

在虛擬鏈路上配置OSPF身份驗證

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簡介

開放最短路徑優先(OSPF)自治系統中的所有區域必須物理連線到主幹區域 (區域0)。但是，在無法進行此物理連線的情況下，您可以使用虛擬鏈路通過非主幹區域連線到主幹。您還可以使用虛擬鏈路通過非主幹區域連線分割槽主幹的兩個部分。您也可以在虛擬鏈路上啟用OSPF身份驗證。

本文檔介紹如何在OSPF網路中的虛擬鏈路上啟用純文字檔案和消息摘要5(MD5)身份驗證。有關如何配置OSPF身份驗證的詳細資訊，請參閱[在OSPF中進行身份驗證的示例配置](#)。

必要條件

需求

嘗試此組態之前，請確保符合以下要求：

- 瞭解OSPF路由協定及其操作
- 瞭解OSPF虛擬鏈路概念

有關OSPF路由協定和OSPF中虛擬鏈路概念的詳細資訊，請參閱[OSPF設計手冊](#)。

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- Cisco 2500系列路由器
- Cisco IOS®軟體版本12.2(27)

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路正在作用，請確保您已瞭解任何指令可能造成的影響。

慣例

如需文件慣例的詳細資訊，請參閱[思科技術提示慣例](#)。

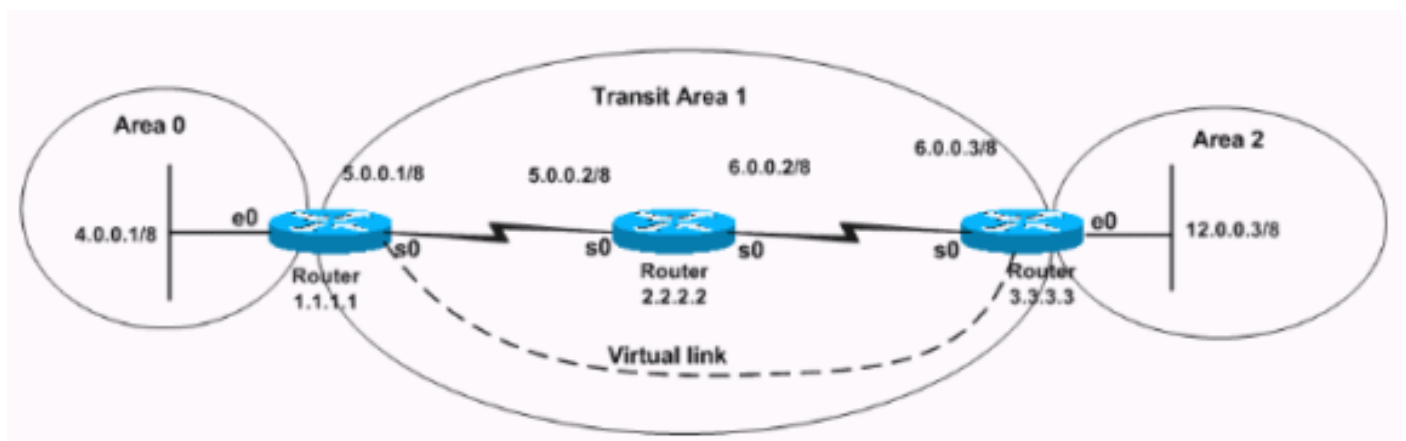
設定

本節提供用於設定本文件中所述功能的資訊。

註：使用[Command Lookup Tool](#)(僅限[註冊](#)客戶)查詢有關本文檔中使用的命令的更多資訊。

網路圖表

本檔案會使用以下網路設定：



組態

本檔案會使用以下設定：

- [配置純文字檔案身份驗證](#)
- [配置MD5身份驗證](#)

配置純文字檔案身份驗證

明文身份驗證通過網路以明文形式傳送口令。在此配置中，路由器3.3.3.3在區域0中沒有介面，但虛擬連線到區域0。此配置使路由器3.3.3.3成為虛擬區域邊界路由器(ABR)，因此您必須在路由器3.3.3.3上啟用區域0身份驗證。本節提供在虛擬鏈路方案中配置純文字檔案身份驗證的命令。

注意：配置使用的身份驗證金鑰定義了直接插入OSPF報頭的金鑰（密碼）。Cisco IOS軟體建立路由通訊協定封包時，會將金鑰插入到標頭中。您可以為每個介面為每個網路分配單獨的密碼。為了交換OSPF資訊，同一網路上的所有相鄰路由器必須具有相同的密碼。

