在VRF意识L2TPv3的Xconnect在ASR1K

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Introduction

本文描述如何可以使用虚拟路由和转发(VRF)，当您配置第2层隧道协议时(L2TP)v3在IP和多协议标签交换(MPLS)网络的Xconnect。

背景信息

L2TP是互联网服务提供商用于的隧道协议(ISP)为了提供在拨号接入空间的虚拟专用网络(VPN)在互联网。

它结合最佳思科的第二层转发协议和Microsoft的点对点隧道协议(PPTP)。L2TP主要组件是L2TP访问控制器(LAC)和L2TP网络服务器(LNS)。

L2TP访问控制器：LAC是接入服务器被连接到公共交换电话网(PSTN)。 LAC是呼入的呼叫和去话接受器发起者。它被连接到在LAN或广域网的LNS。

L2TP网络服务器：LNS是PPP会话终止和验证的L2TP protcol的网络服务器。LNS是去话和呼入的呼叫接受器发起者。

L2TPv2设计运载在IP网络的PPP数据流。网络访问设备(DSL、有线调制解调器或者拨号访问接口)接受从订户的PPP连接并且以隧道传输PPP会话对在L2TP的ISP。新版本L2TPv3设计传送是唯一的有效载荷版本2支持的所有第2层有效载荷除PPP之外。 特别地， L2TPv3定义了建立隧道第2层有效载荷的L2TP协议在与使用第2层VPN的IP核心网络。此功能的好处包括此：

