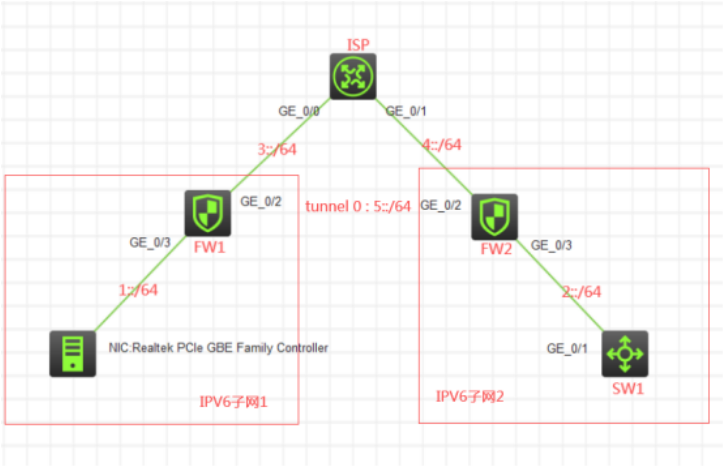
F1060 IPV6 GRE OVER IPSEC典型组网配置案例

GRE VPN | IPSec VPN | 设备部署方式 | H3C模拟器 | 韦家宁 | 2020-03-08 发表

组网及说明



组网说明：

本案例采用H3C HCL模拟器的F1060防火墙来模拟IPV6 GRE OVER IPSEC的典型组网配置，IPV6子网在网络拓扑图中已经有了明确的标识。为了使得IPV6子网1和IPV6子网2能够在整个IPV6子网中不泄露且能够互相通信，因此在FW1与FW2之间采用GRE IPV6技术建立隧道使其互通，但是为了进一步保证IPV6子网1和IPV6子网2的数据传输安全，因此在GRE IPV6隧道的基础上再嵌套IPSEC，这样数据则更加安全。

配置步骤

1、按照网络拓扑图正确配置IP地址

2、FW1与FW2建立GRE IPV6隧道

3、FW1与FW2采用IPSEC+IKE预共享密钥方式建立隧道，并嵌套到GRE IPV6隧道中

配置关键点

SW1：

```
<H3C>sys
System View: return to User View with Ctrl+Z.
[H3C]sysname SW1
[SW1]int gi 1/0/1
[SW1-GigabitEthernet1/0/1]port link-mode route
[SW1-GigabitEthernet1/0/1]des <connect to FW2>
[SW1-GigabitEthernet1/0/1]ipv6 address 2::2 64
[SW1-GigabitEthernet1/0/1]quit
[SW1]ipv6 route-static :: 0 2::1
```

ISP：

```
<H3C>sys
System View: return to User View with Ctrl+Z.
[H3C]sysname ISP
[ISP]int gi 0/0
[ISP-GigabitEthernet0/0]des <connect to FW1>
[ISP-GigabitEthernet0/0]ipv6 address 3::2 64
[ISP-GigabitEthernet0/0]quit
[ISP]int gi 0/1
[ISP-GigabitEthernet0/1]des <connect to FW2>
[ISP-GigabitEthernet0/1]ipv6 address 4::2 64
[ISP-GigabitEthernet0/1]quit
```