路由器1.1.1.1

```
hostname r1.1.1.1

interface Loopback0
 ip address 1.1.1.1 255.0.0.0

interface Ethernet0
 ip address 4.0.0.1 255.0.0.0
 ip ospf authentication-key cisco
 !--- This command configures the authentication key (password) !--- on the interface as "cisco".
 interface Serial0 ip address 5.0.0.1 255.0.0.0 clockrate 64000 !
 router ospf 2 network 4.0.0.0 0.255.255.255 area 0
 network 5.0.0.0 0.255.255.255 area 1 area 0 authentication
 !--- This command enables plain authentication for area 0 !--- on the router. area 1 virtual-link 3.3.3.3
 authentication-key cisco
 !--- This command creates the virtual link between Router !--- 1.1.1.1 and Router 3.3.3.3 with plain text authentication enabled.
```

路由器3.3.3.3

```
hostname r3.3.3.3

interface Loopback0
 ip address 3.3.3.3 255.0.0.0

interface Ethernet0
 ip address 12.0.0.3 255.0.0.0

interface Serial0
 ip address 6.0.0.3 255.0.0.0

!

router ospf 2
 network 12.0.0.0 0.255.255.255 area 2
 network 6.0.0.0 0.255.255.255 area 1
 area 0 authentication
 !--- This command enables plain authentication for area 0 !--- on the router. area 1 virtual-link 1.1.1.1
 authentication-key cisco
 !--- This command creates the virtual link to area 0 via !--- transit area 1 with plain text authentication enabled.
```

配置MD5身份驗證

MD5身份驗證比純文字檔案身份驗證更安全。安全性更好，因為此方法使用MD5演算法從OSPF資料包的內容和密碼（或金鑰）計算雜湊值。該雜湊值隨金鑰ID和非遞減序列號一起在資料包中傳輸。知道相同密碼的接收方會計算自己的雜湊值。本節提供在虛擬鏈路場景中配置MD5身份驗證的命令。

路由器1.1.1.1

```
hostname r1.1.1.1

interface Loopback0
```

```
ip address 1.1.1.1 255.0.0.0

interface Ethernet0
 ip address 4.0.0.1 255.0.0.0
 ip ospf message-digest-key 1 md5 cisco
 !--- This command configures the MD5 authentication key
 !--- on the interface as "cisco". interface Serial0 ip
 address 5.0.0.1 255.0.0.0 clockrate 64000 ! router ospf
 2 network 4.0.0.0 0.255.255.255 area 0 network 5.0.0.0
 0.255.255.255 area 1 area 0 authentication message-
digest
 !--- This command enables MD5 authentication for area 0
 !--- on the router. area 1 virtual-link 3.3.3.3
 message-digest-key 1 md5 cisco
 !--- This command creates the virtual link between
 Router !--- 1.1.1.1 and Router 3.3.3.3 with MD5
 authentication enabled.
```

路由器3.3.3.3

```
hostname r3.3.3.3

interface Loopback0
 ip address 3.3.3.3 255.0.0.0

interface Ethernet0
 ip address 12.0.0.3 255.0.0.0

interface Serial0
 ip address 6.0.0.3 255.0.0.0

!

router ospf 2
 network 12.0.0.0 0.255.255.255 area 2
 network 6.0.0.0 0.255.255.255 area 1
 area 0 authentication message-digest
 !--- This command enables MD5 authentication for area 0
 !--- on the router. area 1 virtual-link 1.1.1.1 message-
 digest-key 1 md5 cisco
 !--- This command creates the virtual link to area 0 via
 !--- the transit area 1 with MD5 authentication enabled.
```

驗證

使用本節內容，確認您的組態是否正常運作。

[輸出直譯器工具](#)(僅供已註冊客戶使用)(OIT)支援某些show命令。使用OIT檢視show命令輸出的分析

。

- **show ip ospf virtual-links** — 顯示OSPF虛擬鏈路的引數和當前狀態。
- **show ip route** — 顯示路由表的當前狀態。

[show命令輸出示例 — 配置純文字檔案身份驗證](#)

```
r3.3.3.3# show ip ospf virtual-links
```

```
Virtual Link OSPF_VL0 to router 1.1.1.1 is up
```

```

!--- The status of the virtual link displays. Run as demand circuit
  DoNotAge LSA allowed
!--- This specifies that OSPF runs as a demand circuit over virtual links, !--- and so link-
state advertisements (LSAs) are not refreshed (not aged out). Transit area 1, via interface
Serial0, Cost of using 128 Transmit Delay is 1 sec, State POINT_TO_POINT, Timer intervals
configured, Hello 10, Dead 40, Wait 40, Retransmit 5 Hello due in 00:00:01 Adjacency State FULL
(Hello suppressed)
!--- The status of the neighbor adjacency displays. Index 1/2, retransmission queue length 0,
number of retransmission 1 First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0) Last retransmission scan
length is 1, maximum is 1 Last retransmission scan time is 0 msec, maximum is 0 msec Simple
password authentication enabled
!--- The type of authentication that is enabled displays. !--- The authentication type is simple
password. r3.3.3.3#

