

ASA 9.2.1版OSPF增強配置示例

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簡介

本文檔介紹自適應安全裝置(ASA)軟體版本9.2.1中引入的與開放最短路徑優先(OSPF)協定相關的新功能和命令。

必要條件

需求

本文件沒有特定需求。

採用元件

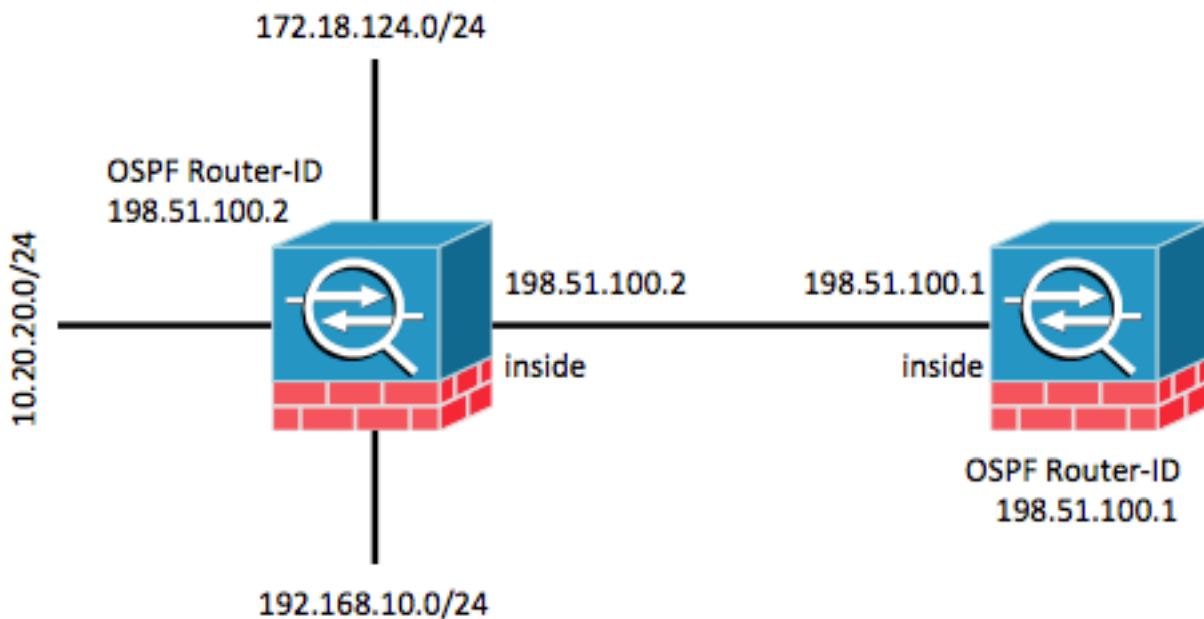
本文檔中的資訊基於運行Cisco ASA軟體版本9.2.(1)及更高版本的Cisco ASA 5500-X系列防火牆。

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。

設定

附註：使用[命令查詢工具](#)(僅供已註冊客戶使用)可獲取本節中使用的命令的更多資訊。

網路圖表



組態

適用於快速Hello的OSPF支援

OSPF hello資料包是OSPF進程傳送到其OSPF鄰居以保持與這些鄰居的連線的資料包。這些hello資料包以可配置的間隔（以秒為單位）傳送。乙太網鏈路的預設值為10秒，非廣播鏈路的預設值為30秒。Hello資料包包括死間隔內收到其呼叫資料包的所有鄰居的清單。dead間隔也是一個可配置的間隔（秒），預設為hello間隔值的四倍。網路中所有hello間隔的值必須相同。同樣，網路中所有死區間隔的值必須相同。

OSPF快速hello資料包是指以小於1秒的間隔傳送的hello資料包。要啟用OSPF快速呼叫資料包，請輸入`ospf dead-interval`命令。對於亞秒hello，dead間隔設定為1秒或**最小**，hello-multiplier值設定為您希望在此1秒中傳送的hello資料包數。例如，如果dead間隔設定為1秒，hello-multiplier設定為4，則hello間隔每0.25秒傳送一次。