FW1：

```
<H3C>sys
System View: return to User View with Ctrl+Z.
```

```
[H3C]sysname FW1
[FW1]acl ipv6 basic 2001
[FW1-acl-ipv6-basic-2001]rule 0 permit source any
[FW1-acl-ipv6-basic-2001]quit
[FW1]zone-pair security source trust destination untrust
[FW1-zone-pair-security-Trust-Untrust]packet-filter ipv6 2001
[FW1-zone-pair-security-Trust-Untrust]quit
[FW1]
[FW1]zone-pair security source untrust destination trust
[FW1-zone-pair-security-Untrust-Trust]packet-filter ipv6 2001
[FW1-zone-pair-security-Untrust-Trust]quit
[FW1]
[FW1]zone-pair security source trust destination local
[FW1-zone-pair-security-Trust-Local]packet-filter ipv6 2001
[FW1-zone-pair-security-Trust-Local]quit
[FW1]
[FW1]zone-pair security source local destination trust
[FW1-zone-pair-security-Local-Trust]packet-filter ipv6 2001
[FW1-zone-pair-security-Local-Trust]quit
[FW1]
[FW1]zone-pair security source untrust destination local
[FW1-zone-pair-security-Untrust-Local]packet-filter ipv6 2001
[FW1-zone-pair-security-Untrust-Local]quit
[FW1]
[FW1]zone-pair security source local destination untrust
[FW1-zone-pair-security-Local-Untrust]packet-filter ipv6 2001
[FW1-zone-pair-security-Local-Untrust]quit
[FW1]
[FW1]zone-pair security source trust destination trust
[FW1-zone-pair-security-Trust-Trust]packet-filter ipv6 2001
[FW1-zone-pair-security-Trust-Trust]quit
[FW1]
[FW1]zone-pair security source untrust destination untrust
[FW1-zone-pair-security-Untrust-Untrust]packet-filter ipv6 2001
[FW1-zone-pair-security-Untrust-Untrust]quit
[FW1]int gi 1/0/3
[FW1-GigabitEthernet1/0/3]ipv6 address 1::1 64
[FW1-GigabitEthernet1/0/3]quit
[FW1]int gi 1/0/2
[FW1-GigabitEthernet1/0/2]des <connect to ISP>
[FW1-GigabitEthernet1/0/2]ipv6 address 3::1 64
[FW1-GigabitEthernet1/0/2]quit
[FW1]ipv6 route-static :: 0 3::2
[FW1]security-zone name Untrust
[FW1-security-zone-Untrust]import interface GigabitEthernet 1/0/2
[FW1-security-zone-Untrust]quit
[FW1]security-zone name Trust
[FW1-security-zone-Trust]import interface GigabitEthernet 1/0/3
[FW1-security-zone-Trust]quit
```

FW1 IPV6 GRE OVER IPSEC配置关键点：

```
[FW1]int Tunnel 0 mode gre ipv6
[FW1-Tunnel0]ipv6 address 5::1 64
[FW1-Tunnel0]source 3::1
[FW1-Tunnel0]destination 4::1
[FW1-Tunnel0]quit
[FW1]ipv6 route-static 2:: 64 5::2
[FW1]security-zone name Untrust
[FW1-security-zone-Untrust]import interface Tunnel 0
[FW1-security-zone-Untrust]quit
[FW1]acl ipv6 advanced 3000
[FW1-acl-ipv6-adv-3000]rule 0 permit ipv6 source 1:: 64 destination 2:: 64
[FW1-acl-ipv6-adv-3000]quit
[FW1]ike keychain james
```

```
[FW1-ike-keychain-james]pre-shared-key address ipv6 5::2 64 key simple james
[FW1-ike-keychain-james]quit
[FW1]ike proposal 1
[FW1-ike-proposal-1]quit
[FW1]ike profile james
[FW1-ike-profile-james]keychain james
[FW1-ike-profile-james]proposal 1
[FW1-ike-profile-james]match remote identity address ipv6 5::2 64
[FW1-ike-profile-james]quit
[FW1]ipsec transform-set james
[FW1-ipsec-transform-set-james]protocol esp
[FW1-ipsec-transform-set-james]encapsulation-mode tunnel
[FW1-ipsec-transform-set-james]esp authentication-algorithm md5
[FW1-ipsec-transform-set-james]esp encryption-algorithm des-cbc
[FW1-ipsec-transform-set-james]quit
[FW1]ipsec ipv6-policy james 1 isakmp
[FW1-ipsec-ipv6-policy-isakmp-james-1]security acl ipv6 3000
[FW1-ipsec-ipv6-policy-isakmp-james-1]ike-profile james
[FW1-ipsec-ipv6-policy-isakmp-james-1]transform-set james
[FW1-ipsec-ipv6-policy-isakmp-james-1]remote-address ipv6 5::2
[FW1-ipsec-ipv6-policy-isakmp-james-1]quit
[FW1]int Tunnel 0 mode gre ipv6
[FW1-Tunnel0]ipsec apply ipv6-policy james
[FW1-Tunnel0]quit
```

