



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.1312

(09/2003)

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT GENERATION NETWORKS

Internet protocol aspects – Transport

Layer 1 Virtual Private Network generic requirements and architecture elements

ITU-T Recommendation Y.1312

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ITU-T Recommendation Y.1312

Layer 1 Virtual Private Network generic requirements and architecture elements

Summary

This Recommendation specifies service definition, service scenarios, service requirements and service architecture elements on Layer 1 Virtual Private Network (L1 VPN).

Source

ITU-T Recommendation Y.1312 was approved on 13 September 2003 by ITU-T Study Group 13 (2001-2004) under the ITU-T Recommendation A.8 procedure.

Keywords

Architecture, Layer 1, Layer 1 VPN, Requirement, Virtual Private Network, VPN.

FOREWORD

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ITU-T Recommendation Y.1312

Layer 1 Virtual Private Network generic requirements and architecture elements

1 Scope

This Recommendation specifies service definition, service scenarios, service requirements and service architecture elements on Layer 1 Virtual Private Network (L1 VPN).

L1 VPN has specific features compared to generic VPN described in ITU-T Rec. Y.1311, such as connections between CEs rather than tunnels between PEs, and C-plane/U-plane separation. In addition, L1 VPN has features such as connectivity restriction within limited CEs and per-VPN C-plane functionalities, which are achieved by additional functionalities to the basic L1 network. To this end, L1 VPN provides customers with large capacity U-plane resources with a different set of C-plane functionalities. Thus, new kinds of services are expected to emerge, including multi-service backbone, carrier's carrier and L1 resource trading.

This Recommendation addresses service features of L1 VPN including those mentioned above, and also describes service requirements and service architecture elements. In addition, this Recommendation describes several scenarios where the merits of L1 VPN are well expected.

2 References

The following ITU-T Recommendations and other references contain provisions, which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation G.805 (2000), *Generic functional architecture of transport networks*.
- [2] ITU-T Recommendation G.8080/Y.1304 (2001), *Architecture for the automatic switched optical network (ASON)*.
- [3] ITU-T Recommendation Y.1311 (2002), *Network Based VPNs – Generic architecture and service requirements*.

3 Definitions

This Recommendation defines the following terms:

3.1 L1 VPN: A network formed by a set of CEs and network resources between CEs. A set of CEs is managed by the same authority. Network resources between CEs are provided by the service provider, and may include links, connections and C-plane functionalities. Refer to ITU-T Rec. Y.1311.

3.2 NB L1VPN: Refer to ITU-T Rec. Y.1311.

3.3 CE: The entity receiving U-plane and C-plane service provided by the network to which it is attached. Refer to ITU-T Rec. Y.1311.

3.4 PE: The entity within the Network connected to CE, that provides service to customers. Refer to ITU-T Rec. Y.1311.

- 3.5 P:** The entity within the network, and connected to P or PE devices. Refer to ITU-T Rec. Y.1311.
- 3.6 link:** U-Plane resource connecting adjacent network devices in the same layer (in the OSI sense) and within the same layer network (in the G.805 sense), e.g. connecting CE and PE, PE and P.
- 3.7 connection:** For L1 VPN, a connection is established between a pair of CEs. See Annex A for a more detailed description.
- 3.8 customer:** The entity that has authority over a set of CEs within the same VPN (e.g. the owner of the CEs). The customer is the billable entity to which L1 VPN service is provided. The customer of a Layer 1 VPN has typically at least 3 CEs, while the customer of a private line service has exactly two CEs.
- 3.9 shared U-plane:** U-plane in which link resources can be multiplexed (over time) between different VPNs. At any instant in time the resources are either dedicated to one VPN or are unallocated.
- 3.10 dedicated U-plane:** U-plane in which link resources are allocated exclusively to a specific VPN.
- 3.11 shared C-plane:** C-plane in which the same control resources are used by multiple VPNs.
- 3.12 dedicated C-plane:** C-plane in which control resources are allocated exclusively to a specific VPN.
- 3.13 Shared U-Plane Private Network (SUPN):** L1VPN with shared U-plane.
- 3.14 Dedicated U-Plane Private Network (DUPN):** L1VPN with dedicated U-plane.
- 3.15 Shared C-Plane Private Network (SCPN):** L1VPN with shared C-plane.
- 3.16 Dedicated C-Plane Private Network (DCPN):** L1VPN with dedicated C-plane.
- 3.17 site:** The network behind a CE, that is managed by the same authority as the CE.

4 Abbreviations

This Recommendation uses the following abbreviations:

AAA	Authentication, Authorization and Accounting
CE	Customer Edge
CNM	Customer Network Management
CSM	Customer Service Management
DCN	Data Communication Network
P	Provider
PE	Provider Edge
PM	Performance Measurement
VPN	Virtual Private Network

5 Service definition and service reference model

5.1 Basic L1 service reference model and features

5.1.1 Basic L1 service reference model

Figure 5-1 shows the reference network model where a customer edge (CE) is using a L1 service. Separation between the service provider and the customer is provided by L1 service interface. Basic L1 service provides U-plane resources between CEs in a point-to-point manner, i.e. connection oriented.

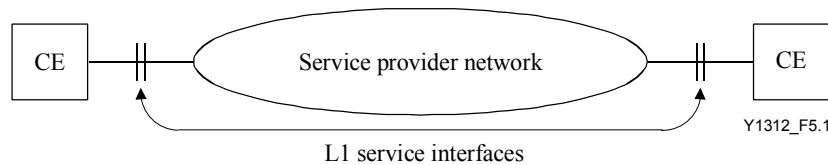


Figure 5-1/Y.1312 – Basic L1 service reference model

5.1.2 Basic L1 services features

Basic layer 1 service is characterized in terms that include:

- Connectivity: between a pair of CEs;
- Capacity: for example, bit rate for a TDM service;
- Transparency: for example, for a SDH network, overhead transparency etc.;
- Availability: the percentage of time that the quality service meets the agreed criteria. To achieve the required level of availability for the customer connections, the service provider's network may use restoration or protected resources;
- Performance: e.g., number of error seconds per month.

5.2 L1 service categories, L1 VPN reference model and definition

5.2.1 L1 service categories

Layer 1 services can be categorized based on the combination of connectivity features (U-plane) and service control capability (C-plane) available to the customer. A CE is associated with the service interface between a customer site and the network. Type 1 enables one connection between a pair of CEs. Type 2 enables multiple connections among a set of CEs. Type 2 may involve a variety of C-plane types depending on the customer. Table 5-1 shows the classification of the services. Layer 1 VPN can be defined as a subset of the Type 2 service category. Compared to Type 1 services, the Layer 1 VPN service has features such as separate policy per VPN and distribution of membership information. For either Type 1 or Type 2 services, connections are point-to-point and can be permanent, soft-permanent, or switched. For a static service, the network is responsible for the management of both the network infrastructure and the end user connections. For dynamic service, the network is only responsible for the configuration of the infrastructure; end user connections are established dynamically by the network.