IANA Considerations

IANA is requested to update the "Multiprotocol Label Switching (MPLS)
Label Switched Paths (LSPs) Ping Parameters" namespace
[IANA-LSP-PING] as described in this document.

See Section 1.2.1 "Terminology Used in this Document" to see how
"namespace", "registry" and "sub-registry" are used in this document.

In other parts of this document the communality of the changes to the
LSP Ping registries has been the focus. For the IANA considerations
each changed registry has been described in its own right.

The following registries and sub-registries are changed:

"Message Types", [IANA-MT],
"Reply Modes", [IANA-RM]
"Return Codes" [IANA-RC]
"TLVs" [IANA-TLV-reg]
"Sub-TLVs for TLV Types 1, 16, and 21" [IANA-Sub-1-16-21]
"Sub-TLVs for TLV Type 6" [IANA-Sub-6]
"Sub-TLVs for TLV Type 11" [IANA-Sub-11]
"Sub-TLVs for TLV Type 20" [IANA-Sub-20]
"Sub-TLVs for TLV Type 23" [IANA-Sub-23]
"Sub-TLVs for TLV Type 27" [IANA-Sub-27]

This document will be listed as an additional reference for each of
the registries described in Sections 6.1 and 6.2.

6.1. Updates to the Message Type, Reply Mode and Return Codes
       Registries

This section details the updated registration procedures and
allocations for "Message Type", "Reply Mode" and "Return Codes"
registries.

6.1.1. Updates to the Message Type registry

This is the changes to the "Message Type" registry specified in this document:

o Code Point 0 (zero) is marked Reserved.

o The registration procedure "Specification Required" is changed to "RFC Required" and the comment "Experimental RFC needed" is removed.

o Four code point have been taken from what was earlier "Specification Required" to form a set of code points for "Experimental Use."

The registration procedures after the changes for the "Message Type" registry are shown in the table below:

```
+---------+--------------------+----------------------------------+
| Range   | Registration       | Note                             |
|         | Procedures         |                                  |
+---------+--------------------+----------------------------------+
| 0-191   | Standards Action   |                                  |
| 192-247 | RFC Required       |                                  |
| 248-251 | Experimental Use   | Reserved, not to be assigned     |
| 252-255 | Private Use        | Reserved, not to be assigned     |
+---------+--------------------+----------------------------------+
```

Table 3: Message Type registration procedures

The updated assignments for the "Message Types" registry will look like this:

```
+---------+-------------------------------+----------------------+
| Value   | Meaning                       | Reference            |
+---------+-------------------------------+----------------------+
| 0       | Reserved                      | This document        |
| 1       | MPLS Echo Request             | [RFC8029]            |
| 2       | MPLS Echo Reply               | [RFC8029]            |
| 3       | MPLS Proxy Ping Request       | [RFC7555]            |
| 4       | MPLS Proxy Ping Reply         | [RFC7555]            |
| 5       | MPLS Relayed Echo Reply       | [RFC7743]            |
| 6-247   | Unassigned                    |                      |
| 248-251 | Reserved for Experimental Use | This document        |
| 252-255 | Reserved for Private Use      | [RFC8029]            |
+---------+-------------------------------+----------------------+
```

Table 4: Assignments for the Message Types registry

6.1.2. Updates to the Reply Modes registry

   This is the changes to the "Reply Modes" registry specified in this
   document:

   o Code Point 0 (zero) is marked Reserved.

   o The registration procedure "Specification Required" is changed to
      "RFC Required" and the comment "Experimental RFC needed" is
      removed.

   o Four code point have been taken from what was earlier
      "Specification Required" to form a set of code points for
      "Experimental Use".

   The registration procedures after the changes for the "Reply Modes"
   registry are show in the table below:

```
+---------+--------------------+-----------------------------------+
| Range   | Registration       | Note                              |
|         | Procedures         |                                   |
+---------+--------------------+-----------------------------------+
| 0-191   | Standards Action   |                                   |
| 192-247 | RFC Required       |                                   |
| 248-251 | Experimental Use   | Reserved, not to be assigned      |
| 252-255 | Private Use        | Reserved, not to be assigned      |
+---------+--------------------+-----------------------------------+
```