在介面上配置快速hello資料包時，從該介面發出的hello資料包中通告的hello間隔設定為0。將忽略通過該介面接收的hello資料包中的hello間隔。必須注意的是，段中的**停頓間隔必須一致**。無論它設定為1秒（對於快速呼叫資料包）還是設定為任何其他值，它都必須在該網段中的鄰居之間保持一致。只要在dead間隔內至少傳送一個hello資料包，則整個網段的呼叫乘數不必相同。

要啟用具有4倍數的快速hello地址，請在相應的介面配置下輸入 `ospf dead-interval minimal hello-multiplier 4`命令。

```
interface GigabitEthernet0/0
nameif inside
security-level 100
```

```
ip address 198.51.100.1 255.255.255.0
ospf dead-interval minimal hello-multiplier 4
```

```
router ospf 1
network 198.51.100.0 255.255.255.0 area 0
```

使用**show ospf interface**命令進行驗證。

```
asa(config)# show ospf interface
```

```
inside is up, line protocol is up
Internet Address 198.51.100.1 mask 255.255.255.0, Area 0
Process ID 928, Router ID 198.51.100.1, Network Type BROADCAST, Cost: 10
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 198.51.100.1, Interface address 198.51.100.1
No backup designated router on this network
Timer intervals configured, Hello 250 msec, Dead 1, Wait 1, Retransmit 5
Hello due in 48 msec
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 0
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

用於鏈路狀態通告和SPF調節的新OSPF計時器命令

ASA 9.2.1及更高版本中引入了以下命令：**timers lsa arrival**、**timers pacing**、**timers throttle lsa**和**timers throttle spf**作為OSPF路由器配置的一部分。

```
asa(config-router)# timers ?
```

```
router mode commands/options:
lsa OSPF LSA timers
pacing OSPF pacing timers
throttle OSPF throttle timers
```

已刪除以下命令：**timers spf** 和**timers lsa-grouping-pacing**。

有關連結狀態通告(LSA)和最短路徑優先(SPF)限制優勢的更多資訊，請參閱以下檔案：

- [OSPF最短路徑優先限制](#)
- [OSPF連結狀態通告\(LSA\)](#)

使用ACL的OSPF路由過濾

現在支援使用存取控制清單(ACL)進行路由過濾。這是使用**distribute-list**命令過濾路由實現的。

例如，若要過濾出10.20.20.0/24的路由，配置如下所示：

```
access-list ospf standard deny host 10.20.20.0
access-list ospf standard permit any4
!
router ospf 1
network 198.51.100.0 255.255.255.0 area 0
log-adj-changes
```

distribute-list ospf in interface inside
檢查關聯的ACL時，表示其命中計數增加：

```
asa(config)# show access-list ospf
access-list ospf; 2 elements; name hash: 0xb5dd06eb
access-list ospf line 1 standard deny host 10.20.20.0 (hitcnt=1) 0xe29503b8
access-list ospf line 2 standard permit any4 (hitcnt=2) 0x51ff4e67
```

此外，還可以檢查ASA上的路由資訊庫(RIB)以進一步驗證功能。輸入show ospf rib detail命令以報告OSPF路由器進程的完整路由資訊資料庫。與每條路由關聯的「標誌」表示該路由是否已安裝在RIB中。

```
asa(config)# show ospf rib detail

          OSPF Router with ID (198.51.100.10) (Process ID 1)
OSPF local RIB
Codes: * - Best, > - Installed in global RIB

*> 172.18.124.0/32, Intra, cost 11, area 0
   SPF Instance 13, age 0:13:59
   Flags: RIB, HiPrio
     via 198.51.100.2, inside, flags: RIB
     LSA: 1/198.51.100.2/198.51.100.2
* 10.20.20.0/32, Intra, cost 11, area 0
   SPF Instance 13, age 0:13:59
   Flags: HiPrio
     via 198.51.100.2, inside, flags: none
     LSA: 1/198.51.100.2/198.51.100.2
*> 192.168.10.0/32, Intra, cost 11, area 0
   SPF Instance 13, age 0:13:59
   Flags: RIB, HiPrio
     via 198.51.100.2, inside, flags: RIB
     LSA: 1/198.51.100.2/198.51.100.2
* 198.51.100.0/24, Intra, cost 10, area 0
   SPF Instance 13, age 0:52:52
   Flags: Connected
     via 198.51.100.10, inside, flags: Connected
     LSA: 2/198.51.100.2/192.151.100.10
```

在上面的輸出中，安裝了標有「RIB」的路由器，但尚未安裝標有「none」的路由。這也應反映在全域性路由表中。使用show route命令檢查。

