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**L2TPv3 Extended Circuit Status Values**  
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Abstract

This document defines additional Layer 2 Tunneling Protocol Version 3 (L2TPv3) bit values to be used within the "Circuit Status" Attribute Value Pair (AVP) to communicate more granular error states for Access Circuits and Pseudowires. It also deprecates the use of the New bit in the "Circuit Status" AVP, updating [RFC3931](#).

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## 1. Introduction

Currently the L2TPv3 Circuit Status AVP [[RFC3931](#)] is able to convey the UP/DOWN status of an access circuit. However, a finer granularity is often useful to determine the direction of the fault as has been added for MPLS-based pseudowires and used in the pseudowire control protocol using LDP, see [[RFC4446](#)] and [[RFC4447](#)].

Additionally, it is useful (in redundancy scenarios) to be able to indicate if a pseudowire is in a standby state, where it is fully established but is not switching data. Again, such functionality is available for MPLS based pseudowires using LDP, see [[I-D.ietf-pwe3-redundancy-bit](#)].

The proposal is to provide extended circuit status bit values for L2TPv3 and to add them in a manner such that it is backwards compatible with the current Circuit Status AVP. These new bits are applicable to all pseudowires types.

### 1.1. Specification of Requirements

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. L2TPv3 Extended Circuit Status Values

The Circuit Status AVP (ICRQ, ICRP, ICCN, OCRQ, OCRP, OCCN, SLI), Attribute Type 71, indicates the initial status of or a status change in the circuit to which the session is bound.

The Attribute Value field for this AVP currently defined in [[RFC3931](#)] has the following format:

```

      0                               1
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|           Reserved              |N|A|
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

```

Bit	Bit-Value	Name
(A)	15 0x0001	Active
(N)	14 0x0002	New

Where, the A (Active) bit indicates whether the circuit is up/active/ready (1) or down/inactive/not-ready (0).



The N (New) bit indicates if the notification is for a new circuit (1) or an existing circuit (0), and is provided to emulate (Frame Relay) NNI signaling between PEs. It MAY be used to convey that a circuit has been reprovisioned or newly provisioned at the PE, which can already be inferred from the L2TP control message type. It is uncertain as to what use the receiving PE can make of this bit, although it MAY include logging. This document deprecates this bit as it is of little or no use, hence this bit SHOULD be ignored on receipt and is OPTIONAL to send. For reference, see [Section 3.4 of \[RFC4591\]](#) which does not specify any additional usage beyond the setting of in the ICRQ, ICRP (and OCRQ, OCRP) and clearing in all other control messages.

This document extends this bitmap of values to allow for finer granularity of local pseudowire (i.e., access circuit or PSN-facing endpoint) status reporting.

The Attribute Value field for the Circuit Status AVP including the new values has the following format:

```

      0                               1
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+-+--+--+--+--+--+--+--+--+--+--+
|      Reserved      |S|E|I|T|R|O|A|
+-+--+--+--+--+--+--+--+--+--+--+

```

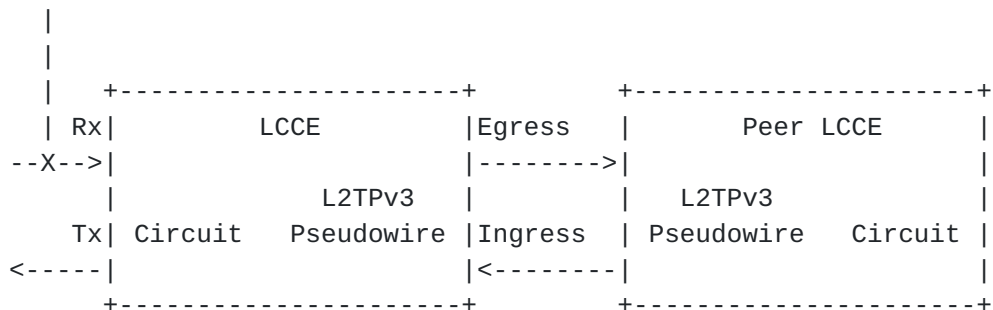
Bit	Bit-Value	Name
(A)	15 0x0001	Active: Pseudowire has no faults
(R)	14 0x0004	Local Attachment Circuit (ingress) Receive Fault
(T)	13 0x0008	Local Attachment Circuit (egress) Transmit Fault
(I)	12 0x0010	Local PSN-facing PW (ingress) Receive Fault
(E)	11 0x0020	Local PSN-facing PW (egress) Transmit Fault
(S)	9 0x0040	Pseudowire is in Standby mode

The new bits values have the following meanings:



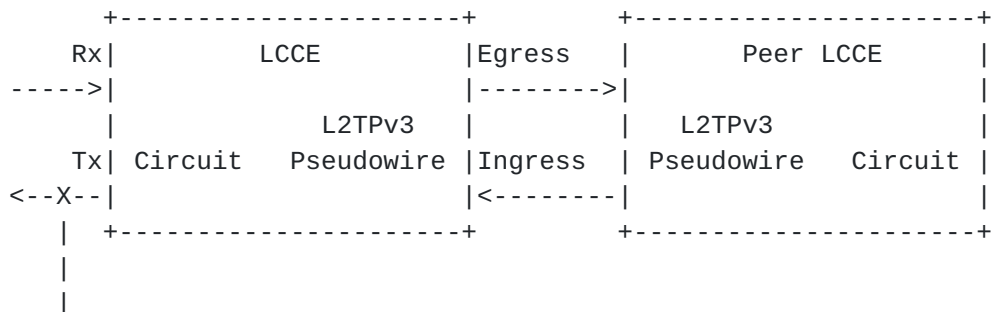
## (R), Local Attachment Circuit (ingress) Receive Fault

Fault Here



An alarm or fault has occurred at the local attachment circuit such that it is unable to receive traffic. It can still transmit traffic.

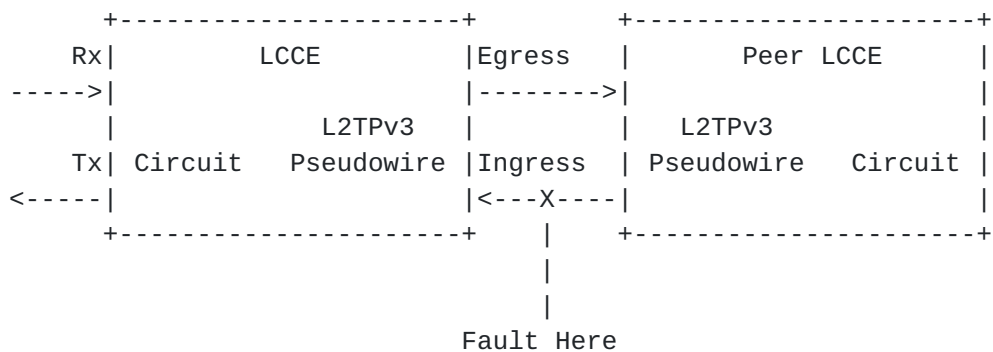
## (T), Local Attachment Circuit (egress) Transmit Fault



Fault Here

A fault has occurred at the local attachment circuit such that it is unable to transmit traffic. It can still receive traffic.

## (I), Local PSN-facing PW (ingress) Receive Fault



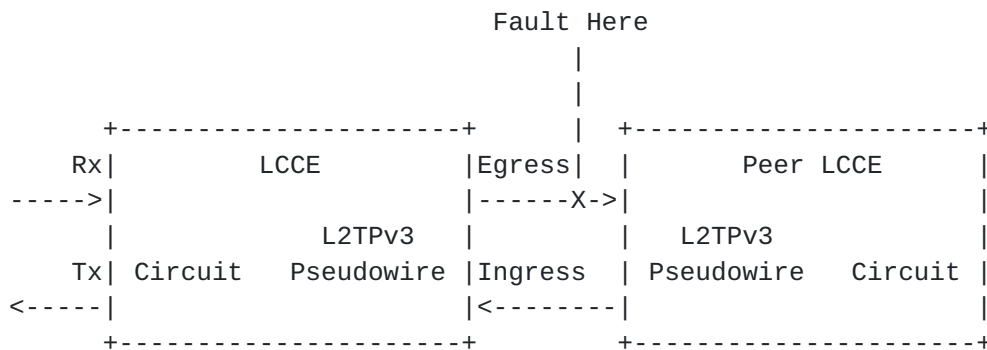




A fault has occurred in the receive direction between the local endpoint and the remote L2TP endpoint.

Note that a fault at the session level would not necessarily trigger an L2TP control connection timeout. The means of detecting this fault are outside the scope of this document; as an example, detection may be via PW Type-specific means, BFD, or other methods.

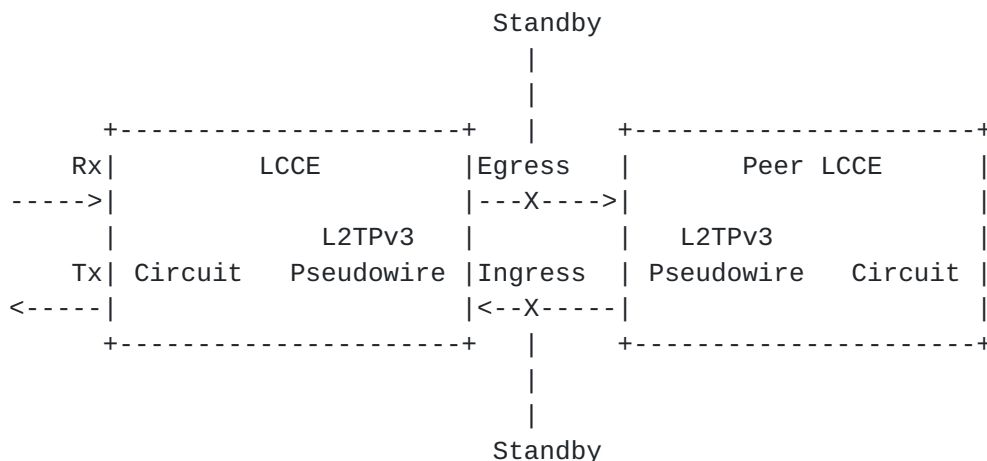
#### (E), Local PSN-facing PW (egress) Transmit Fault



