Hamid Ould-Brahim
Nortel Networks

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Yakov Rekhter
Juniper Networks

Luyuan Fang
AT&T

Yong Xue
UUNET/WorldCom

Ananth Nagarajan
Sprint

Eric Mannie
Ebone

Marco Carugi
France Telecom R&D

John Drake
Calient Networks

Dimitri Papadimitriou
Alcatel

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Service Requirements for Optical Virtual Private Networks

draft-ouldbrahim-ovpn-requirements-01.txt

Status of this Memo

Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/1id-abstracts.txt
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Abstract

This document addresses service requirements for provider provisioned optical virtual private network

The intent of this document is to include the OVPN work as part of PPVPN charter. A VPN service model based on optical connectivity has a lot of functional elements in common with other models already chartered in PPVPN.
Inclusion of this topic in the charter will facilitate convergence and maximise reusability of common techniques to provide VPN service functions independently of the VPN connectivity level. That is also a global objective of the PPVPN standardisation effort.

1. Sub-IP ID Summary

This document addresses service requirements for provider provisioned port based optical virtual private network.

RELATED DOCUMENTS

"BGP/GMPLS Optical VPNs", draft-ouldbrahim-bgpgmpls-ovpn-01.txt

See also the reference section.

WHERE DOES IT FIT IN THE PICTURE OF THE SUB-IP WORK

Fits the PPVPN box.

WHY IS IT TARGETED AT THIS WG

This WG is looking at port based VPN using IP based building blocks. This work is within the scope of a port-based optical VPN.

2. Introduction

This document addresses service requirements for provider provisioned optical virtual private network. The scope of this draft is related to port-based VPNs only.

The intent of this document is to include the OVPN work as part of PPVPN charter.

3. Conventions used in this document

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 [2].

4. Optical VPN Reference Model

Consider a service provider network that consists of devices such as Optical Network Element (ONE) which may be Optical Cross Connects (OXCs), or SONET/SDH Cross Connects. We partition these devices into P (provider) ONEs and PE (provider edge) ONEs. The P ONEs are connected only to the ONEs within the provider's network. The PE ONEs are connected to the ONEs within the provider network, as well as to the devices outside of the provider network. We'll refer to such other devices as Client Edge Devices (CEs). An example of a CE would be a router, or a SONET/SDH Cross Connect, or an Ethernet switch. Figure 1 highlights the Optical VPN reference model as described above

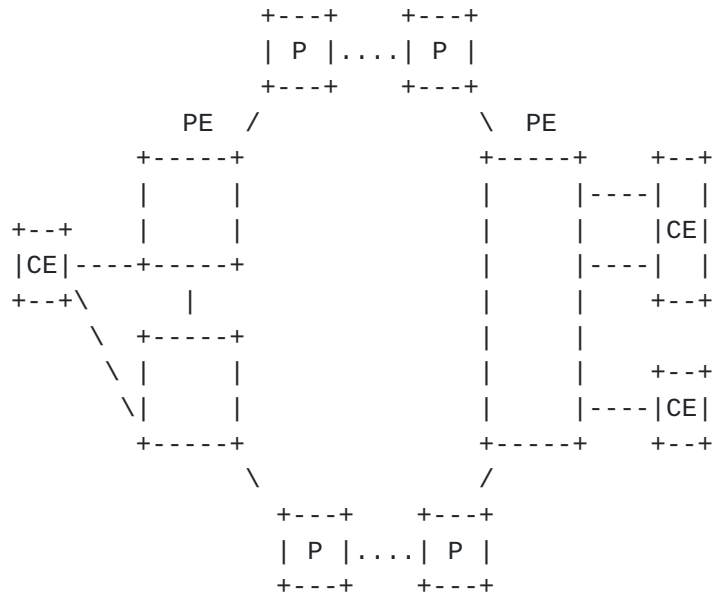

Figure 1 Optical VPN reference Model

A CE is connected to a PE ONE via one or more links, where each link may consist of one or more channels or sub-channels (e.g.,

wavelength, or wavelength and timeslot respectively, or just timeslot). A link has two end-points - one on CE and one on PE ONE. In the context of this document we'll refer to the former as "CE port", and to the latter as "PE ONE port".