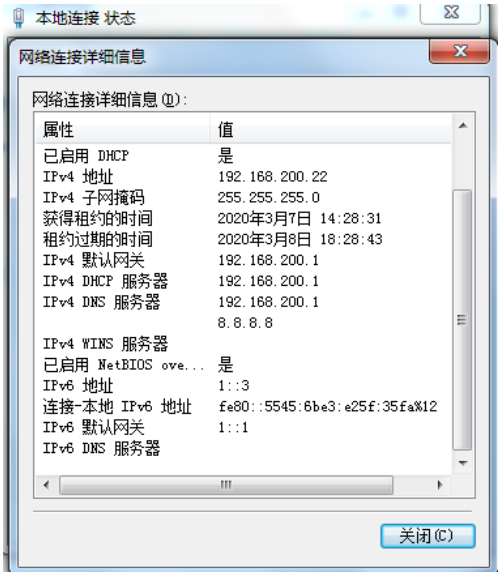
FW2：

```
<H3C>sys
System View: return to User View with Ctrl+Z.
[H3C]sysname FW2
[FW2]acl ipv6 basic 2001
[FW2-acl-ipv6-basic-2001]rule 0 permit source any
[FW2-acl-ipv6-basic-2001]quit
[FW2]zone-pair security source trust destination untrust
[FW2-zone-pair-security-Trust-Untrust]packet-filter ipv6 2001
[FW2-zone-pair-security-Trust-Untrust]quit
[FW2]
[FW2]zone-pair security source untrust destination trust
[FW2-zone-pair-security-Untrust-Trust]packet-filter ipv6 2001
[FW2-zone-pair-security-Untrust-Trust]quit
[FW2]
[FW2]zone-pair security source trust destination local
[FW2-zone-pair-security-Trust-Local]packet-filter ipv6 2001
[FW2-zone-pair-security-Trust-Local]quit
[FW2]
[FW2]zone-pair security source local destination trust
[FW2-zone-pair-security-Local-Trust]packet-filter ipv6 2001
[FW2-zone-pair-security-Local-Trust]quit
[FW2]
[FW2]zone-pair security source untrust destination local
[FW2-zone-pair-security-Untrust-Local]packet-filter ipv6 2001
[FW2-zone-pair-security-Untrust-Local]quit
[FW2]
[FW2]zone-pair security source local destination untrust
[FW2-zone-pair-security-Local-Untrust]packet-filter ipv6 2001
[FW2-zone-pair-security-Local-Untrust]quit
[FW2]
[FW2]zone-pair security source trust destination trust
[FW2-zone-pair-security-Trust-Trust]packet-filter ipv6 2001
[FW2-zone-pair-security-Trust-Trust]quit
[FW2]
[FW2]zone-pair security source untrust destination untrust
[FW2-zone-pair-security-Untrust-Untrust]packet-filter ipv6 2001
```

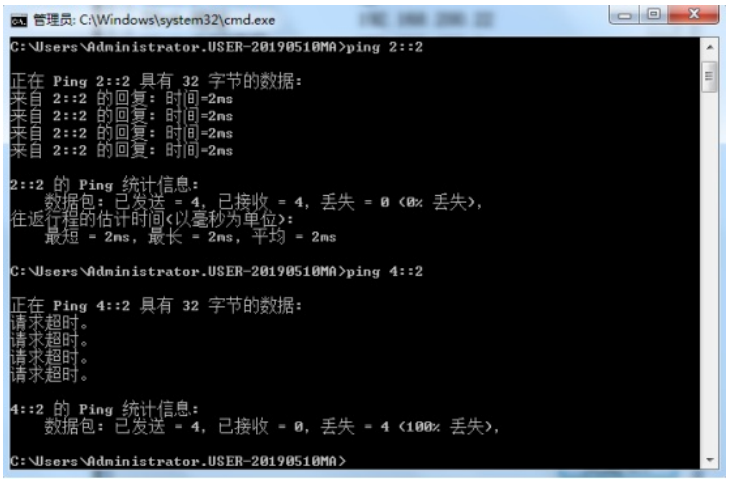
[FW2-zone-pair-security-Untrust-Untrust]quit
[FW2]int gi 1/0/3
[FW2-GigabitEthernet1/0/3]ipv6 address 2::1 64
[FW2-GigabitEthernet1/0/3]quit
[FW2]int gi 1/0/2
[FW2-GigabitEthernet1/0/2]des <connect to ISP>
[FW2-GigabitEthernet1/0/2]ipv6 address 4::1 64
[FW2-GigabitEthernet1/0/2]quit
[FW2]ipv6 route-static :: 0 4::2
[FW2]security-zone name Untrust
[FW2-security-zone-Untrust]import interface GigabitEthernet 1/0/2
[FW2-security-zone-Untrust]quit
[FW2]security-zone name Trust
[FW2-security-zone-Trust]import interface GigabitEthernet 1/0/3
[FW2-security-zone-Trust]quit

