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Pseudowire Customer Edge to Customer Edge Emulation
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Abstract

The PWE3 architecture document places the interworking function solely in the PE, so that the attachment circuit between PE and CE carries the native service. This is appropriate for a service provider that offers the customer a seamless alternative for transporting the native service. An alternative is to place the interworking function in the CE, with ethernet access from CE to PE. We present advantages of this approach and note required changes to the PWE architecture.

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1. Introduction

In VPN architectures provider edge routers communicate with customer edge routers, and both types of routers carry essentially the same service (e.g. IP). The PWE model is an extension of this architecture, but while the provider has a IP or MPLS packet switched network, the customer's network is some native service, e.g. ATM, frame-relay, or TDM. In order to transport the customer's traffic over the provider's PSN, an interworking function is required. The PWE architecture as detailed in [\[PWE-arch\]](#) places this interworking function in the PE. The emulation of the native service is thus "edge to edge", meaning provider edge to provider edge. We can call this pseudowire provider edge to provider edge emulation, or PWPE2E.

The reasoning behind this placement of the interworking function is clear. The customer is assumed to have had a native service provider, and to have connected to this provider via a native service attachment circuit. Hence the new service provider deploying a PWE network and wishing to provide a seamless migration path, naturally offers to accept the native service attachment circuit. In this way no modification of the customer premises equipment is required, and the customer may even be unaware of the different transport mode of the new provider.

However, this is not the only possible placement of the interworking function. For reasons discussed in [Section 2](#) below, it is frequently more sensible to place the interworking function at the CE instead. In that case the CE to PE connection is of the PSN type, rather than of the native service, and the emulation is from CE to CE. We can thus call this variant pseudowire customer edge to customer edge emulation, or PWCE2E.

Although the traffic type of the attachment circuit tends to distinguish between PWPE2E and PWCE2E, this differentiation is not sufficient. In a possible scenario the interworking function itself, although located at the customer's site, is under control of the provider. In this case it essentially functions as a user located PE, and participates in provider network signaling. In the true PWCE2E case the interworking function belongs to the customer, and the provider may be unaware of its existence. All provider network signaling is carried out at the remote PE, as in the standard PWE model [\[PWE-ctrl\]](#).

A provider may offer both PWPE2E and PWCE2E connections. A single end to end emulation may be PWPE2E on one side and PWCE2E on the other.

[2.](#) Motivations for PWCE2E

Why should the interworking be performed before the attachment circuit? There are various reasons.

The first is to take advantage of ethernet access. Ethernet access is becoming widely available and may prove less expensive to the customer than ATM or frame relay access links. Standardization of ethernet in the first mile and metro ethernet networks is being advanced by several forums, and the models being developed in these forums are thus different from the PWE model. Ethernet access may particularly appeal to customers who did not previously contract with service providers for their non-ethernet services.

In the PWPE2E model the interworking function tends to be a large gateway, built to serve large numbers of customers. It may not be viable for a provider to install a large gateway when only a few customers are interested in a particular service. In such cases a small customer located gateway may be desirable.

An advantage of the PWCE2E model is that customer edge to customer edge OAM and performance measurement is natural here, while the parallel functionalities for the PWPE2E case cover only the provider network, and not the attachment circuits.

[3. Implications](#)

When the PSN is IP, no user protocol enhancements are required for PWCE2E. The IP header, demultiplexing label, control word, and payload are sent from CE to PE as described in the present service specific encapsulation documents.

For the MPLS case, IP access is also possible, with the CE converting the native service into IP packets. The PE then prepends MPLS labels and the packet is forwarded as any other MPLS-labeled IP packet. This would result in inefficient transport, and circumvents the PWE mechanisms for MPLS.

The ideal way of handling a PWCE2E packet is to have the CE perform the service specific encapsulation and to prepend the (inner) PW label, but no (outer) MPLS transport labels. The PE, which participates in the provider network signaling, then adds the appropriate MPLS labels as required.

This capability of accepting non-IP MPLS-like packets is not presently available in MPLS LERs nor in PWE PEs. Its advantage is its universality. Equipped with this feature any edge router can participate in PWE applications without being aware of service specific details.

Other than defining this capability, only minor changes to the present PWE documents are needed to add PWCE2E functionality. Figure 2 of the architecture document (PWE3 Network Reference Model) would

need to be slightly enhanced, and the term "CE-bound" would need to be changed.

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[4.](#) References

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