5. General Service Requirements

The basic unit of the OVPN service is an optical or TDM connection between a pair of CEs, or to be more precise, between a port on one CE and a port on another CE. If a port on CE has multiplexing capabilities, the same port could be used to connect to more than one (remote) CE ports.

1) The OVPN service SHOULD support VPN membership at the granularity as fine as a single port/link/channel (e.g. an "AUG-4" in an STM-64 interface, or more simply a VC-4).

2) The OVPN service SHOULD support treating ports and links as logical constructs that are used to represent grouping of physical resources per OVPN. The OVPN service MAY be built using link bundling mechanism.

3) The OVPN service SHOULD provide support for a broad spectrum of OVPN topologies, such as hub-and-spoke, full mesh, arbitrary, etc.

4) The OVPN service SHOULD support either direct control where an in band control channel exists with the data bearing links and channels between the CE and PE ONE pair, or indirect control where an out of band control channel exists for the data bearing links and channels between the CE and PE ONE pair. Moreover, an OVPN service SHOULD allow multiple data links with one associated control channel/link.

5) In general, addressing, signaling and routing interaction between the provider's network and client networks are based on the standard control plane interconnection models currently under development in the IETF.

6) For the control and provisioning of the OVPN service, both distributed control mechanisms and centralized control mechanisms SHOULD be supported to accommodate the service control and management platforms used by different carriers.

7) As far as possible, the OVPN service SHOULD be based on technologies developed in the PPVPN Working Group and other relevant IETF working groups.

6. Service Provider Network Requirements

8) The OVPN service SHOULD allow links from different OVPNs to be connected to a given PE ONE.

9) The OVPN service SHOULD provide mechanisms by which ports on a PE ONE are partitioned into (disjoint) sets, with each set representing ports for a given OVPN.

10) The OVPN service SHOULD not require all ports on a given PE ONE to have the same characteristics.

11) To simplify operations and for better scalability and stability purposes, the OVPN service SHOULD provide mechanisms by which a given PE ONE that has at least one port associated with a given OVPN could learn about all other ports of that OVPN, even if these ports are on other PE ONEs, and even if these other PE ONEs belong to some other service providers. These mechanisms SHOULD be provided per OVPN basis and on a network wide scale from service provider perspective.

12) Furthermore, as a value added service, a service provider MAY provide a CE that has at least one port in a given OVPN with the information related to all other CE ports of that OVPN, including the information about various properties of these ports.

13) When a service provider network denies connectivity between a pair of CE ports, the service provider network MUST provide a reason (to at least one of these CEs) for denying the connectivity.

14) The OVPN service MAY assume that each PE ONE port has an identifier that is unambiguous at least with the Service Provider network that this port belongs to. And in the case where the OVPN service spans multiple (interconnected) service providers, it is assumed that this identifier is unambiguous across all PE ONE ports of these service providers.

15) The OVPN service SHOULD allow PE ONE ports facing the customer devices to be identified by either network layer addresses (e.g., IPv4 addresses), or by a combination of PE ONE identifier and a port/interface index (e.g., IP unnumbered interfaces).

16) To provide OVPN service that scales to a large number of customers, no single component of the service provider networks should be required to maintain all the information about all the OVPNs.

17) For scalability purposes, it SHOULD be desirable to minimize the amount of configuration changes when adding/deleting a port to/from a given OVPN. For the same

reasons, it is also desirable that configuration/provisioning changes of a port to/from a given OVPN SHOULD involve configuration/provisioning only on the device that this port is connected to.

18) A service network SHOULD support an OVPN that spans multiple (interconnected) service providers or multiple networks within a single service provider.

19) For minimum disruption to the service provider existing VPN infrastructure (e.g., layer-3 VPNs, Layer 2 VPNs), when possible, an OVPN service SHOULD maximize reusability of existing VPN service and technology building blocks already deployed (e.g., management tools, membership schemes, etc.) and being standardized in the PPVPN WG.

6.1 Service Provider Management Requirements

20) As value added OVPN services, service provider MAY provide auto-provisioning tools to facilitate customer ordering. (e.g. web ordering, "point-and-click" solutions). Service provider MAY also provide its customer with customer specific report via web access or other means.

21) Operator should have the capability to display the OVPN topology on a per OVPN basis or multiple OVPN basis.

7. Customer Requirements

22) An OVPN customer MAY have circuits in a OVPN and "regular" circuits on the same physical interface, or even circuits in different OVPNs through the same physical interface.