                Table 5: Reply Modes registration procedures

   The updated assignments for the "Reply Modes" registry will look like
   this:

```
+---------+------------------------------+----------------------+
| Value   | Meaning                      | Reference            |
+---------+------------------------------+----------------------+
| 0       | Reserved                     | This document        |
| 1       | Do not reply                 | [RFC8029]            |
| 2       | Reply via an IPv4/IPv6 UDP   | [RFC8029]            |
|         | packet                       |                      |
| 3       | Reply via an IPv4/IPv6 UDP   | [RFC8029]            |
|         | packet with Router Alert     |                      |
| 4       | Reply via application-level  | [RFC8029]            |
|         | control channel              |                      |
| 5       | Reply via Specified Path     | [RFC7110]            |
| 6-247   | Unassigned                   |                      |
| 248-251 | Reserved for Experimental Use | This document       |
| 252-255 | Reserved for Private Use     | [RFC8029]            |
+---------+------------------------------+----------------------+
```

Table 6: Assignments for the Reply Modes registry

6.1.3. Updates to the Return Codes registry

These are the changes to the "Return Codes" registry specified in this document:

o   The registration procedure "Specification Required" is changed to "RFC Required" and the comment "Experimental RFC needed" is removed.

o   Four code point have been taken from what was earlier "Specification Required" to form a set of code points for "Experimental Use".

The registration procedures after the changes for the "Return Codes" registry are show in the table below:

```
+---------+-------------------+---------------------------------+
| Range   | Registration      | Note                            |
|         | Procedures        |                                 |
+---------+-------------------+---------------------------------+
| 0-191   | Standards Action  |                                 |
| 192-247 | RFC Required      |                                 |
| 248-251 | Experimental Use  | Reserved, not to be assigned    |
| 252-255 | Private Use       | Reserved, not to be assigned    |
+---------+-------------------+---------------------------------+
```

Table 7: Return Codes registration procedures

The updated assignments for the "Return Codes" registry will look
like this:

```
+---------+-----------------------------+--------------------+
| Value   | Meaning                     | Reference          |
+---------+-----------------------------+--------------------+
| 0       | No Return Code              | This document      |
| 1       | Malformed echo request received | [RFC8029]      |
| 2       | One or more of the TLVs was not | [RFC8029]      |
|         | understood                  |                    |
| 3       | Replying router is an egress for | [RFC8029]     |
|         | the FEC at stack-depth <RSC> |                    |
| 4       | Replying router has no mapping | [RFC8029]       |
|         | for the FEC at stack-depth <RSC> |                  |
| 5       | Downstream Mapping Mismatch (See | [RFC8029]     |
|         | [1])                        |                    |
| 6       | Upstream Interface Index Unknown | [RFC8029]     |
|         | (See [1])                   |                    |
| 7       | Reserved                    | [RFC8029]          |
| 8       | Label switched at stack-depth | [RFC8029]        |
|         | <RSC>                       |                    |
| 9       | Label switched but no MPLS  | [RFC8029]          |
|         | forwarding at stack-depth <RSC> |                |
| 10      | Mapping for this FEC is not the | [RFC8029]      |
|         | given label at stack-depth <RSC> |                |
| 11      | No label entry at stack-depth | [RFC8029]        |
|         | <RSC>                       |                    |
| 12      | Protocol not associated with | [RFC8029]         |
|         | interface at FEC stack-depth |                    |
|         | <RSC>                       |                    |
| 13      | Premature termination of ping | [RFC8029]        |
|         | due to label stack shrinking to |                |
|         | a single label              |                    |
| 14      | See DDMAP TLV for meaning of | [RFC8029]         |
|         | Return Code and Return Subcode |                  |
|         | (See [2])                   |                    |
| 15      | Label switched with FEC change | [RFC8029]       |
| 16      | Proxy Ping not authorized   | [RFC7555]          |
| 17      | Proxy Ping parameters need to be | [RFC7555]     |
|         | modified                    |                    |
| 18      | MPLS Echo Request could not be | [RFC7555]       |
|         | sent                        |                    |
| 19      | Replying router has FEC mapping | [RFC7555]      |
|         | for topmost FEC             |                    |
| 20      | One or more TLVs not returned | [RFC7743]        |
|         | due to MTU size             |                    |
| 21      | OAM Problem/Unsupported BFD  | [RFC7759]          |
|         | Version                     |                    |
```