FW2 IPV6 GRE OVER IPSEC配置关键点：
[FW2]int Tunnel 0 mode gre ipv6
[FW2-Tunnel0]ipv6 address 5::2 64
[FW2-Tunnel0]source 4::1
[FW2-Tunnel0]destination 3::1
[FW2-Tunnel0]quit
[FW2]ipv6 route-static 1:: 64 5::1
[FW2]security-zone name Untrust
[FW2-security-zone-Untrust]import interface Tunnel 0
[FW2-security-zone-Untrust]quit
[FW2]acl ipv6 advanced 3000
[FW2-acl-ipv6-adv-3000]rule 0 permit ipv6 source 2:: 64 destination 1:: 64
[FW2-acl-ipv6-adv-3000]quit
[FW2]ike keychain james
[FW2-ike-keychain-james]pre-shared-key address ipv6 5::1 key simple james
[FW2-ike-keychain-james]quit
[FW2]ike proposal 1
[FW2-ike-proposal-1]quit
[FW2]ike profile james
[FW2-ike-profile-james]keychain james
[FW2-ike-profile-james]proposal 1
[FW2-ike-profile-james]match remote identity address ipv6 5::1 64
[FW2-ike-profile-james]quit
[FW2]ipsec transform-set james
[FW2-ipsec-transform-set-james]protocol esp
[FW2-ipsec-transform-set-james]encapsulation-mode tunnel
[FW2-ipsec-transform-set-james]esp authentication-algorithm md5
[FW2-ipsec-transform-set-james]esp encryption-algorithm des-cbc
[FW2-ipsec-transform-set-james]quit
[FW2]ipsec ipv6-policy james 1 isakmp
[FW2-ipsec-ipv6-policy-isakmp-james-1]security acl ipv6 3000
[FW2-ipsec-ipv6-policy-isakmp-james-1]transform-set james
[FW2-ipsec-ipv6-policy-isakmp-james-1]ike-profile james
[FW2-ipsec-ipv6-policy-isakmp-james-1]remote-address ipv6 5::1
[FW2-ipsec-ipv6-policy-isakmp-james-1]quit
[FW2]int Tunnel 0 mode gre ipv6
[FW2-Tunnel0]ipsec apply ipv6-policy james
[FW2-Tunnel0]quit

