



Cisco Group Encrypted Transport VPN (GET VPN) and LISP Interaction

SDU DCI Validation and Configuration Notes

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Group Encrypted Transport VPN (GET VPN) and LISP Interaction

Cisco ASR and ISR series routers can be configured for both GET VPN encryption and LISP, therefore a decision must be made regarding what (if any) LISP traffic to encrypt when GET VPN is already deployed, or will be deployed, prior to the introduction of [LISP](#).



Note

This document assumes a working knowledge of GET VPN. An ACL should be prepared ahead of time and be ready to combine with the information in this document. GET VPN documentation, including the *Cisco Group Encrypted Transport VPN Configuration Guide* can be found here: http://www.cisco.com/en/US/docs/ios-xml/ios/sec_conn_getvpn/configuration/xs-3s/sec-get-vpn.html

Options

GET VPN functionality can be selectively used to encrypt none, some or all of the LISP traffic transiting between two or more routers in a GDOI¹ domain. Since GET VPN uses an ACL to determine which traffic to encrypt or leave unencrypted, it's possible to encrypt all LISP data and/or control traffic by use of explicit permit statements in the ACL. When a port is permitted in a GET VPN ACL, packets sent to the port will be *encrypted* which will provide the benefit of secure data and/or control information exchanges between the GDOI member routers. Packets that are encrypted by a GDOI domain member can only be unencrypted by another member router, therefore if a GDOI member router suffers a fault or misconfiguration affecting GET VPN, any encrypted LISP packets normally transiting the affected router would be affected.

Conversely, ACL deny statements can be used to *prevent* encryption to data and/or control traffic between GDOI group members. Using deny statements for LISP data or control ports can prevent an unforeseen impact to LISP due to a GET VPN session failure or misconfiguration by modifying the ACL used in the configuration to deny the data and/or control port numbers. When a port is denied in a GET VPN ACL, packets sent to the port are *ignored* and will not be encrypted. Configuring the ACL to ignore the control or both control and data ports used by LISP will ensure that if the GET VPN session were to go down or if a misconfiguration were introduced affecting the GET VPN settings, any LISP traffic that matched a deny ACL entry would be unaffected by the GET VPN session failure.

Lastly there are two hybrid options: data packets can be encrypted, but control packets can be left unencrypted, or the reverse where control is encrypted but data is unencrypted.

Assuming that a best practice would be to use a deterministic approach to explicitly deny or permit LISP control and data traffic, the possibilities are in [Table 1-1](#).

1. Group Domain of Interpretation – see RFC 6407: <http://tools.ietf.org/html/rfc6407>

Table 1-1 Deny or Permit Options for LISP Control and Data Traffic

Data Port	Control Port
Deny	Deny
Deny	Permit
Permit	Deny
Permit	Permit

Careful planning and design considerations should be implemented when creating or editing an ACL to have the desired effect on the traffic that could be seen and acted on by the ACL, according to the needs and priorities for a given network.

LISP Traffic and GET VPN ACL Considerations

In the LISP whitepaper “Locator/ID Separation Protocol”, available on CCO¹, we see that both the port numbers and traffic type used by LISP are specified:

“Both data and control messages use User Datagram Protocol (UDP) transport to facilitate passage through firewalls and distribution across parallel link aggregation group (LAG) paths through the Internet. **Encapsulated user data packets are transported using UDP port 4341, and LISP control packets are transported using UDP port 4342.**”

When a port is denied in a GET VPN ACL, packets using the port are ignored and will not be encrypted. Since ports 4341 and 4342 are used by LISP, including both those ports in deny statements in the ACL used by GET VPN will ensure that the LISP traffic will never be encrypted by the GET VPN session. Alternatively, if it is desired that LISP traffic be encrypted, both the control and data ports could be permitted, thus allowing LISP state information and data packets to be transmitted and received in encrypted format. The hybrid option of permitting one type of traffic and denying the other could also be a valid choice. The examples to follow detail how to modify an existing ACL for all three approaches.

Modifying an Existing GET VPN ACL to Deny All LISP Traffic

To modify an existing ACL to *deny* LISP control packets using port 4342, and data packets using port 4341, follow the configuration steps in the next section.



Note

The following steps are based on the assumption that GET VPN is already in use and the ACL is available to modify or prepare for the introduction of LISP traffic.