```

注意：輸出顯示OSPF hello被抑制。這意味著，一旦虛擬鏈路啟動，就不再交換hello。OSPF會抑制hello，因為它將虛擬鏈路視為請求電路。通常，OSPF每10秒傳送一次hello，並每30分鐘刷新一次LSA。然而，即使這種流量量也不需要按需電路。使用OSPF需求電路選項會抑制hello和LSA刷新功能。因此，在使用**clear ip ospf process** 命令清除OSPF進程之前，對OSPF身份驗證所做的任何更改都不會生效。例如，路由器上的身份驗證型別發生了變化。

```
r3.3.3.3# show ip route
```

```

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set
C 3.0.0.0/8 is directly connected, Loopback0
O 4.0.0.0/8 [110/138] via 6.0.0.2, 00:31:08, Serial0
O 5.0.0.0/8 [110/128] via 6.0.0.2, 22:55:44, Serial0
C 6.0.0.0/8 is directly connected, Serial0
C 12.0.0.0/8 is directly connected, Ethernet0
r3.3.3.3#

```

show命令輸出示例 — 配置MD5身份驗證

```
r3.3.3.3# show ip ospf virtual-links
```

```

Virtual Link OSPF_VL1 to router 1.1.1.1 is up
!--- The status of the virtual link displays. Run as demand circuit
  DoNotAge LSA allowed
!--- This specifies that OSPF runs as a demand circuit over virtual links, !--- and so LSAs are
not refreshed (not aged out). Transit area 1, via interface Serial0, Cost of using 128 Transmit
Delay is 1 sec, State POINT_TO_POINT, Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5 Hello due in 00:00:01 Adjacency State FULL (Hello suppressed)
!--- The status of the neighbor adjacency displays. Index 1/2, retransmission queue length 0,
number of retransmission 0 First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0) Last retransmission scan
length is 0, maximum is 0 Last retransmission scan time is 0 msec, maximum is 0 msec Message
digest authentication enabled
!--- The type of authentication that is enabled displays. !--- The authentication type is MD5.
Youngest key id is 1

```

```
r3.3.3.3# show ip route
```

```

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

```

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
C 3.0.0.0/8 is directly connected, Loopback0
O 4.0.0.0/8 [110/138] via 6.0.0.2, 00:02:41, Serial0
O 5.0.0.0/8 [110/128] via 6.0.0.2, 00:02:51, Serial0
C 6.0.0.0/8 is directly connected, Serial0
C 12.0.0.0/8 is directly connected, Ethernet0
```

疑難排解

使用本節內容，對組態進行疑難排解。

附註：使用 `debug` 指令之前，請先參閱[有關 Debug 指令的重要資訊](#)。

- `debug ip ospf adj` — 調試OSPF鄰居鄰接關係建立過程。

debug命令輸出示例 — 配置純文字檔案身份驗證

```
r3.3.3.3# debug ip ospf adj
```

```
23:31:41: OSPF: Interface OSPF_VL0 going Up
23:31:41: OSPF: Build router LSA for area 0, router ID 3.3.3.3, seq 0x8000002E
23:31:41: OSPF: Build router LSA for area 1, router ID 3.3.3.3, seq 0x8000002E
23:31:41: OSPF: Build router LSA for area 2, router ID 3.3.3.3, seq 0x80000031
23:31:51: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL0 seq 0x887 opt 0x62 flag 0x7
len 32 mtu 0 state INIT
23:31:51: OSPF: 2 Way Communication to 1.1.1.1 on OSPF_VL0, state 2WAY
23:31:51: OSPF: Send DBD to 1.1.1.1 on OSPF_VL0 seq 0x2102 opt 0x62 flag 0x7 len 32
23:31:51: OSPF: First DBD and we are not SLAVE
23:31:51: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL0 seq 0x2102 opt 0x62 flag 0x2
len 172 mtu 0 state EXSTART
23:31:51: OSPF: NBR Negotiation Done. We are the MASTER
23:31:51: OSPF: Send DBD to 1.1.1.1 on OSPF_VL0 seq 0x2103 opt 0x62 flag 0x3 len 172
23:31:51: OSPF: Database request to 1.1.1.1
23:31:51: OSPF: sent LS REQ packet to 5.0.0.1, length 12
23:31:51: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL0 seq 0x2103 opt 0x62 flag 0x0 len 32
mtu 0 state EXCHANGE
23:31:51: OSPF: Send DBD to 1.1.1.1 on OSPF_VL0 seq 0x2104 opt 0x62 flag 0x1 len 32
23:31:51: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL0 seq 0x2104 opt 0x62 flag 0x0
len 32 mtu 0 state EXCHANGE
23:31:51: OSPF: Exchange Done with 1.1.1.1 on OSPF_VL0
23:31:51: OSPF: Synchronized with 1.1.1.1 on OSPF_VL0, state FULL
!--- This indicates the establishment of neighbor adjacency. 23:31:51: %OSPF-5-ADJCHG: Process
2, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to FULL, Loading Done 23:31:52: OSPF: Build router LSA
for area 0, router ID 3.3.3.3, seq 0x8000002F 23:32:23: OSPF: Dead event ignored for 1.1.1.1 on
demand circuit OSPF_VL0 r3.3.3.3#
```

debug命令輸出示例 — 配置MD5身份驗證