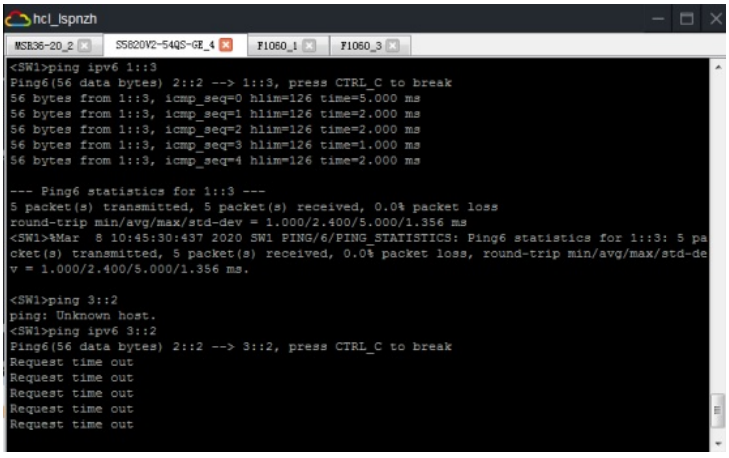
测试：
物理机填写IPV6地址：



物理机能PING通SW1，PING不通ISP的地址：

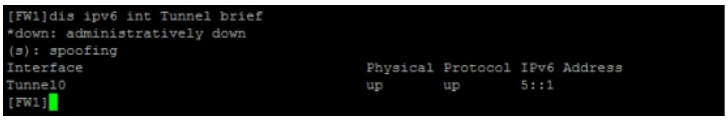


SW1能PING通物理机，PING不通ISP的地址：



根据测试结果得知，IPV6子网1和IPV6子网2能够穿越整个IPV6子网实现互通。

查看FW1的隧道状态及信息：



```
[FW1]dis cu int Tunnel 0
#
interface Tunnel0 mode gre ipv6
 source 3::1
 destination 4::1
 ipv6 address 5::1/64
 ipsec apply ipv6-policy james
#
return
[FW1]
```

查看FW2的隧道状态及信息：

```
[FW2]dis ipv6 int Tunnel brief
*down: administratively down
(s): spoofing
Interface                         Physical Protocol IPv6 Address
Tunnel0                           up       up       5::2
[FW2]
```

```
[FW2]dis cu int Tunnel 0
#
interface Tunnel0 mode gre ipv6
 source 4::1
 destination 3::1
 ipv6 address 5::2/64
 ipsec apply ipv6-policy james
#
return
[FW2]
```

查看FW1的IPSEC显示信息：

```
[FW1]dis ipsec tunnel
Tunnel ID: 0
Status: Active
Perfect forward secrecy:
Inside vpn-instance:
SA's SPI:
    outbound:  691616518   (0x29393b06)   [ESP]
    inbound:   225186354   (0x0d6c1232)   [ESP]
Tunnel:
    local  address: 5::1
    remote address: 5::2
Flow:
    sour addr: 1::/64  port: 0  protocol: ipv6
    dest addr: 2::/64  port: 0  protocol: ipv6
[FW1]
```

```
[FW1]dis ipsec tunnel brief
------------------------------------------------------------------------------
Tunn-id   Src Address     Dst Address     Inbound SPI   Outbound SPI  Status
------------------------------------------------------------------------------
0         5::1            5::2            225186354     691616518     Active
[FW1]
```

```
[FW1]dis ipsec tunnel brief
------------------------------------------------------------------------------
Tunn-id   Src Address     Dst Address     Inbound SPI   Outbound SPI  Status
------------------------------------------------------------------------------
0         5::1            5::2            225186354     691616518     Active
[FW1]dis ipsec ipv
[FW1]dis ipsec ipv6-policy
-------------------------------------------
IPsec Policy: james
Interface: Tunnel0
-------------------------------------------

  ----------------------------
  Sequence number: 1
  Mode: ISAKMP
  ----------------------------
  Traffic Flow Confidentiality: Disabled
  Security data flow: 3000
  Selector mode: standard
  Local address:
  Remote address: 5::2
  Transform set:  james
  IKE profile: james
  IKEv2 profile:
  smart-link policy:
  SA trigger mode: Traffic-based
  SA duration(time based): 3600 seconds
  SA duration(traffic based): 1843200 kilobytes
  SA soft-duration buffer(time based): --
  SA soft-duration buffer(traffic based): --
  SA idle time: --
[FW1]
```

```
[FW1]dis ipsec transform-set
IPsec transform set: james
  State: complete
  Encapsulation mode: tunnel
  ESN: Disabled
  PFS:
  Transform: ESP
  ESP protocol:
    Integrity: MD5
    Encryption: DES-CBC

[FW1]
```

```
[FW1]dis ike sa
    Connection-ID   Remote                Flag         DOI
--------------------------------------------------------------------
    1               5::2                  RD           IPsec
Flags:
RD--READY RL--REPLACED FD-FADING RK-REKEY
[FW1]
```