ACL Configuration Procedure

The following procedure, using the appropriate corresponding IOS commands, allows you to modify an existing ACL to deny LISP control packets on port 4342 and data packets on 4341.

1. http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6554/ps6599/ps10800/white_paper_c11-652502.html

-
- Step 1** Enter global configuration mode.
- configure terminal**
- Step 2** Modify an existing extended ACL used for GET VPN.
- ip access-list extended *ACL_NAME***
- Step 3** By prepending a line number to an entry into the ACL, we can control where it appears in the ACL, which can affect how likely the entry will match the condition. Here a UDP packet sent from any IP to any IP using destination UDP 4342 will trigger a match on the ACL for LISP control packets.
- line_number* **deny udp any any eq 4342**
- Step 4** Here a UDP packet sent from any IP to any IP using destination UDP 4341 will trigger a match on the ACL for LISP data packets.
- line_number* **deny udp any any eq 4341**
- Step 5** After inserting the lines into the ACL, we can resequence them, selecting the starting number and also the step increment value for each line in the ACL.
- ip access-list resequence *ACL_NAME* *starting_number* *step_increment_value***
- Step 6** Exit configuration mode.
- exit**
-

Example Configuration Changes

The following examples illustrate an ACL configuration procedure. The ACL being modified on the router called *key-server* is named GET VPN_EXAMPLE. Entries for port 4342 and 4341 will be added to the ACL. Note that the router *key-server* functions as the key server¹ for the GDOI group, and the ACL is stored and maintained on this router. Copies of the ACL are sent to each of the GDOI member routers so that all have the same ACL information to use to deny or permit encryption.



Note

For brevity, the following procedure shows a partial configuration of an example ACL and does not convey, expressed or implied, a complete ACL, nor should it be used as an ACL in a production network.

GET VPN ACL Before Modification (ACL Shortened for Brevity)

```
key-server#show ip access-lists GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
 10 deny udp any eq 848 any
 20 deny udp any any eq 848
 30 deny tcp any any eq tacacs
 40 deny tcp any eq tacacs any
 50 deny tcp any any eq bgp
 60 deny tcp any eq bgp any
 70 deny ospf any any
 80 deny eigrp any any
 90 deny udp any any eq ntp
100 deny udp any eq ntp any
```

1. Key Server: Among other duties, the Key Server router maintains the group policy (ACL), creates and maintains the keys used by the group and also manages group membership.

Sample Modification Procedure

The following simplified modification process exemplifies the noted ACL configuration changes.

Step 1 Insert lines 25 and 26.

```
key-server#configure terminal
key-server(config)#ip access-list extended GET VPN_EXAMPLE
key-server(config-ext-nacl)#25 deny udp any any eq 4342
key-server(config-ext-nacl)#26 deny udp any any eq 4341
key-server(config-ext-nacl)#end
key-server#
```

Step 2 Verify changes made to the ACL.

```
key-server#show ip access-list GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
10 deny udp any eq 848 any
20 deny udp any any eq 848
25 deny udp any any eq 4342
26 deny udp any any eq 4341
30 deny tcp any any eq tacacs
40 deny tcp any eq tacacs any
50 deny tcp any any eq bgp
60 deny tcp any eq bgp any
70 deny ospf any any
80 deny eigrp any any
90 deny udp any any eq ntp
100 deny udp any eq ntp any
```

Step 3 Resequence the ACL.

```
key-server#configure terminal
key-server(config)#ip access-list resequence GET VPN_EXAMPLE 10 10
key-server(config)#end
key-server#
```

GET VPN ACL After Modification (ACL Shortened for Brevity)

```
key-server#show ip access-list GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
10 deny udp any eq 848 any
20 deny udp any any eq 848
30 deny udp any any eq 4342
40 deny udp any any eq 4341
50 deny tcp any any eq tacacs
60 deny tcp any eq tacacs any
70 deny tcp any any eq bgp
80 deny tcp any eq bgp any
90 deny ospf any any
100 deny eigrp any any
110 deny udp any any eq ntp
120 deny udp any eq ntp any
```

The ACL now has deny entries for the LISP control and data ports, and has been uniformly resequenced. Any LISP packets will be sent in unencrypted format no matter what the state of the GET VPN session. If we examine the packets using a sniffer device, we can see that the control packets using port 4342 and data packets using port 4341 are sent unencrypted. See [Figure 1-1](#) and [Figure 1-2](#) for an example sniffer capture showing both control and data packets that were sent without encryption:

Figure 1-1 Sniffer Trace of a LISP Control Packet Sent to Port 4342

No.	Time	Source	Destination	Protocol	Length	Info
145	25.9999974	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=60/15360, ttl=64
146	25.9999974	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=60/15360, ttl=63
147	26.9993129	Cisco_Fc:c8:d0	00:00:00:02:00:00	0x200e	84	Ethernet II
148	26.9995132	10.46.1.1	5.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
149	26.9997110	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
150	26.9997110	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
151	26.9998275	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
152	26.9999976	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=61/15616, ttl=64
153	26.9999976	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=61/15616, ttl=63
154	27.9996550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
155	27.9996550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
156	27.9996969	10.46.1.1	2.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
157	27.9997824	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
158	27.9999970	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=62/15872, ttl=64
159	27.9999970	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=62/15872, ttl=63
160	28.9996544	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet

Frame 148: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface
 Ethernet II, Src: Cisco_85:d8:00 (00:21:1c:85:d8:00), Dst: Cisco_4f:8c:00 (00:1a:30:4f:8c:00)
 Internet Protocol Version 4, Src: 10.46.1.1 (10.46.1.1), Dst: 5.5.5.35 (5.5.5.35)
 User Datagram Protocol, Src Port: lisp-control (4342), Dst Port: lisp-control (4342)
 Source port: lisp-control (4342)
 Destination port: lisp-control (4342)
 Length: 72
 Checksum: 0x5db9 [validation disabled]
 Locator/ID Separation Protocol

Figure 1-2 Sniffer Trace of a LISP Control Packet Sent to Port 4341

No.	Time	Source	Destination	Protocol	Length	Info
145	25.9999974	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=60/15360, ttl=64
146	25.9999974	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=60/15360, ttl=63
147	26.9993129	Cisco_Fc:c8:d0	00:00:00:02:00:00	0x200e	84	Ethernet II
148	26.9995132	10.46.1.1	5.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
149	26.9997110	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
150	26.9997110	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
151	26.9998275	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
152	26.9999976	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=61/15616, ttl=64
153	26.9999976	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=61/15616, ttl=63
154	27.9996550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
155	27.9996550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
156	27.9996969	10.46.1.1	2.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
157	27.9997824	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
158	27.9999970	10.25.33.50	123.123.123.123	ICMP	138	Echo (ping) request id=0x4e46, seq=62/15872, ttl=64
159	27.9999970	123.123.123.123	10.25.33.50	ICMP	138	Echo (ping) reply id=0x4e46, seq=62/15872, ttl=63
160	28.9996544	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet

Frame 152: 138 bytes on wire (1104 bits), 138 bytes captured (1104 bits) on interface
 Ethernet II, Src: Cisco_4f:8c:00 (00:1a:30:4f:8c:00), Dst: Cisco_85:d8:00 (00:21:1c:85:d8:00)
 Internet Protocol Version 4, Src: 10.35.1.1 (10.35.1.1), Dst: 10.10.10.1 (10.10.10.1)
 User Datagram Protocol, Src Port: 65025 (65025), Dst Port: lisp-data (4341)
 Source port: 65025 (65025)
 Destination port: lisp-data (4341)
 Length: 100
 Checksum: 0x0000 (none)
 Locator/ID Separation Protocol (Data)
 Internet Protocol Version 4, Src: 10.25.33.50 (10.25.33.50), Dst: 123.123.123.123 (123.123.123.123)
 Internet Control Message Protocol

With both LISP ports denied in the GETVPV ACL, all LISP packets would be sent unencrypted, and would be unaffected if there were any problem with the GET VPN ACL or any of the member routers. However, the traffic would be unencrypted, and hence would be less secure and could possibly be captured and used to create crafted packets or for other undesirable purposes.

Modifying Existing GET VPN ACL to Permit All LISP Traffic

To modify an existing ACL to permit (encrypt) LISP control packets using port 4342 and data packets using port 4341, follow the configuration steps in the next section .



Note

The following steps are based on the assumption that GET VPN is already in use and the ACL is available to modify to prepare for the introduction of LISP traffic.