```
r3.3.3.3# debug ip ospf adj
```

```
23:48:06: OSPF: Interface OSPF_VL1 going Up
23:48:06: OSPF: Send with youngest Key 0
23:48:07: OSPF: Build router LSA for area 0, router ID 3.3.3.3, seq 0x80000001
23:48:07: OSPF: Build router LSA for area 2, router ID 3.3.3.3, seq 0x80000033
23:48:07: OSPF: Build router LSA for area 1, router ID 3.3.3.3, seq 0x80000030
```

```
23:48:14: OSPF: 2 Way Communication to 1.1.1.1 on OSPF_VL1, state 2WAY
23:48:14: OSPF: Send DBD to 1.1.1.1 on OSPF_VL1 seq 0x1EA opt 0x62 flag 0x7 len32
23:48:14: OSPF: Send with youngest Key 1
23:48:14: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL1 seq 0x3FB opt 0x62 flag 0x7
len 32 mtu 0 state EXSTART
23:48:14: OSPF: First DBD and we are not SLAVE
23:48:16: OSPF: Send with youngest Key 1
23:48:19: OSPF: Send DBD to 1.1.1.1 on OSPF_VL1 seq 0x1EA opt 0x62 flag 0x7 len 32
23:48:19: OSPF: Send with youngest Key 1
23:48:19: OSPF: Retransmitting DBD to 1.1.1.1 on OSPF_VL1 [1]
23:48:19: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL1 seq 0x3FB opt 0x62 flag 0x7 len 32
mtu 0 state EXSTART
23:48:19: OSPF: First DBD and we are not SLAVE
23:48:19: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL1 seq 0x1EA opt 0x62 flag 0x2
len 172 mtu 0 state EXSTART
23:48:19: OSPF: NBR Negotiation Done. We are the MASTER
23:48:19: OSPF: Send DBD to 1.1.1.1 on OSPF_VL1 seq 0x1EB opt 0x62 flag 0x3 len 112
23:48:19: OSPF: Send with youngest Key 1
23:48:19: OSPF: Send with youngest Key 1
23:48:19: OSPF: Database request to 1.1.1.1
23:48:19: OSPF: sent LS REQ packet to 5.0.0.1, length 48
23:48:19: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL1 seq 0x1EB opt 0x62 flag 0x0 len 32
mtu 0 state EXCHANGE
23:48:19: OSPF: Send DBD to 1.1.1.1 on OSPF_VL1 seq 0x1EC opt 0x62 flag 0x1 len 32
23:48:19: OSPF: Send with youngest Key 1
23:48:19: OSPF: Build router LSA for area 0, router ID 3.3.3.3, seq 0x80000030
23:48:19: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL1 seq 0x1EC opt 0x62 flag 0x0 len 32
mtu 0 state EXCHANGE
23:48:19: OSPF: Exchange Done with 1.1.1.1 on OSPF_VL1
23:48:19: OSPF: Synchronized with 1.1.1.1 on OSPF_VL1, state FULL
!--- This indicates the establishment of neighbor adjacency. 23:48:19: %OSPF-5-ADJCHG: Process
2, Nbr 1.1.1.1 on OSPF_VL1 from LOADING to FULL, Loading Done
```

相關資訊

- [OSPF支援頁](#)
- [OSPF 設計指南](#)
- [OSPF虛擬鏈路](#)
- [OSPF中身份驗證的示例配置](#)
- [OSPF需求電路功能](#)
- [技術支援與文件 - Cisco Systems](#)