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Pseudowire Redundancy on S-PE
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Abstract

This document describes Multi-Segment Pseudowire (MS-PW) protection scenarios in which the pseudowire redundancy is provided on the Switching-PE (S-PE). Operations of the S-PEs which provide PW redundancy are specified in this document. Signaling of the preferential forwarding status as defined in [\[RFC6870\]](#) is reused. This document does not require any change to the T-PEs of MS-PW.

Requirements Language

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](#)].

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[1.](#) Introduction

[RFC6718] describes the framework and requirements for pseudowire (PW) redundancy, and [\[RFC6870\]](#) specifies Pseudowire (PW) redundancy mechanism for scenarios where a set of redundant PWs is configured between provider edge (PE) nodes in single-segment pseudowire (SS-PW) [\[RFC3985\]](#) applications, or between terminating provider edge (T-PE) nodes in multi-segment pseudowire (MS-PW) [\[RFC5659\]](#) applications.

In some MS-PW scenarios, there are benefits to provide PW redundancy on S-PEs, such as reducing the burden on the access T-PE nodes, and faster protection switching. This document describes some scenarios in which PW redundancy is provided on S-PEs, and specifies the operations of the S-PEs. Signaling of the preferential forwarding status as defined in [\[RFC6870\]](#) is reused. This document does not require any change to the T-PEs of MS-PW.

[2.](#) Typical Scenarios of PW Redundancy on S-PE

In some MS-PW deployment scenarios, there are benefits to provide PW redundancy on S-PEs. This section describes typical scenarios of PW redundancy on S-PE.

2.1. MS-PW Redundancy on S-PE

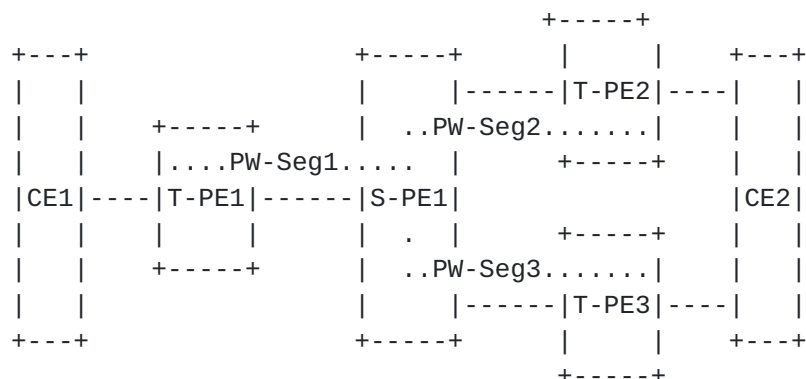


Figure 1. MS-PW Redundancy on S-PE

As illustrated in Figure 1, CE1 is connected to T-PE1 while CE2 is dual-homed to T-PE2 and T-PE3. T-PE1 is connected to S-PE1 only, and S-PE1 is connected to both T-PE2 and T-PE3. The MS-PW is switched on S-PE1, and PW-Seg2 and PW-Seg3 provides resiliency on S-PE1 for failure of T-PE2 or T-PE3 or the connected ACs. PW-Seg2 is selected as the primary PW segment, and PW-Seg3 is the secondary PW segment.

MS-PW redundancy on S-PE is beneficial for the scenario in Figure 1 since T-PE1 as an access node may not be able to provide PW redundancy, especially when the PW-Seg1 between T-PE1 and S-PE1 is statically configured. And with PW redundancy on S-PE, the number of PW segments required between T-PE1 and S-PE1 is only half of the number of PW segments needed when using end-to-end MS-PW redundancy. In addition, in this scenario PW redundancy on S-PE could provide faster protection switching, compared with end-to-end protection switching of MS-PW.