ACL Configuration Procedure

The following procedure, using the appropriate corresponding IOS commands, allows you to modify an existing ACL to permit LISP control packets on port 4342 and data packets on 4341.

-
- Step 1** Enter global configuration mode.
- ```
configure terminal
```
- Step 2** Modify an existing extended ACL used for GET VPN.
- ```
ip access-list extended ACL_NAME
```
- Step 3** By prepending a line number to an entry into the ACL, we can control where it appears in the ACL, which can affect how likely the entry will match the condition. Here a UDP packet sent from any IP to any IP using destination UDP 4342 will trigger a match on the ACL.
- ```
line_number permit udp any any eq 4342
```
- Step 4** A second line is inserted into the ACL. Here a UDP packet sent from any IP to any IP using destination UDP 4341 will trigger a match on the ACL.
- ```
line_number permit udp any any eq 4341
```
- Step 5** After inserting the lines into the ACL, we can resequence them, selecting the starting number and also the step increment value for each line in the ACL.
- ```
ip access-list resequence ACL_NAME starting_number step_increment_value
```
- Step 6** Exit configuration mode.
- ```
exit
```
-

Example Configuration Changes

The following examples illustrate the ACL. The ACL being modified on the router called *key-server* is named GET VPN_EXAMPLE. Entries for port 4342 and 4341 will be added to the ACL.



Note

For brevity, the following procedure shows a partial configuration of an example ACL and does not convey, expressed or implied, a complete ACL, nor should it be used as an ACL in a production network.

GET VPN ACL Before Modification (ACL Shortened for Brevity)

```
key-server#show ip access-lists GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
 10 deny udp any eq 848 any
 20 deny udp any any eq 848
 30 deny tcp any any eq tacacs
 40 deny tcp any eq tacacs any
 50 deny tcp any any eq bgp
 60 deny tcp any eq bgp any
 70 deny ospf any any
 80 deny eigrp any any
 90 deny udp any any eq ntp
```

Sample Modification Procedure

The following simplified modification process exemplifies the noted ACL configuration changes.

Step 1 Insert lines 25 and 26.

```
key-server#configure terminal
key-server(config)#ip access-list extended GET VPN_EXAMPLE
key-server(config-ext-nacl)#25 permit udp any any eq 4342
key-server(config-ext-nacl)#26 permit udp any any eq 4341
key-server(config-ext-nacl)#end
key-server#
```

Step 2 Verify changes made to the ACL

```
key-server#show ip access-list GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
 10 deny udp any eq 848 any
 20 deny udp any any eq 848
 25 permit udp any any eq 4342
 26 permit udp any any eq 4341
 30 deny tcp any any eq tacacs
 40 deny tcp any eq tacacs any
 50 deny tcp any any eq bgp
 60 deny tcp any eq bgp any
 70 deny ospf any any
 80 deny eigrp any any
 90 deny udp any any eq ntp
100 deny udp any eq ntp any
```

Step 3 Resequence the ACL.

```
key-server#configure terminal
key-server(config)#ip access-list resequence GET VPN_EXAMPLE 10 10
key-server(config)#end
key-server#
```

GET VPN ACL After Modification (ACL Shortened for Reivity)

```
key-server#show ip access-list GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
 10 deny udp any eq 848 any
 20 deny udp any any eq 848
 30 permit udp any any eq 4342
```

```

40 permit udp any any eq 4341
50 deny tcp any any eq tacacs
60 deny tcp any eq tacacs any
70 deny tcp any any eq bgp
80 deny tcp any eq bgp any
90 deny ospf any any
100 deny eigrp any any
110 deny udp any any eq ntp
120 deny udp any eq ntp any

```

The ACL now has permit entries for the LISP control and data ports, and has been resequenced. All LISP control and data packets are encrypted and are sent as Encapsulating Security Payload (ESP) packets. If we examine the packets using a sniffer device, we see no references to ports 4342 or 4341 since the contents of all LISP packets are encrypted. Figure 1-3 exemplifies a sniffer capture showing a sample ESP packet decode. Note that with the exception of OSPF hello packets, all other packets seen in the sniffer trace are encrypted ESP packets:

Figure 1-3 sniffer Capture Showing a Sample ESP Packet Decode

No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000000	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
2	0.00022125	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x6bcc92c)
3	0.00022209	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x6bcc92c)
4	0.00023550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
5	0.00023550	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
6	0.00053302	10.46.1.9	1.1.1.47	ESP	130	ESP (SPI=0x6bcc92c)
7	0.00054392	19.98.1.2	10.10.10.1	ESP	154	ESP (SPI=0x6bcc92c)
8	0.99994407	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
9	1.00021226	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
10	1.00021226	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
11	1.00022148	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x6bcc92c)
12	1.00022315	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x6bcc92c)
13	1.00089950	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
14	2.00011610	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
15	2.00011610	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
16	2.00022254	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x6bcc92c)


```

Frame 2: 194 bytes on wire (1552 bits), 194 bytes captured (1552 bits)
Ethernet II, Src: Cisco_4f:8c:00 (00:1a:30:4f:8c:00), Dst: Cisco_85:d8:00 (00:21:1c:85:d8:00)
Internet Protocol Version 4, Src: 10.35.1.1 (10.35.1.1), Dst: 10.10.10.1 (10.10.10.1)
  Version: 4
  Header length: 20 bytes
  Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
  Total Length: 176
  Identification: 0x0095 (149)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 254
  Protocol: ESP (50)
  Header checksum: 0x9c58 [correct]
  Source: 10.35.1.1 (10.35.1.1)
  Destination: 10.10.10.1 (10.10.10.1)
Encapsulating Security Payload
  ESP SPI: 0x6bcc92c
  ESP Sequence: 149

```

In this situation, the highest level of security would be maintained, since both control and data LISP packets are encrypted and no information that the packets are used for LISP is available in the sniffer trace. However, though this is the most secure approach, there is also some risk in that the control and data information is encrypted, so if there is a GET VPN failure on one or more of the GDOI group member routers, or a corrupt ACL is pushed from the key server to the GDOI members, all LISP traffic would be unavailable until the issue affecting GET VPN were resolved.

A Hybrid Approach—Modifying an Existing GET VPN ACL to Deny LISP Control Traffic and Permit LISP Data Traffic

To modify an existing ACL to deny (leave unencrypted) LISP control packets using port 4342 and permit (encrypt) LISP data packets using port 4341, follow the configuration steps in the next section.



Note

The following steps are based on the assumption that GET VPN is already in use and the ACL is available to modify to prepare for the introduction of LISP traffic.

ACL Configuration Procedure

The following procedure, using the appropriate corresponding IOS commands, allows you to modify an existing ACL to deny LISP control packets on port 4342 and permit LISP data packets using port 4341.

-
- Step 1** Enter global configuration mode.
- ```
configure terminal
```
- Step 2** Modify an existing extended ACL used for GET VPN.
- ```
ip access-list extended ACL_NAME
```
- Step 3** By prepending a line number to an entry into the ACL, we can control where it appears in the ACL, which can affect how likely the entry will match the condition. Here a UDP packet sent from any IP to any IP using destination UDP 4342 will trigger a match on the ACL, resulting in the packets being left unencrypted.
- ```
line_number deny udp any any eq 4342
```
- Step 4** Here a UDP packet sent from any IP to any IP using destination UDP 4341 will trigger a match on the ACL, causing the packets to be encrypted.
- ```
line_number permit udp any any eq 4341
```
- Step 5** After inserting the lines into the ACL, we can resequence them, selecting the starting number and also the step increment value for each line in the ACL.
- ```
ip access-list resequence ACL_NAME starting_number step_increment_value
```
- Step 6** Exit configuration mode.
- ```
exit
```
-

Example Configuration Changes

The following examples illustrate the ACL. The ACL being modified on the router called *key-server* is named GET VPN_EXAMPLE. Entries for port 4342 and 4341 will be added to the ACL.

For brevity, the following procedure shows a partial configuration of an example ACL and does not convey, expressed or implied, a complete ACL, nor should it be used as an ACL in a production network. GET VPN ACL Before modification (ACL shortened for brevity)

```
key-server#show ip access-lists GET VPN_EXAMPLE
Extended IP access list GET VPN_EXAMPLE
```

```

10 deny udp any eq 848 any
20 deny udp any any eq 848
30 deny tcp any any eq tacacs
40 deny tcp any eq tacacs any
50 deny tcp any any eq bgp
60 deny tcp any eq bgp any
70 deny ospf any any
80 deny eigrp any any
90 deny udp any any eq ntp

```

Sample Modification Procedure

The following simplified modification process exemplifies the noted ACL configuration changes.