22	OAM Problem/Unsupported BFD Encapsulation format	[RFC7759]
23	OAM Problem/Unsupported BFD Authentication Type	[RFC7759]
24	OAM Problem/Mismatch of BFD Authentication Key ID	[RFC7759]
25	OAM Problem/Unsupported Timestamp Format	[RFC7759]
26	OAM Problem/Unsupported Delay Mode	[RFC7759]
27	OAM Problem/Unsupported Loss Mode	[RFC7759]
28	OAM Problem/Delay variation unsupported	[RFC7759]
29	OAM Problem/Dyadic mode unsupported	[RFC7759]
30	OAM Problem/Loopback mode unsupported	[RFC7759]
31	OAM Problem/Combined mode unsupported	[RFC7759]
32	OAM Problem/Fault management signaling unsupported	[RFC7759]
33	OAM Problem/Unable to create fault management association	[RFC7759]
34	OAM Problem/PM Configuration Error	[RFC7759]
35	Mapping for this FEC is not associated with the incoming interface	[RFC8287] sec 7.4
36-247	Unassigned	
248-251	Reserved for Experimental Use	This document
252-255	Reserved for Private Use	[RFC8029]

Table 8: Assignments for the Return Codes registry

Note 1: Notes [1] and [2] for code points 5, 6 and 14 point to
footnotes in the "Multiprotocol Label Switching (MPLS) Label Switched
Paths (LSPs) Ping Parameters" namespace. The footnotes are not
changed by this document.

Note 2: <RSC> stands for "Return Subcode" and is explained in section
3.1 of RFC 8029 [RFC8029].

6.2. Updates to the TLV and Sub-TLV registries

The updates to the TLV and the sub-TLV registries are mostly the same, however the Sub-TLVs for TLV Type 9 [IANA-Sub-9] have not been updated.

Note that when a field in an assignment table says "EQ", it means that there is no change from the existing field in the "Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs) Ping Parameters" namespace [IANA-LSP-PING]

6.2.1. Updates to the TLVs registry

This section describes the new registration procedures and the assignments for the "TLVs" registry [IANA-TLV-reg] based on the new registration procedures.

The registration procedures have been changed, as follows, for the "TLVs" registry.

o The "Specification Required" registration procedure has been
   changed to "RFC Required", the comment "Experimental RFC Required"
   has been removed. Note that when a field in an assignment table
   says "EQ", it means that there is no change from the existing
   field in the "Multiprotocol Label Switching (MPLS) Label Switched
   Paths (LSPs) Ping Parameters" namespace [IANA-LSP-PING].

o RFC 8611 was published after RFC 8126 and uses the new
   terminology, e.g. "Private Use". The code points registration
   procedure "Private Use" has been eplaced by the "First come,First
   Served" code point registration proceedure..

o Two small sets, 4 code points each, have been created for
   Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a TLV is not
   recognized.

The registration procedures for the "TLVs" registry [IANA-TLV-reg] will now look like this:

Range	Registration Procedures	Note
0-16383	Standards Action	This range is for TLVs that require an error message if not recognized. [This document, section 3.1]
16384-31739	RFC Required	This range is for TLVs that require an error message if not recognized. [This document, section 3.1]
31740-31743	Experimental Use	Reserved, not to be assigned. This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31744-32767	FCFS	This range is for TLVs that require an error message if not recognized. [This document, section 3.1]
32768-49161	Standards Action	This range is for TLVs that can be silently dropped if not recognized.
49162-64507	RFC Required	This range is for TLVs that can be silently dropped if not recognized.
64508-64511	Experimental Use	Reserved, not to be assigned. This range is for TLVs that can be silently dropped if not recognized.
64512-65535	FCFS	This range is for TLVs that can be silently dropped if not recognized.

Table 9: TLV Registration Procedures

The TLV Assignments will now look like this.