- L2TPv3简化VPN的配置
- L2TPv3不要求MPLS
- L2TPv3支持建立隧道在所有有效载荷的IP的第2层

这是L2TPv3 pseudowire配置示例：

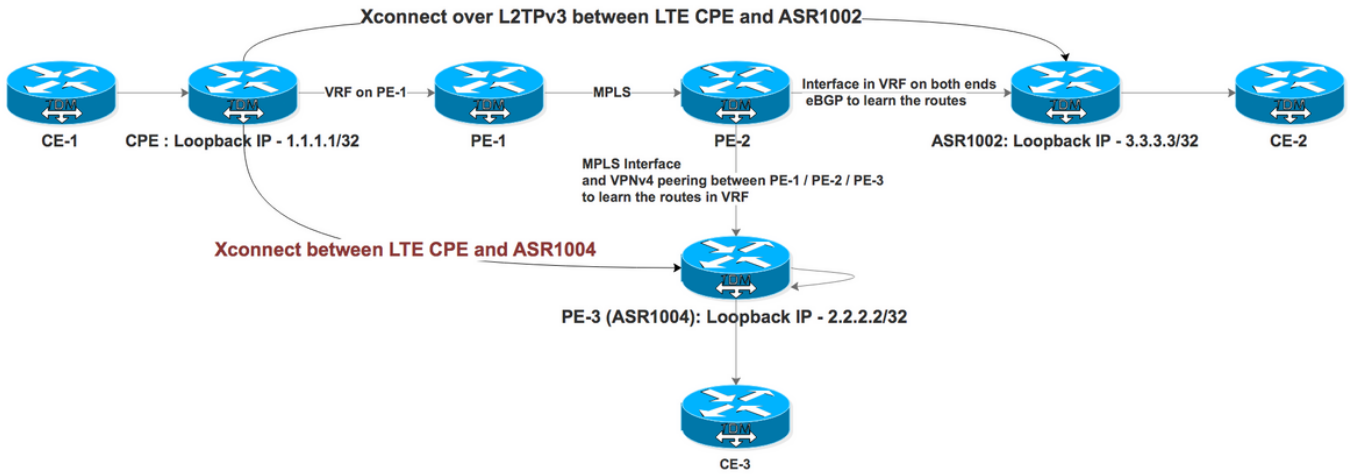
1._enable

2.terminal_configure

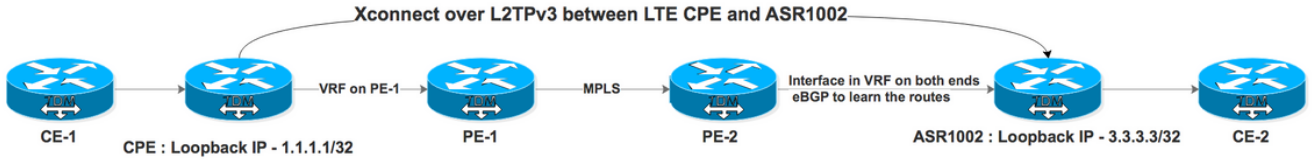
3._interface 请键入插槽/端口

4.peer IP地址_xconnectvcidencapsulation l2tpv3pw-classpw-class-name

现在请看一看在L2TPv3 Xconnect如何正常运行，当使用时VRF。 这是使用演示我们Xconnect被配置在CPE之间和ASR1002的拓扑(IP)和ASR1004 (MPLS)用在ASR1000的终端在VRF (ASR1000平台不支持VRF意识L2TPv3)。



测试个案我：在IP网络的L2TPv3 Xconnect与在VRF的终端



PE-1和PE-2做ISP的MPLS网络。CPE被连接到在VRF和ASR1002的PE-1被连接到在VRF的PE-2。ASR1002也有在接口的VRF被连接到PE-2。CPE环回的可到达性从ASR1002的是通过在IP接口的VRF。

在CPE的配置往ASR1002的Xconnect的：

```
interface FastEthernet4.2381

encapsulation dot1Q 2381

xconnect 3.3.3.3 2381 encapsulation l2tpv3 pw-class PSEUDO_CLASS >>>>>>>>>>> Xconnect with
ASR1002



pseudowire-class PSEUDO_CLASS

encapsulation l2tpv3

interworking vlan

protocol l2tpv3 L2TP_CLASS
```

```
ip local interface Loopback0

ip tos reflect


l2tp-class L2TP_CLASS

authentication

password cisco


interface Gigabit0/1

ip address 192.168.8.190 255.255.255.0

end


Interface Loopback0

ip address 1.1.1.1 255.255.255.255

end


ip route 0.0.0.0 0.0.0.0 192.168.8.1 >>>>>>>>>>>>>>> Default route towards PE-1
```

在ASR1002的工作配置：

```
interface GigabitEthernet0/0/0.906 ——————————————> Interface connected to PE-2 is in VRF

encapsulation dot1Q 906

ip vrf forwarding L2TP_VRF

ip address 10.1.1.1 255.255.255.252


interface GigabitEthernet0/0/1.2381

encapsulation dot1Q 2381

xconnect 1.1.1.1 2381 encapsulation l2tpv3 pw-class PSEUDO_CLASS


pseudowire-class PSEUDO_CLASS

encapsulation l2tpv3

interworking vlan

protocol l2tpv3 L2TP_CLASS

ip local interface Loopback11
```

```
l2tp-class L2TP_CLASS

authentication

password cisco


interface Loopback11

ip vrf forwarding L2TP_VRF ————————————————————————> Source is in VRF

ip address 3.3.3.3 255.255.255.255


router bgp 1


address-family ipv4 vrf L2TP_VRF

redistribute connected

neighbor 10.1.1.2 remote-as 2 ————————————————> eBGP with PE-2 in VRF

neighbor 10.1.1.2 activate

neighbor 10.1.1.2 soft-reconfiguration inbound

exit-address-family
```

VRF L2TP_VRF ：

```
B       1.1.1.1/32 [20/0] via 10.1.1.2, 1d ——————————> Xconnect end point learned via eBGP in
VRF
```

当前让我们检查Xconnect的状态在CPE的：

```
CPE #sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--


UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp 3.3.3.3:2381              DOWN

           Interworking: vlan                   Session ID: 1906980494
```

```
                                                  Tunnel ID: 2886222725

                                                 Protocol State: DOWN

                                                 Remote Circuit State: DOWN

                                                 pw-class: PSEUDO_CLASS_VLAN
```