查看FW2的IPSEC显示信息：

```
[FW2]dis ipsec ipv6-policy
-----------------------------------------
IPsec Policy: james
Interface: Tunnel0
-----------------------------------------

  ----------------------------
  Sequence number: 1
  Mode: ISAKMP
  ----------------------------
  Traffic Flow Confidentiality: Disabled
  Security data flow: 3000
  Selector mode: standard
  Local address:
  Remote address: 5::1
  Transform set:  james
  IKE profile: james
  IKEv2 profile:
  smart-link policy:
  SA trigger mode: Traffic-based
  SA duration(time based): 3600 seconds
  SA duration(traffic based): 1843200 kilobytes
  SA soft-duration buffer(time based): --
  SA soft-duration buffer(traffic based): --
  SA idle time: --
[FW2]
```

```
[FW2]dis ipsec transform-set
IPsec transform set: james
  State: complete
  Encapsulation mode: tunnel
  ESN: Disabled
  PFS:
  Transform: ESP
  ESP protocol:
    Integrity: MD5
    Encryption: DES-CBC

[FW2]
```

```
[FW2]dis ike sa
    Connection-ID   Remote                Flag         DOI
--------------------------------------------------------------------
    1               5::1                  RD           IPsec
Flags:
RD--READY RL--REPLACED FD-FADING RK-REKEY
[FW2]
```

分别查看FW1、FW2的IPV6表，均可看到隧道的路由：

[FW1]dis ipv6 routing-table

Destinations : 11　　Routes : 11

Destination: ::/0　　Protocol　: Static
NextHop　: 3::2　　Preference: 60
Interface　: GE1/0/2　　Cost　　: 0

Destination: ::1/128　　Protocol　: Direct
NextHop　: ::1　　Preference: 0
Interface　: InLoop0　　Cost　　: 0

Destination: 1::/64　　Protocol　: Direct
NextHop　: ::　　Preference: 0
Interface　: GE1/0/3　　Cost　　: 0

```
Destination: 1::1/128                   Protocol  : Direct
NextHop    : ::1                        Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: 2::/64                     Protocol  : Static
NextHop    : 5::2                       Preference: 60
Interface  : Tun0                       Cost      : 0

Destination: 3::/64                     Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : GE1/0/2                    Cost      : 0

Destination: 3::1/128                   Protocol  : Direct
NextHop    : ::1                        Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: 5::/64                     Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : Tun0                       Cost      : 0

Destination: 5::1/128                   Protocol  : Direct
NextHop    : ::1                        Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: FE80::/10                  Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: FF00::/8                   Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : NULL0                      Cost      : 0
[FW1]

[FW2]dis ipv6 routing-table

Destinations : 11       Routes : 11

Destination: ::/0                       Protocol  : Static
NextHop    : 4::2                       Preference: 60
Interface  : GE1/0/2                    Cost      : 0

Destination: ::1/128                    Protocol  : Direct
NextHop    : ::1                        Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: 1::/64                     Protocol  : Static
NextHop    : 5::1                       Preference: 60
Interface  : Tun0                       Cost      : 0

Destination: 2::/64                     Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : GE1/0/3                    Cost      : 0

Destination: 2::1/128                   Protocol  : Direct
NextHop    : ::1                        Preference: 0
Interface  : InLoop0                    Cost      : 0

Destination: 4::/64                     Protocol  : Direct
NextHop    : ::                         Preference: 0
Interface  : GE1/0/2                    Cost      : 0

Destination: 4::1/128                   Protocol  : Direct
NextHop    : ::1                        Preference: 0
```

```
Interface  : InLoop0                        Cost      : 0

Destination: 5::/64                         Protocol  : Direct
NextHop    : ::                             Preference: 0
Interface  : Tun0                           Cost      : 0

Destination: 5::2/128                       Protocol  : Direct
NextHop    : ::1                            Preference: 0
Interface  : InLoop0                        Cost      : 0

Destination: FE80::/10                      Protocol  : Direct
NextHop    : ::                             Preference: 0
Interface  : InLoop0                        Cost      : 0

Destination: FF00::/8                       Protocol  : Direct
NextHop    : ::                             Preference: 0
Interface  : NULL0                          Cost      : 0
[FW2]
```

至此，F1060 IPV6 GRE OVER IPSEC典型组网配置案例已完成！