2.2. MS-PW Redundancy on S-PE with S-PE Protection

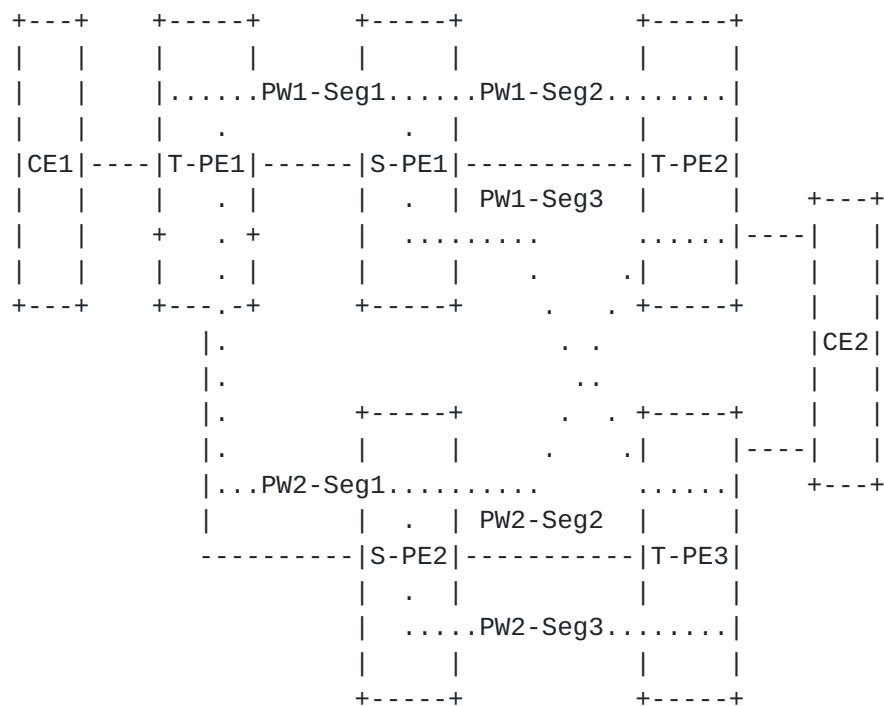


Figure 2. MS-PW Redundancy on S-PE with S-PE protection

As illustrated in Figure 2, CE1 is connected to T-PE1 while CE2 is dual-homed to T-PE2 and T-PE3. T-PE1 is connected to S-PE1 and S-PE2, and both S-PE1 and S-PE2 are connected to both T-PE2 and T-PE3. There are two MS-PWs which are switched at S-PE1 and S-PE2 respectively to provide S-PE node protection. For MS-PW1, S-PE1 provides resiliency using PW1-Seg2 and PW1-Seg3. For MS-PW2, S-PE2 provides resiliency using PW2-Seg2 and PW2-Seg3. MS-PW1 is the primary PW and PW1-Seg2 between S-PE1 and T-PE2 is the primary PW segment. MS-PW2 is the secondary PW.

MS-PW redundancy on S-PE is beneficial for this scenario since it reduces the number of end-to-end MS-PWs required for both T-PE and S-PE protection. In addition, PW redundancy on S-PE could provide faster protection switching, compared with end-to-end protection switching of MS-PW.

3. S-PE Operations

For an S-PE which provides PW redundancy for MS-PW, it is important to advertise proper preferential forwarding status to the PW segments on both sides and perform protection switching according to the received status information. This section specifies the operations of S-PEs on which PW redundancy is provisioned. This document does not make any change to the T-PEs of MS-PW.

In general, the S-PE SHOULD work as a Slave node for the single-connected side, and SHOULD work in Independent mode for the multi-connected side. The S-PE SHOULD pass the preferential forwarding status received from the single-connected side unchanged to the PW segments on the multi-connected side. The S-PE SHOULD advertise Standby status to the single-connected side if it receives Standby status from all the PW segments on the multi-connected side, and it SHOULD advertise Active status to the single-connected side if it receives Active status from any of the PW segments on the multi-connected side. For the single-connected side, the active PW segment is determined by the T-PE on this side, which works as the Master node. On the multi-connected side, the PW segment which has both local and remote Up/Down status and Preferential Forwarding status as Up and Active SHOULD be selected for traffic forwarding.

The Signaling of Preferential Forwarding bit defined in [\[RFC6870\]](#) is reused in these scenarios.

3.1. Operations of Scenario 1

For the scenario in Figure 1, assume the AC from CE2 to T-PE2 is active. In normal operation, S-PE1 would receive Active Preferential Forwarding status bit on the single-connected side from T-PE1, then it would advertise Active Preferential Forwarding status bit on both PW-Seg2 and PW-Seg3. T-PE2 and T-PE3 would advertise Active and Standby preferential status bit respectively to S-PE1, reflecting the forwarding state of the two ACs to CE2. By matching the local and remote Up/Down status and Preferential Forwarding status, PW-Seg2 would be used for traffic forwarding.