Step 1 Insert lines 25 and 26.

```

key-server#configure terminal
key-server(config)#ip access-list extended GET_VPN_EXAMPLE
key-server(config-ext-nacl)#25 deny udp any any eq 4342
key-server(config-ext-nacl)#26 permit udp any any eq 4341
key-server(config-ext-nacl)#end
key-server#

```

Step 2 Verify changes made to the ACL.

```

key-server#show ip access-list GET_VPN_EXAMPLE
Extended IP access list GET_VPN_EXAMPLE
10 deny udp any eq 848 any
20 deny udp any any eq 848
25 deny udp any any eq 4342
26 permit udp any any eq 4341
30 deny tcp any any eq tacacs
40 deny tcp any eq tacacs any
50 deny tcp any any eq bgp
60 deny tcp any eq bgp any
70 deny ospf any any
80 deny eigrp any any
90 deny udp any any eq ntp
100 deny udp any eq ntp any

```

Step 3 Resequence the ACL.

```

key-server#configure terminal
key-server(config)#ip access-list resequence GET_VPN_EXAMPLE 10 10
key-server(config)#end
key-server#

```

GET VPN ACL After Modification (ACL Shortened for Brevity)

```

key-server#show ip access-list GET_VPN_EXAMPLE
Extended IP access list GET_VPN_EXAMPLE
10 deny udp any eq 848 any
20 deny udp any any eq 848
30 deny udp any any eq 4342
40 permit udp any any eq 4341
50 deny tcp any any eq tacacs
60 deny tcp any eq tacacs any
70 deny tcp any any eq bgp
80 deny tcp any eq bgp any
90 deny ospf any any

```

```

100 deny eigrp any any
110 deny udp any any eq ntp
120 deny udp any eq ntp any

```

The ACL now has a deny entry for the LISP control port and a permit entry for the LISP data port, and has been resequenced. All LISP control packets are sent unencrypted while data packets are sent as Encapsulating Security Payload (ESP) packets. If we examine the packets using a sniffer device, we see packets sent to port 4342, but no references to port 4341 since the contents of the packets are encrypted. Figure 1-4 exemplifies sniffer captures showing both unencrypted and ESP encrypted decodes.

Packet number 280 captured during a sniffer trace: It's a Map-Register LISP control packet destined for port 4342 that is unencrypted:

Figure 1-4 Sniffer Captures Showing Both Unencrypted and ESP Encrypted Decodes

No.	Time	Source	Destination	Protocol	Length	Info
277	58.0002300	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
278	58.0002300	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
279	59.0000458	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
280	59.0000701	10.46.1.1	5.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
281	59.0001581	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
282	59.0001581	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
283	59.0001673	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x3c62de99)
284	59.0001682	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x3c62de99)
285	60.0000217	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
286	60.0000662	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
287	60.0000662	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
288	60.0001684	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x3c62de99)
289	60.0001692	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x3c62de99)
290	60.9995585	10.55.1.10	224.0.0.13	PIMV2	76	Hello
291	60.9995585	10.55.1.10	224.0.0.13	PIMV2	76	Hello
292	60.9999625	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
293	61.0000488	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet

Frame 280: 110 bytes on wire (880 bits), 110 bytes captured (880 bits)

Ethernet II, Src: Cisco_85:d8:00 (00:21:1c:85:d8:00), Dst: Cisco_4f:8c:00 (00:1a:30:4f:8c:00)

Internet Protocol Version 4, Src: 10.46.1.1 (10.46.1.1), Dst: 5.5.5.35 (5.5.5.35)

Version: 4
Header length: 20 bytes

Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))

Total Length: 92

Identification: 0xb0c9 (45257)

Flags: 0x00

Fragment offset: 0

Time to live: 31

Protocol: UDP (17)

Header checksum: 0xd4b1 [correct]

Source: 10.46.1.1 (10.46.1.1)

Destination: 5.5.5.35 (5.5.5.35)

User Datagram Protocol, Src Port: lisp-control (4342), Dst Port: lisp-control (4342)

Source port: lisp-control (4342)

Destination port: lisp-control (4342)

Length: 72

Checksum: 0x5db9 [validation disabled]

Locator/ID Separation Protocol

Note that with the exception of the OSPF and PIM Hello packets, the other packets seen are Encapsulating Security Payload – ESP packets - representing the LISP data packets sent when the sniffer trace was taken. Because the LISP data is encrypted, we cannot see the destination port number 4341 to which it was sent.