Note that when a field in an assignment table says "EQ", it means that there is no change from the existing field in the "Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs) Ping Parameters" namespace [IANA-LSP-PING]

```
+-------------+--------------+----------------+------------------+
| Type        | TLV Name     | Reference      | Sub-TLV Registry |
+-------------+--------------+----------------+------------------+
| 0           | Reserved     | This document  |                  |
| 1-7         | EQ           | EQ             | EQ               |
| 8           | Unassigned   |                |                  |
| 9-16        | EQ           | EQ             | EQ               |
| 17-19       | unassigned   |                |                  |
| 20-27       | EQ           | EQ             | EQ               |
| 28-31739    | Unassigned   |                |                  |
| 31740-31743 | Experimental | This Document  | Reserved, not to |
|             | Use          |                | be assigned. This|
|             |              |                | range is for sub-|
|             |              |                | TLVs that require |
|             |              |                | an error message |
|             |              |                | if not           |
|             |              |                | recognized. [This|
|             |              |                | document, section |
|             |              |                | 3.1]             |
| 31744-32767 | Unassigned   |                |                  |
| 32768-32770 | EQ           | EQ             | EQ               |
| 32771-64507 | EQ           | EQ             | EQ               |
| 64508-64511 | Experimental | This document  | Reserved, not to |
|             | Use. This    |                | be assigned      |
|             | range is for |                |                  |
|             | TLVs that can |                |                  |
|             | be silently  |                |                  |
|             | dropped if   |                |                  |
|             | not          |                |                  |
|             | recognized.  |                |                  |
| 64512-65535 | Unassigned   |                |                  |
+-------------+--------------+----------------+------------------+
```

Table 10: TLV Assignments

6.2.2. Updates to the registry for Sub-TLVs for TLVs 1, 16 and 21

   This section describes the new registration procedures and the
   assignments for the "Sub-TLVs for TLV Types 1, 16, and 21"
   [IANA-Sub-1-16-21] sub-registry based on the new registration
   procedures.

   o The "Specification Required" registration procedure has been
      changed to "RFC Required", the comment "Experimental RFC Required"
      has been removed.

o The code points registration procedure "Vendor Private Use" has
   been removed and replaced with "First Come, First Served" code
   points.

o Two small sets, 4 code points each, have been created for
   Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a sub-TLV is
   not recognized.

The registration procedures for the
"Sub-TLVs for TLV Types 1, 16, and 21" [IANA-Sub-1-16-21] sub-
registry will now look like this:

Range	Registration Procedures	Note
0-16383	Standards Action	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
16384-31739	RFC Required	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31740-31743	Experimental Use	Reserved, not to be assigned. This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31744-32767	FCFS	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
32768-49161	Standards Action	This range is for sub-TLVs that can be silently dropped if not recognized.
49162-64507	RFC Required	This range is for sub-TLVs that can be silently dropped if not recognized.
64508-64511	Experimental Use	Reserved, not to be assigned. This range is for TLVs that can be silently dropped if not recognized.
64512-65535	FCFS	This range is for sub-TLVs that can be silently dropped if not recognized.

Table 11: Registration Procedures for Sub-TLVs for TLVs 1, 16 and 21

```
+-------------+--------------+-----------------+------------------+
| Type        | TLV Name     | Reference       | Comment          |
+-------------+--------------+-----------------+------------------+
| 0           | Reserved     | This document   |                  |
| 1-4         | EQ           | EQ              | EQ               |
| 5           | Unassigned   |                 |                  |
| 6-8         | EQ           | EQ              | EQ               |
| 9           | EQ           | EQ              | DEPRECATED       |
| 10-20       | EQ           | EQ              | EQ               |
| 21          | unassigned   |                 |                  |
| 22-37       | EQ           | EQ              | EQ               |
| 38-31739    | Unassigned   |                 |                  |
| 31740-31743 | Experimental | This Document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for sub-|
|             |              |                 | TLVs that require|
|             |              |                 | an error message |
|             |              |                 | if not           |
|             |              |                 | recognized. [This|
|             |              |                 | document, section|
|             |              |                 | 3.1]             |
| 31744-64507 | Unassigned   |                 |                  |
| 64508-64511 | Experimental | This document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for TLVs|
|             |              |                 | that can be      |
|             |              |                 | silently dropped |
|             |              |                 | if not           |
|             |              |                 | recognized.      |
| 64512-65535 | Unassigned   |                 |                  |
+-------------+--------------+-----------------+------------------+
```

              Table 12: Sub-TLV for TLV 1, 16 and 21 Assignments

6.2.3. Updates to the registry for Sub-TLVs for TLV 6

   This section describes the new registration procedures and the
   assignments for the "Sub-TLVs for TLV Type 6" [IANA-Sub-6] sub-
   registry based on the new registration procedures.

   o The "Specification Required" registration procedure has been
      changed to "RFC Required", the comment "Experimental RFC Required"
      has been removed.

   o The code points registration procedure "Vendor Private Use" has
      been removed and replaced with "First Come, First Served" code
      points.

   o Two small sets, 4 code points each, have been created for
      Experimental Use.

   o Code points that are reserved are clearly marked as such.

   o The assignments have been updated to match the new registration
      procedures.

   o The notes related to the registration procedures have been changed
      to reflect whether a response is required or not if a sub-TLV is
      not recognized.