On failure of the AC between CE2 and T-PE2, the forwarding state of AC on T-PE3 is changed to Active. T-PE3 then advertises Active Preferential Status to S-PE1, and T-PE2 would advertise a PW status Notification message to S-PE1, indicating that the AC between CE2 and T-PE2 is down. S-PE1 would perform the switchover according to the updated local and remote Preferential Forwarding status and status of "Pseudowire forwarding", and select PW-Seg3 as the new PW Segment for traffic forwarding. Since S-PE1 still connects to an Active PW segment on the multi-connected side, it will not advertise any change of the PW status to T-PE1. S-PE1 may advertise the updated Switching Point PE TLVs (SP-PE TLVs) [\[RFC6073\]](#) using Label Mapping message to T-PE1.

3.2. Operations of Scenario 2

For the scenario of Figure 2, assume the AC from CE2 to T-PE2 is active. T-PE1 works in Master mode and it would advertise Active and Standby Preferential Forwarding status bit respectively to S-PE1 and

S-PE2 according to configuration. According to the received Preferential Forwarding status bit, S-PE1 would advertise Active Preferential Forwarding status bit to both T-PE2 and T-PE3, and S-PE2 would advertise Standby Preferential Forwarding status bit to both T-PE2 and T-PE3. T-PE2 would advertise Active Preferential Forwarding status bit to both S-PE1 and S-PE2, and T-PE3 would advertise Standby Preferential Forwarding status bit to both S-PE1 and S-PE2, reflecting the forwarding state of the two ACs to CE2. By matching the local and remote Up/Down Status and Preferential Forwarding status, PW1-Seg2 from S-PE1 to T-PE2 would be used for traffic forwarding. Since S-PE1 connects to the Active PW segment on the multi-connected side, it would advertise Active Preferential Forwarding status bit to T-PE1, and S-PE2 would advertise Standby Preferential Forwarding status bit to T-PE1 since it does not have any Active PW segment on the multi-connected side.

On failure of the AC between CE2 and T-PE2, the forwarding state of AC on T-PE3 is changed to Active. T-PE3 would then advertise Active Preferential Forwarding status bit to both S-PE1 and S-PE2, and T-PE2 would advertise a PW status Notification message to both S-PE1 and S-PE2, indicating that the AC between CE2 and T-PE2 is down. S-PE1 would perform the switchover according to the updated local and remote Preferential Forwarding status and status of "Pseudowire forwarding", and select PW1-Seg3 for traffic forwarding. Since S-PE1 still has an Active PW segment on the multi-connected side, it would not advertise any change of the PW status to T-PE1. S-PE1 may advertise the updated SP-PE TLVs [[RFC6073](#)] using Label Mapping message to T-PE1.

If S-PE1 fails, T-PE1 would notice this through some kind of detection mechanism and then advertise the Active Preferential Forwarding status bit to S-PE2, and PW2-Seg1 would be selected by T-PE1 for traffic forwarding. On receipt of the newly changed Preferential Forwarding status, S-PE2 would advertise the Active Preferential Forwarding status to both T-PE2 and T-PE3. T-PE2 and T-PE3 would also notice the failure of S-PE1 by some kind of detection mechanism. Then by matching the local and remote Up/Down and Preferential Forwarding status, PW2-Seg2 would be selected for traffic forwarding.

4. VCCV Considerations

PW VCCV [[RFC5085](#)] CC type 1 "PW ACH" can be used with S-PE redundancy mechanism. VCCV CC type 2 "Router Alert Label" is not supported for MS-PW as specified in [[RFC6073](#)]. If VCCV CC type 3 "TTL Expiry" is to be used, the hop count from one T-PE to the remote T-PE needs to be obtained in advance. This can be achieved either by control plane SP-PE TLVs or through data plane tracing of the MS-PW.

5. IANA Considerations

This document makes no request of IANA.

6. Security Considerations

This document has the same security properties as in the PWE3 control protocol [[RFC4447](#)] and [[RFC6870](#)].

7. Acknowledgements

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