它说分段2发生故障，意味着路径从CPE到ASR1002有问题。然而，我们能连接终端。在CPE的调试表示，对终端的隧道是失败的或没有路由对终端。

```
CPE #sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--


UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp 3.3.3.3:2381              DOWN

           Interworking: vlan                    Session ID: 1906980494

                                                  Tunnel ID: 2886222725

                                                 Protocol State: DOWN

                                                 Remote Circuit State: DOWN

                                                 pw-class: PSEUDO_CLASS_VLAN
```

这里主要问题是终端通过在ASR1002的VRF是可及的。Xconnect终端需要在它的全局路由表里能出现。当前让我们配置CPE环回的1.1.1.1/32路由在建立接口本身在VRF的GigabitEthernet0/0/0.906的全局指向。

```
 ip route 1.1.1.1 255.255.255.255 GigabitEthernet0/0/0.906 10.1.1.2


             S        1.1.1.1/32 [1/0] via 10.1.1.2, GigabitEthernet0/0/0.906
```

一旦配置假的静态路由，Xconnect出现。您能也指向它Null0。这是让路由器的解决方法相信终端通过不是全局VRF是可及的和使用控制层面。实际数据层面数据流将是通过仅VRF。

这是ping结果有和没有VRF ：

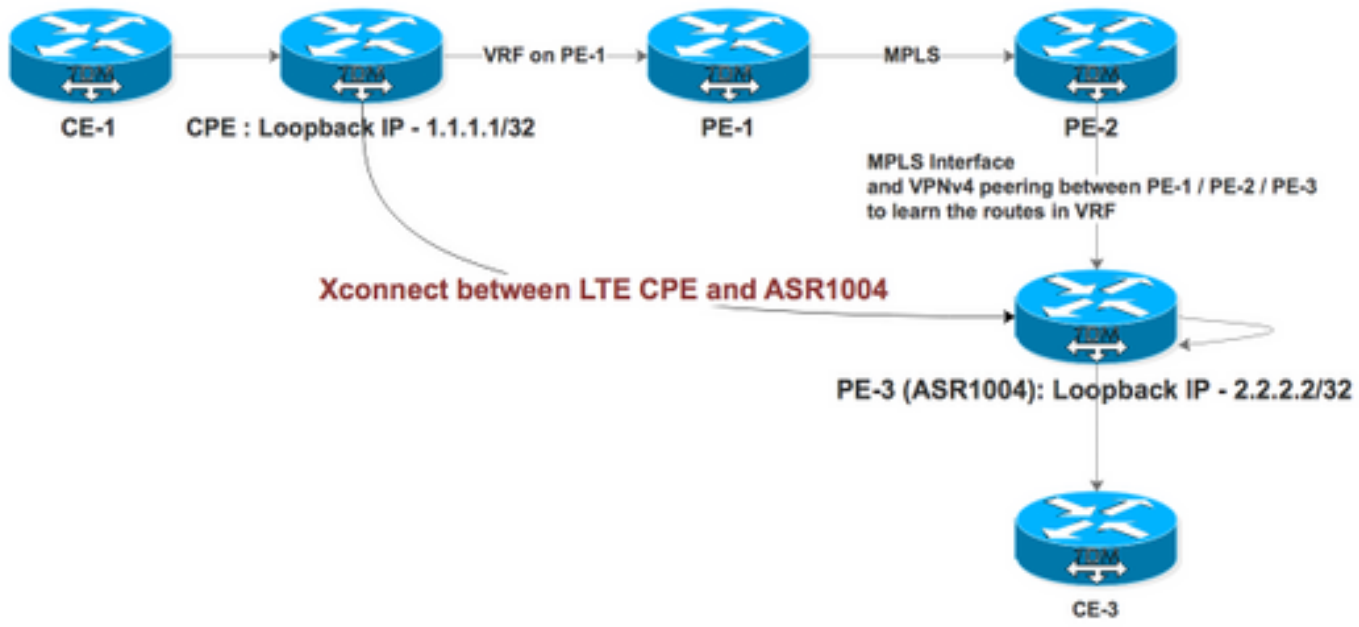
```
 ip route 1.1.1.1 255.255.255.255 GigabitEthernet0/0/0.906 10.1.1.2
```

```
            S        1.1.1.1/32 [1/0] via 10.1.1.2, GigabitEthernet0/0/0.906
```