Figure 1-5 shows another packet from the same sniffer trace example, now showing packet number 283 which is an encrypted ping packet:

Figure 1-5 Encrypted Ping Packet

No.	Time	Source	Destination	Protocol	Length	Info
277	58.0002300	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
278	58.0002300	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
279	59.0000458	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
280	59.0000701	10.46.1.1	5.5.5.35	LISP	110	Map-Register for 120.120.120.0/24
281	59.0001581	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
282	59.0001581	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
283	59.0001673	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x3c62de99)
284	59.0001682	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x3c62de99)
285	60.0000217	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
286	60.0000662	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
287	60.0000662	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet
288	60.0001684	10.35.1.1	10.10.10.1	ESP	194	ESP (SPI=0x3c62de99)
289	60.0001692	10.46.1.9	1.1.1.35	ESP	194	ESP (SPI=0x3c62de99)
290	60.9995585	10.55.1.10	224.0.0.13	PIMv2	76	Hello
291	60.9995585	10.55.1.10	224.0.0.13	PIMv2	76	Hello
292	60.9999625	10.55.1.9	224.0.0.5	OSPF	98	Hello Packet
293	61.0000488	10.55.1.10	224.0.0.5	OSPF	98	Hello Packet


```

Frame 283: 194 bytes on wire (1552 bits), 194 bytes captured (1552 bits)
  Ethernet II, Src: Cisco_4f:8c:00 (00:1a:30:4f:8c:00), Dst: Cisco_85:d8:00 (00:21:1c:85:d8:00)
  Internet Protocol Version 4, Src: 10.35.1.1 (10.35.1.1), Dst: 10.10.10.1 (10.10.10.1)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
    Total Length: 176
    Identification: 0x0025 (37)
    Flags: 0x00
    Fragment offset: 0
    Time to live: 254
    Protocol: ESP (50)
    Header checksum: 0x9cc8 [correct]
    Source: 10.35.1.1 (10.35.1.1)
    Destination: 10.10.10.1 (10.10.10.1)
  Encapsulating Security Payload
    ESP SPI: 0x3c62de99
    ESP Sequence: 37
  
```

Because the packet is encrypted we cannot see what port it was destined to, however because pings were being sent during the capture period when the sniffer trace was active, we can infer that it was most likely an ICMP ping packet, followed by packet number 284, which was an ICMP ping reply.

In this hybrid case, control packets are sent unencrypted, so LISP state information exchanged between the GDOI group routers would be unaffected by any GET VPN malfunctions. The LISP data would be encrypted, however, so it would be secure when transiting between routers, but would be vulnerable to any GET VPN malfunctions.

For brevity, the other hybrid possibility – control encrypted and data unencrypted – is not shown. To implement such a design, simply switch the port numbers used in the hybrid example information.

Summary

Cisco ASR and ISR series routers provide a wide latitude of flexibility for configuring GET VPN with LISP. GET VPN functionality can be selectively used to encrypt some, all or none of the LISP traffic, depending on the needs in a given network. Careful planning and design considerations should be implemented when creating or editing an ACL to have the desired effect on the traffic that could be seen and acted on by the ACL.

For more about GET VPN, browse to: <http://www.cisco.com/go/getvpn>

To learn more about LISP, go to <http://www.cisco.com/go/lisp> and <http://lisp.cisco.com>

Glossary

The following terms are identified for clarification:

- **ACL**—Access Control List
- **ESP**—Encapsulating Security Payload
- **GDOI**—Group Domain of Interpretation
- **GETVPN**—Group Encrypted Transport Virtual Private Network
- **Key Server**—Among other duties, the Key Server router maintains the policy (ACL), creates and maintains the keys used by the group and manages group membership
- **LISP**—Locator/ID Separation Protocol

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His background in the networking industry spans over 12 years in various roles at Cisco. Phil has experience in a wide range of technologies including Routing, Switching, Storage and DCI related technologies such as OTV and LISP. In his current role, Phil focuses on DCI Systems releases for the enterprise customer. His most recent collaborative Cisco solution testing and validation effort is Cisco LISP VM-Mobility & Path Optimization Solution with EMC VPLEX.



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