A fault has occurred in the transmit direction between the local endpoint and the remote L2TP endpoint.

Note that a fault at the session level would not necessarily trigger an L2TP control connection timeout. The means of detecting this fault are outside the scope of this document; as an example, detection may be via PW Type-specific means, BFD, or other methods.

#### (S), Pseudowire is in Standby mode





The pseudowire has been placed into a standby mode which means that although it can be signaled and is operational, it is NOT switching traffic. Any received traffic SHOULD be dropped. Traffic MUST NOT be transmitted.

### **3. Circuit Status Usage and Clarifications**

The following are clarifications regarding the usage of the Circuit Status AVP bits:

- o If multiple faults occur, all the bits corresponding to each fault MUST be set (i.e., they MUST be bitwise-OR-d together).
- o The (A) bit MUST NOT be set until all fault flags are cleared. This behavior allows an endpoint to be backwards compatible with a remote endpoint that does not understand these new status bits.
- o [[RFC3931](#)] defined the (A) bit as pertaining to local access circuit state only. This draft redefines it as meaning that "no faults are present on the local pseudowire endpoint."
- o If any of the (R), (T), (I) or (E) bits are set, then the (A) bit MUST be cleared. That is, (R, T, I, E) are a more granular definition of (A), such that OR-ing the bits provides an inverted (A).
- o If (A) is clear and (R, T, I, E) are clear, it means that there is no extended circuit status. That is, the circuit is down/inactive/not-ready (from the (A) bit), without a more granular (extended) indication.
- o The (S) bit can be set in conjunction with any other bit, including (A). A pseudowire endpoint in Standby (S bit set) can be up/active/ready (A bit set) or experiencing a fault (A bit cleared and (R, T, I, E) bit(s) set).
- o Leaving standby mode is indicated by the clearing of the (S) bit.
- o The (N) bit has been deprecated.

### **4. Security Considerations**

No additional security considerations exist with extending this attribute.



## 5. IANA Considerations

The Circuit Status Bits number space reachable at [[IANA.l2tp-parameters](#)] is managed by IANA as per [[RFC3931](#)]. Five new bits and one updated bit are requested to be assigned as follows:

Circuit Status Bits - per [[RFC3931](#)]

-----

Bit 9 - S (Standby) bit  
Bit 10 - E (Local PSN-facing PW (egress) Tx Fault) bit  
Bit 11 - I (Local PSN-facing PW (ingress) Rx Fault) bit  
Bit 12 - T (Local AC (egress) Tx Fault) bit  
Bit 13 - R (Local AC (ingress) Rx Fault) bit  
Bit 14 - N (New) bit [use deprecated]

## 6. Acknowledgements

The authors wish to thank Muhammad Yousuf, Mark Townsley and George Wilkie for comments received.

## 7. References

### 7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3931] Lau, J., Townsley, M., and I. Goyret, "Layer Two Tunneling Protocol - Version 3 (L2TPv3)", [RFC 3931](#), March 2005.

### 7.2. Informative References

- [I-D.ietf-pwe3-redundancy-bit]  
Muley, P., Aissaoui, M., Bocci, M., Dutta, P., and M. Lasserre, "Preferential Forwarding Status bit definition", [draft-ietf-pwe3-redundancy-bit-00](#) (work in progress), February 2008.
- [IANA.l2tp-parameters]  
Internet Assigned Numbers Authority, "Layer Two Tunneling Protocol "L2TP"", December 2007,  
<<http://www.iana.org/assignments/l2tp-parameters>>.
- [RFC4446] Martini, L., "IANA Allocations for Pseudowire Edge to Edge Emulation (PWE3)", [BCP 116](#), [RFC 4446](#), April 2006.



- [RFC4447] Martini, L., Rosen, E., El-Aawar, N., Smith, T., and G. Heron, "Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)", [RFC 4447](#), April 2006.
- [RFC4591] Townsley, M., Wilkie, G., Booth, S., Bryant, S., and J. Lau, "Frame Relay over Layer 2 Tunneling Protocol Version 3 (L2TPv3)", [RFC 4591](#), August 2006.

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