Xconnect的状态在CPE的：

```
CPE #sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                        S2

------+---------------------------------+--+---------------------------------+--


UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp3.3.3.3:2381             UP

           Interworking: vlan                   Session ID: 1906980494

                                                 Tunnel ID: 2886222725

                                                Protocol State: UP

                                                Remote Circuit State: UP

                                                pw-class: PSEUDO_CLASS_VLAN
```

测试个案II ：在MPLS网络的L2TPv3 Xconnect与在VRF的终端



PE-1、PE-2和PE-3做ISP的MPLS网络与作为路由反射器(RR)的PE-2。CPE被连接到在VRF和ASR1004的PE-1被连接到PE-2有在接口的MPLS功能。ASR1004也有应该从PE-1接受Vpnv4路由通过RR的VRF。CPE looback的可到达性从ASR1004的是通过在MPLS接口的VRF。

在CPE的配置往ASR1004的Xconnect的：

```
CPE #sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--


UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp3.3.3.3:2381             UP

           Interworking: vlan                   Session ID: 1906980494

                                                 Tunnel ID: 2886222725

                                                Protocol State: UP

                                                Remote Circuit State: UP

                                                pw-class: PSEUDO_CLASS_VLAN
```

在ASR1004的配置：

```
CPE #sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--


UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp3.3.3.3:2381             UP

           Interworking: vlan                   Session ID: 1906980494

                                                 Tunnel ID: 2886222725

                                                Protocol State: UP

                                                Remote Circuit State: UP

                                                pw-class: PSEUDO_CLASS_VLAN
```

Xconnect终点的路由条目：

```
ASR1004#sh ip rou vrf L2TP_VRF 1.1.1.1 .   ——————————————————> Xconnect End Point also learned
via VRF

Routing Table: L2TP_VRF
Routing entry for 1.1.1.1/32
Known via "bgp 2", distance 200, metric 0, type internal
Last update from 11.11.11.11 6d17h ago
Routing Descriptor Blocks:
* 11.11.11.11 (default), from 22.22.22.22, 6d17h ago
Route metric is 0, traffic share count is 1
AS Hops 0
MPLS label: 18
MPLS Flags: MPLS Required
```

We observed that Segment 2 was continuously flapping on both ends.

```
ASR1004#sh xc all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

  UP=Up       DN=Down            AD=Admin Down      IA=Inactive

  SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--

DN pri   ac Gi0/0/1:2380(Eth VLAN)       UP l2tp 1.1.1.1:2380           DN  >>>>>>>>>>>>>>

            Interworking: vlan                   Session ID: 2543426569

                                                 Tunnel ID: 3352120314

                                                 Protocol State: DOWN

                                                 Remote Circuit State: DOWN

                                                 pw-class: PSEUDO_CLASS_VLAN

ASR1004#sh xc all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

  UP=Up       DN=Down            AD=Admin Down      IA=Inactive

  SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--
```

```
UP pri   ac Gi0/0/1:2380(Eth VLAN)       UP l2tp 1.1.1,1:2380           UP >>>>>>>>>>>>>>>>>
            Interworking: vlan                   Session ID: 2543426569
                                                 Tunnel ID: 3352120314
                                                 Protocol State: UP
                                                 Remote Circuit State: UP
                                                 pw-class: PSEUDO_CLASS_VLAN
```