23) The OVPN service MUST be able to support more than one link between a given (CE, PE ONE) pair. Moreover, the service should allow a CE to be connected to more than one PE ONE (with at least one port per each PE ONE). And, of course, a PE ONE should be able to have more than one CE connected to it.

24) The OVPN service SHOULD allow links from different OVPNs to be connected to a given PE ONE. Likewise, it should allow links from different OVPNs to be connected to a given CE.

25) The OVPN service SHOULD not require all ports on a given CE to have the same characteristics.

26) When a service provider network denies connectivity between a pair of CE ports, the network MUST provide a reason (to at least one of these CEs) for denying the connectivity.

27) The OVPN service SHOULD allow establishment of connectivity (e.g., establishment of an optical channel trail) between a pair of ports that belong to a given OVPN to be under control of the customer of that OVPN. The service should provide mechanisms to restrict such connectivity to only the ports that belong to that particular OVPN. This connectivity could be further restricted to only the ports with similar characteristics.

28) The OVPN service MUST allow addressing and routing used by the Service Provider network offering the service to be completely independent from the addressing and routing used by the OVPN clients of that network. Moreover, for the purpose of the OVPN service, addressing and routing used by one OVPN client, need not be coordinated with any other OVPN clients.

29) The OVPN service MAY assume that all the CE ports that belong to a given VPN have identifiers that are unambiguous within that OVPN. The service should not assume that these identifiers are unambiguous outside of that OVPN. (As a result, identifiers of CE ports connected to a given PE ONE may be ambiguous).

30) The OVPN service SHOULD allow CE ports to be identified by either network layer addresses (e.g., IPv4, IPv6, NSAP addresses), or by a combination of CE identifier and a port/interface index (e.g., IP unnumbered interfaces).

31) For the purpose of the OVPN service the administrative ownership of CE ports SHOULD be orthogonal to the OVPN membership of these ports. For example, it should be possible to either have all CE ports within a given OVPN to be under control of a single administration, or each port to be controlled by its own administration.

32) The OVPN service architecture should be able to support hierarchical VPN scenarios in which one Service Provider offers OVPN service to another Service Provider who then resells that OVPN service to his customers (as OVPN service or other types of VPN service such as Layer 2 or Layer 3 VPNs)

8. Security Considerations

[TBD]

9. References

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[GMPLS-ARCH] Mannie, E., et al., "Generalized Multi-Protocol Label Switching (GMPLS) Architecture", work in progress

[Framework] Rajagopalan, B. et al., "IP over Optical Networks: A Framework ", November 2000, work in progress.

10. Acknowledgments.

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11. Author's Addresses

Hamid Ould-Brahim
Nortel Networks
P O Box 3511 Station C
Ottawa ON K1Y 4H7 Canada
Phone: +1 (613) 765 3418
Email: hbrahim@nortelnetworks.com

Yakov Rekhter
Juniper Networks
1194 N. Mathilda Avenue
Sunnyvale, CA 94089
Email: yakov@juniper.net

Luyuan Fang
AT&T
200 Laurel Avenue
Middletown, NJ 07748
Email: Luyuanfang@att.com
Phone: +1 (732) 420 1920

Yong Xue
UUNET/WorldCom
Ashburn, Virginia
(703)-886-5358

yxue@uu.net

Ananth Nagarajan
Sprint

9300,Metcalf Ave
Overland Park, KS 66212
Phone +1-913-534-3973
ananth.nagarajan@mail.sprint.com

Eric Mannie
Ebone (GTS)
Terhulpsesteenweg 6A
1560 Hoeilaart
Belgium
Phone: +32 2 658 56 52
Email: eric.mannie@gts.com

Marco Carugi
France Telecom R&D
Technopole Anticipa, 2 av. P. Marzin
22307 Lannion
France
Phone : +33 2 96053617
marco.carugi@francetelecom.com

John Drake
Calient Networks
5853 Rue Ferrari
San Jose, CA 95138
USA
Phone: +1 408 972 3720
Email: jdrake@calient.net

Dimitri Papadimitriou
Alcatel
Francis Wellesplein 1,
B-2018 Antwerpen, Belgium
Phone: +32 3 240-8491
Email: Dimitri.Papadimitriou@alcatel.be

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