   The registration procedures for the "Sub-TLVs for TLV Type 6"
   [IANA-Sub-6] sub-registry will now look like this:

Range	Registration Procedures	Note
0-16383	Standards Action	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
16384-31739	RFC Required	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31740-31743	Experimental Use	Reserved, not to be assigned. This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
31744-32767	FCFS	This range is for sub-TLVs that require an error message if not recognized. [This document, section 3.1]
32768-49161	Standards Action	This range is for sub-TLVs that can be silently dropped if not recognized.
49162-64507	RFC Required	This range is for sub-TLVs that can be silently dropped if not recognized.
64508-64511	Experimental Use	Reserved, not to be assigned. This range is for TLVs that can be silently dropped if not recognized.
64512-65535	FCFS	This range is for sub-TLVs that can be silently dropped if not recognized.

Table 13: Registration Procedures for Sub-TLVs for TLVs 6

```
+-------------+--------------+----------------+------------------+
| Type        | TLV Name     | Reference      | Comment          |
+-------------+--------------+----------------+------------------+
| 0           | Reserved     | This document  |                  |
| 1-2         | EQ           | EQ             | EQ               |
| 3-31739     | Unassigned   |                |                  |
| 31740-31743 | Experimental | This Document  | Reserved, not to |
|             | Use          |                | be assigned. This|
|             |              |                | range is for sub-|
|             |              |                | TLVs that require |
|             |              |                | an error message |
|             |              |                | if not           |
|             |              |                | recognized. [This|
|             |              |                | document, section|
|             |              |                | 3.1]             |
| 31744-64507 | Unassigned   |                |                  |
| 64508-64511 | Experimental | This document  | Reserved, not to |
|             | Use.         |                | be assigned. This|
|             |              |                | range is for TLVs|
|             |              |                | that can be      |
|             |              |                | silently dropped |
|             |              |                | if not           |
|             |              |                | recognized.      |
| 64512-65535 | Unassigned   |                |                  |
+-------------+--------------+----------------+------------------+
```

Table 14: Sub-TLVs for TLV 6 Assignments

6.2.4. Updates to the registry for Sub-TLVs for TLV 11

This section describes the new registration procedures and the
assignments for the "Sub-TLVs for TLV Type 11" [IANA-Sub-11] sub-
registry based on the new registration procedures.

o The "Specification Required" registration procedure has been
   changed to "RFC Required", the comment "Experimental RFC Required"
   has been removed.

o The code points registration procedure "Vendor Private Use" has
   been removed and replaced with "First Come, First Served" code
   points.

o Two small sets, 4 code points each, have been created for
   Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a sub-TLV is
   not recognized.

The registration procedures for the "Sub-TLVs for TLV Type 11"
[IANA-Sub-11] sub-registry will now look like this:

| Range | Registration | Note |
	Procedures	
0-16383	Standards Action	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
16384-31739	RFC Required	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
31740-31743	Experimental Use	Reserved, not to be assigned.
		This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
31744-32767	FCFS	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
32768-49161	Standards Action	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.
49162-64507	RFC Required	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.
64508-64511	Experimental Use	Reserved, not to be assigned.
		This range is for TLVs that can
		be silently dropped if not
		recognized.
64512-65535	FCFS	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.

          Table 15: Registration Procedures for Sub-TLVs for TLVs 11

```
+-------------+--------------+-----------------+-------------------+
| Type        | TLV Name     | Reference       | Comment           |
+-------------+--------------+-----------------+-------------------+
| 0           | Reserved     | This document   |                   |
| 1-4         | EQ           | EQ              | EQ                |
| 5-31739     | Unassigned   |                 |                   |
| 31740-31743 | Experimental | This Document   | Reserved, not to  |
|             | Use          |                 | be assigned. This |
|             |              |                 | range is for sub- |
|             |              |                 | TLVs that require |
|             |              |                 | an error message  |
|             |              |                 | if not            |
|             |              |                 | recognized. [This |
|             |              |                 | document, section |
|             |              |                 | 3.1]              |
| 31744-64507 | Unassigned   |                 |                   |
| 64508-64511 | Experimental | This document   | Reserved, not to  |
|             | Use          |                 | be assigned. This |
|             |              |                 | range is for TLVs |
|             |              |                 | that can be       |
|             |              |                 | silently dropped  |
|             |              |                 | if not            |
|             |              |                 | recognized.       |
| 64512-65535 | Unassigned   |                 |                   |
+-------------+--------------+-----------------+-------------------+
```