从CPE的日志：

```
CPE#sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--

DN pri   ac Fa4.2380:2380(Eth VLAN)      UP l2tp 2.2.2.2:2380            DN ---------------à
Flapping with ASR1004

           Interworking: vlan                   Session ID: 3434660693
                                                 Tunnel ID: 1760690853
                                                 Protocol State: DOWN
                                                 Remote Circuit State: DOWN
                                                 pw-class: PSEUDO_CLASS

UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp 3.3.3.3:2381              UP ------------------
---à Stable with ASR1002

           Interworking: vlan                   Session ID: 1906980494
                                                 Tunnel ID: 2886222725
                                                 Protocol State: UP
                                                 Remote Circuit State: UP
                                                 pw-class: PSEUDO_CLASS


CPE#sh l2tp session


L2TP Session Information Total tunnels 2 sessions 2
```

```
LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID

                                  Vcid, Circuit

2714490989 3697021268 1760690853 2380, Fa4.2380:2380  est   00:00:03 0  ————————> Flapping with
ASR1004

1906980494 2361475239 2886222725 2381, Fa4.2381:2381  est   15:37:06 0       ————————> Stable
with ASR1002
```

因为退出接口是MPLS激活的接口，您不能在这种情况下配置静态路由。 作为解决方法，有两个接口彼此反向了循环并且用其他配置一在VRF在全局。 然后用此Xconnect配置在全局指向的静态路由往VRF接口，变得稳定的。

```
CPE#sh xconnect all de

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State

 UP=Up       DN=Down            AD=Admin Down      IA=Inactive

 SB=Standby  HS=Hot Standby     RV=Recovering      NH=No Hardware


XC ST  Segment 1                         S1 Segment 2                         S2

------+---------------------------------+--+---------------------------------+--

DN pri   ac Fa4.2380:2380(Eth VLAN)      UP l2tp 2.2.2.2:2380            DN ---------------à
Flapping with ASR1004

           Interworking: vlan                   Session ID: 3434660693

                                                 Tunnel ID: 1760690853

                                                 Protocol State: DOWN

                                                 Remote Circuit State: DOWN

                                                 pw-class: PSEUDO_CLASS

UP pri   ac Fa4.2381:2381(Eth VLAN)      UP l2tp 3.3.3.3:2381              UP ------------------
---à Stable with ASR1002

           Interworking: vlan                   Session ID: 1906980494

                                                 Tunnel ID: 2886222725

                                                 Protocol State: UP

                                                 Remote Circuit State: UP

                                                 pw-class: PSEUDO_CLASS


CPE#sh l2tp session


L2TP Session Information Total tunnels 2 sessions 2
```

```
LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID

                                 Vcid, Circuit

2714490989 3697021268 1760690853 2380, Fa4.2380:2380  est   00:00:03 0  ————————> Flapping with
ASR1004

1906980494 2361475239 2886222725 2381, Fa4.2381:2381  est   15:37:06 0       ————————> Stable
with ASR1002
```

L2TP会话信息总数以隧道传输2次会话2 ：

```
LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID

                                 Vcid, Circuit

2714490989 3697021268 1760690853 2380, Fa4.2380:2380  est   00:20:03 0

1906980494 2361475239 2886222725 2381, Fa4.2381:2381  est   15:37:06 0
```

通信流在ASR1004的情况下被看到和：

- 当数据流来自在ASR1004时的CPE，进来MPLS接口Gi0/0/1并且得到交换直接地到Gi0/0/0接入端口。
- 当数据流来自接入端口Gi0/0/0时，采取Gi0/0/0循环的路径- > Gi0/0/2 - > Gi0/0/3 - > Gi0/0/1。

主要问题用此解决方法是为在ASR1000平台的QFP利用率，信息包处理两次完成：

```
LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID

                                 Vcid, Circuit

2714490989 3697021268 1760690853 2380, Fa4.2380:2380  est   00:20:03 0

1906980494 2361475239 2886222725 2381, Fa4.2381:2381  est   15:37:06 0
```

此工作情况在文档Bug描述：CSCvi42964