The nits-tools gives the following warnings that you should take care of:

== Line 109 has weird spacing: '... The scope ...'

== Line 227 has weird spacing: '...ntended dest...'

-- Looks like a reference, but probably isn't: 'RFC2119' on line 117

Loa- 1: This warning comes about because RFC2119 is defined as [3] in the in the reference sections, but you use [RFC2119].

Loa-2: I prefer references that look like [RFC2119], but this is a preference. I think that the RFC Editor will want to use the style [[RFC2119].

== Unused Reference: '1' is defined on line 269, but no explicit reference

was found in the text

This defines a reference for RFC4379, you actually never use this reference, but I think you should, e.g. in the IANA section.

== Unused Reference: '2' is defined on line 272, but no explicit reference

was found in the text

This defines a reference to RFC5085, you never use this reference.

== Unused Reference: '3' is defined on line 276, but no explicit reference

was found in the text

This creates the reference to 2119 - Please see above.

]

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Definition of Time-to-Live TLV for LSP-Ping Mechanisms

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Abstract

LSP-Ping is a widely deployed Operation, Administration, and

Maintenance (OAM) mechanism in MPLS networks. However, in the present

form, this mechanism is inadequate to verify connectivity of a

segment of a Multi-Segment PseudoWire (MS-PW) from any node on the

path of the MS-PW. This document defines a TLV to address this

shortcoming.

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1. Introduction

A MS-PW can span across multiple service provider networks. In order

to allow Service Providers (SP) to verify segments of such MS-PW from

any node on the path of the MS-PW, any node along the path of the MS-

PW, should be able to originate an LSP-Ping echo request packet to

any another node along the path of the MS-PW and receive the

corresponding echo reply. If the originator of the echo request is at

the end of a MS-PW, the receiver of the request can send the reply

back to the sender without knowing the hop-count distance of the

originator. For example, the reply will be intercepted by the

originator regardless of the TTL value on the reply packet. But, if

the originator is not at the end of the MS-PW, the receiver of the

echo request MAY need to know how many hops away the originator of

the echo request is so that it can set the TTL value on the MPLS

header for the echo reply to be intercepted at the originator node.

In MPLS networks, for bidirectional co-routed LSPs, if it is desired

to verify connectivity from any intermediate node (LSR) on the LSP to

the any other LSR on the LSP the receiver may need to know the TTL to

send the Echo reply with, so as the packet is intercepted by the

originator node.

A new optional TTL TLV is being proposed in this document this TLV

will be added by the originator of the echo request to inform the

receiver how many hops away the originator is on the path of the MS-

PW or Bidirectional LSP.

The scope of this TTL TLV is currently limited to MS-PW or

Bidirectional co-routed MPLS LSPs.

2. Terminology

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].

LSR: Label Switching Router

MPLS-OAM: MPLS Operations, Administration and Maintenance

MPLS-TP: MPLS Transport Profile

MS-PW: Multi-Segment PseudoWire

PW: PseudoWire

TLV: Type Length Value

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TTL: Time To Live

3. Time To Live TLV

3.1. TTL TLV Format

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

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Type = TBD | Length = 8 |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Value | Reserved | Flags |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

Figure 1: Time To Live TLV format

The TTL TLV has the format shown in Figure 1.

Value

The value of the TTL as specified by this TLV

Flags

The Flags field is a bit vector with the following format:

0 1

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| MBZ |R|

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

One flag is defined for now, the R bit; the rest MUST be set

to zero when sending and ignored on receipt.

The R flag (Reply TTL) is set signify that the value is

meant to be used as the TTL for the reply packet. Other bits

may be defined later to enhance the scope of this TLV.

3.2. Usage

This TLV shall be included in the echo request by the originator of

request. The use of this TLV is optional. If a receiver does not

understand the TTL TLV, it will simply ignore the TLV (Type value of

TLV is assumed to be in the range of optional TLV's which SHOULD be

ignored if an implementation does not support or understand them). In

the absence of TTL TLV or if TTL TLV is ignored by a receiver, the

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determination of the TTL value used in the MPLS label on the echo

reply is beyond the scope of this document.

If a receiver understands the TTL TLV, and the TTL TLV is present in

the echo request, and if the value field is zero, the LSP Ping Echo

request packet SHOULD be dropped.

If a receiver understands the TTL TLV, and the TTL TLV is present in

the echo request, the receiver MUST use the TTL value specified in

TLV in the MPLS header of the echo reply. In other words, if the

value of the TTL provided by this TLV does not match the TTL

determined by other means, such as Switching Point TLV in MS-PW, then

TTL TLV must be used. This will aid the originator of the echo

request in analyzing the return path.

4. Operation

In this section, we explain a use case for the TTL TLV with an MPLS

MS-PW.

<------------------MS-PW --------------------->

A B C D E

o -------- o -------- o --------- o --------- o

------Echo Request----->

<-----Echo Reply--------

Figure 2: Use-case with MS-PWs

Let us assume a MS-PW going through LSRs A, B, C, D, and E.

Furthermore, assume that an operator wants to perform a connectivity

check between B and D from B. Thus, an LSP-Ping request with the TTL

TLV is originated from B and sent towards D. The echo request packet

contains the FEC of the PW Segment between C and D. The value field

of the TTL TLV and the TTL field of the MPLS label are set to 2. The

echo request is intercepted at D because of TTL expiry. D detects the

TTL TLV in the request, and use the TTL value (i.e., 2) specified in

the TLV on the MPLS label of the echo reply. The echo reply will be

intercepted by B because of TTL expiry.

The same operation will apply in the case a co-routed bidirectional

LSP and we want to check connectivity from an intermediate LSR B to

another LSR D, from B.

4.1. Traceroute mode

In the traceroute mode TTL value in the TLV is successively set to 1,

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2, and so on. This is similar to the TTL values used for the label

set on the packet.

4.2. Error scenario

It is possible that the echo request packet was punted before the

intended destination. This could be due network faults,

misconfiguration or other reasons. In such cases, if the return TTL

is set to the value specified in the TTL TLV then the echo response

packet will continue beyond the originating node. This becomes a

security issue.

To prevent this issue, the TTL value used must be modified by

deducting the incoming label TTL. If the echo request packet is

punted before the incoming TTL is deducted, then another 1 must be

deducted. In other words:

Return TTL Value = (TTL TLV Value)-(Incoming Label TTL) + 1

5. Security Considerations

This draft allows the setting of the TTL value in the MPLS Label of

an echo reply, so that it can be intercepted by an intermediate

device. This can cause a device to get a lot of LSP Ping packets

which get redirected to the CPU.

However the same is possible even without the changes mentioned in

this document. A device should rate limit the LSP ping packets

redirected to the CPU so that the CPU is not overwhelmed.

6. IANA Considerations

IANA is requested to assign TLV type value to the following TLV from

the "Multiprotocol Label Switching Architecture (MPLS) Label Switched

Paths (LSPs) Parameters - TLVs" registry, "TLVs and sub-TLVs" sub-

registry.

Time To Live TLV (See Section 3). The Suggested value is from the range (32768-49161) of optional TLV's which SHOULD be

ignored if an implementation does not support or understand them as

suggested by RFC 4379 Section 3.

7. Acknowledgements

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