Table 16: Sub-TLVs for TLV 11 Assignments

6.2.5. Updates to the registry for Sub-TLVs for TLV 20

This section describes the new registration procedures and the
assignments for the "Sub-TLVs for TLV Type 20" [IANA-Sub-20] sub-
registry based on the new registration procedures.

o The "Specification Required" registration procedure has been
   changed to "RFC Required", the comment "Experimental RFC Required"
   has been removed.

o The code points registration procedure "Vendor Private Use" has
   been removed and replaced with "First Come, First Served" code
   points.

o Two small sets, 4 code ve been created for Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a sub-TLV is
   not recognized.

The registration procedures for the "Sub-TLVs for TLV Type 20"
[IANA-Sub-20] sub-registry will now look like this:

+-------------+------------------+--------------------------------+
| Range | Registration | Note |
| | Procedures | |
+-------------+------------------+--------------------------------+
0-16383	Standards Action	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
16384-31739	RFC Required	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
31740-31743	Experimental Use	Reserved, not to be assigned.
		This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
31744-32767	FCFS	This range is for sub-TLVs that
		require an error message if not
		recognized. [This document,
		section 3.1]
32768-49161	Standards Action	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.
49162-64507	RFC Required	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.
64508-64511	Experimental Use	Reserved, not to be assigned.
		This range is for TLVs that can
		be silently dropped if not
		recognized.
64512-65535	FCFS	This range is for sub-TLVs that
		can be silently dropped if not
		recognized.
+-------------+------------------+--------------------------------+

        Table 17: Registration Procedures for Sub-TLVs for TLVs 20

```
+-------------+--------------+-----------------+------------------+
| Type        | TLV Name     | Reference       | Comment          |
+-------------+--------------+-----------------+------------------+
| 0           | Reserved     | This document   |                  |
| 1-5         | EQ           | EQ              | EQ               |
| 6-31739     | Unassigned   |                 |                  |
| 31740-31743 | Experimental | This Document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for sub-|
|             |              |                 | TLVs that require|
|             |              |                 | an error message |
|             |              |                 | if not           |
|             |              |                 | recognized. [This|
|             |              |                 | document, section|
|             |              |                 | 3.1]             |
| 31744-64507 | Unassigned   |                 |                  |
| 64508-64511 | Experimental | This document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for TLVs|
|             |              |                 | that can be      |
|             |              |                 | silently dropped |
|             |              |                 | if not           |
|             |              |                 | recognized.      |
| 64512-65535 | Unassigned   |                 |                  |
+-------------+--------------+-----------------+------------------+
```

Table 18: Sub-TLVs for TLV 20 Assignments

6.2.6. Updates to the registry for Sub-TLVs for TLV 23

This section describes the new registration procedures and the
assignments for the "Sub-TLVs for TLV Type 23" [IANA-Sub-23] sub-
registry based on the new registration procedures.

o The "Specification Required" registration procedure has been
   changed to "RFC Required", the comment "Experimental RFC Required"
   has been removed.

o The code points registration procedure "Vendor Private Use" has
   been removed and replaced with "First Come, First Served" code
   points.

o Two small sets, 4 code points each, have been created for
   Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a sub-TLV is
   not recognized.

The registration procedures for the "Sub-TLVs for TLV Type 23"
[IANA-Sub-23] sub-registry will now look like this:

```
+-------------+------------------+-------------------------------+
| Range       | Registration     | Note                          |
|             | Procedures       |                               |
+-------------+------------------+-------------------------------+
| 0-16383     | Standards Action | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 16384-31739 | RFC Required     | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 31740-31743 | Experimental Use | Reserved, not to be assigned. |
|             |                  | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 31744-32767 | FCFS             | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 32768-49161 | Standards Action | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
| 49162-64507 | RFC Required     | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
| 64508-64511 | Experimental Use | Reserved, not to be assigned. |
|             |                  | This range is for TLVs that can |
|             |                  | be silently dropped if not    |
|             |                  | recognized.                   |
| 64512-65535 | FCFS             | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
+-------------+------------------+-------------------------------+
```

Table 19: Registration Procedures for Sub-TLVs for TLVs 23

```
+-------------+--------------+-----------------+------------------+
| Type        | TLV Name     | Reference       | Comment          |
+-------------+--------------+-----------------+------------------+
| 0           | Reserved     | [RFC7555]       |                  |
| 1           | EQ           | EQ              | EQ               |
| 2-31739     | Unassigned   |                 |                  |
| 31740-31743 | Experimental | This Document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for sub-|
|             |              |                 | TLVs that require|
|             |              |                 | an error message |
|             |              |                 | if not           |
|             |              |                 | recognized. [This|
|             |              |                 | document, section|
|             |              |                 | 3.1]             |
| 31744-64507 | Unassigned   |                 |                  |
| 64508-64511 | Experimental | This document   | Reserved, not to |
|             | Use          |                 | be assigned. This|
|             |              |                 | range is for TLVs|
|             |              |                 | that can be      |
|             |              |                 | silently dropped |
|             |              |                 | if not           |
|             |              |                 | recognized.      |
| 64512-65535 | Unassigned   |                 |                  |
+-------------+--------------+-----------------+------------------+
```

Table 20: Sub-TLVs for TLV 23 Assignments

6.2.7. Updates to the registry for Sub-TLVs for TLV 27

This section describes the new registration procedures and the
assignments for the "Sub-TLVs for TLV Type 27" [IANA-Sub-27] sub-
registry based on the new registration procedures.

o The "Specification Required" registration procedure has been
   changed to "RFC Required", the comment "Experimental RFC Required"
   has been removed.

o The code points registration procedure "Vendor Private Use" has
   been removed and replaced with "First Come, First Served" code
   points.

o Two small sets, 4 code points each, have been created for
   Experimental Use.

o Code points that are reserved are clearly marked as such.

o The assignments have been updated to match the new registration
   procedures.

o The notes related to the registration procedures have been changed
   to reflect whether a response is required or not if a sub-TLV is
   not recognized.

The registration procedures for the "Sub-TLVs for TLV Type 27"
[IANA-Sub-27] sub-registry will now look like this:

```
+-------------+------------------+-------------------------------+
| Range       | Registration     | Note                          |
|             | Procedures       |                               |
+-------------+------------------+-------------------------------+
| 0-16383     | Standards Action | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 16384-31739 | RFC Required     | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 31740-31743 | Experimental Use | Reserved, not to be assigned. |
|             |                  | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 31744-32767 | FCFS             | This range is for sub-TLVs that |
|             |                  | require an error message if not |
|             |                  | recognized. [This document,   |
|             |                  | section 3.1]                  |
| 32768-49161 | Standards Action | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
| 49162-64507 | RFC Required     | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
| 64508-64511 | Experimental Use | Reserved, not to be assigned. |
|             |                  | This range is for TLVs that can |
|             |                  | be silently dropped if not    |
|             |                  | recognized.                   |
| 64512-65535 | FCFS             | This range is for sub-TLVs that |
|             |                  | can be silently dropped if not |
|             |                  | recognized.                   |
+-------------+------------------+-------------------------------+
```

           Table 21: Registration Procedures for Sub-TLVs for TLV 27

```
+-------------+--------------+----------------+------------------+
| Type        | TLV Name     | Reference      | Comment          |
+-------------+--------------+----------------+------------------+
| 0           | Reserved     | [RFC7555]      |                  |
| 1           | EQ           | EQ             | EQ               |
| 2-31739     | Unassigned   |                |                  |
| 31740-31743 | Experimental | This Document  | Reserved, not to |
|             | Use          |                | be assigned. This|
|             |              |                | range is for sub-|
|             |              |                | TLVs that require|
|             |              |                | an error message |
|             |              |                | if not           |
|             |              |                | recognized. [This|
|             |              |                | document, section|
|             |              |                | 3.1]             |
| 31744-64507 | Unassigned   |                |                  |
| 64508-64511 | Experimental | This document  | Reserved, not to |
|             | Use          |                | be assigned. This|
|             |              |                | range is for TLVs|
|             |              |                | that can be      |
|             |              |                | silently dropped |
|             |              |                | if not           |
|             |              |                | recognized.      |
| 64512-65535 | Unassigned   |                |                  |
+-------------+--------------+----------------+------------------+
```

Table 22: Sub-TLVs for TLV 27 Assignments

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