```
asa(config)# show route

Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, + - replicated route

Gateway of last resort is 10.106.44.1 to network 0.0.0.0

S* 0.0.0.0 0.0.0.0 [1/0] via 10.106.44.1, tftp
O 172.18.124.0 255.255.255.0 [110/11] via 198.51.100.2, 00:00:03, inside
O 192.168.10.0 255.255.255.0 [110/11] via 198.51.100.2, 00:00:03, inside
O 10.20.20.0 255.255.255.0 [110/11] via 198.51.100.2, 00:00:03, inside
S 10.76.76.160 255.255.255.255 [1/0] via 10.106.44.1, tftp
C 10.86.195.0 255.255.255.0 is directly connected, management
```

L 10.86.195.1 255.255.255.255 is directly connected, management

OSPF監控增強功能

引入了以下命令以幫助監控和觀察OSPF路由器進程。這些命令的輸出示例供參考。

show ospf interface brief

輸入show ospf interface brief命令以獲取此ASA上存在的鄰接關係的快速快照。

```
asa(config)# show ospf interface brief
```

```
Interface PID Area IP Address/Mask Cost State Nbrs F/C
inside 1 0 198.51.100.2/255.255.255.0 10 DR 1/1
```

show ospf statistics [Detail]

show ospf statistics detail命令簡短描述了SPF上次運行的時間以及運行次數。它還表示有多少新LSA新增到資料庫。

```
asa(config)# show ospf statistics detail
```

```
OSPF Router with ID (198.51.100.10) (Process ID 1)
```

```
Area 0: SPF algorithm executed 12 times
```

```
SPF 3 executed 00:32:56 ago, SPF type Full
```

```
SPF calculation time (in msec):
```

SPT	Intra	D-Intr	Summ	D-Summ	Ext7	D-Ext7	Total
0	0	0	0	0	0	0	00

```
LSIDs processed R:2 N:1 Stub:1 SN:0 SA:0 X7:0
```

```
Change record 0x0
```

```
LSIDs changed 1
```

```
Changed LSAs. Recorded is LS ID and LS type:
```

```
198.51.100.2(R)
```

```
SPF 4 executed 00:28:16 ago, SPF type Full
```

```
SPF calculation time (in msec):
```

SPT	Intra	D-Intr	Summ	D-Summ	Ext7	D-Ext7	Total
0	0	0	0	0	0	0	00

```
LSIDs processed R:1 N:1 Stub:0 SN:0 SA:0 X7:0
```

```
Change record 0x0
```

```
LSIDs changed 2
```

```
Changed LSAs. Recorded is LS ID and LS type:
```

```
198.51.100.2(R) 198.51.100.10(R)
```

```
SPF 5 executed 00:28:06 ago, SPF type Full
```

```
SPF calculation time (in msec):
```

SPT	Intra	D-Intr	Summ	D-Summ	Ext7	D-Ext7	Total
0	0	0	0	0	0	0	00

```
LSIDs processed R:2 N:1 Stub:1 SN:0 SA:0 X7:0
```

```
Change record 0x0
```

```
LSIDs changed 1
```

```
Changed LSAs. Recorded is LS ID and LS type:
```

```
198.51.100.2(R)
```

```
SPF 6 executed 00:26:40 ago, SPF type Full
```

```
SPF calculation time (in msec):
```

```
SPT      Intra  D-Intr Summ   D-Summ Ext7   D-Ext7 Total
        0      0      0      0      0      0      00
LSIDs processed R:1 N:1 Stub:0 SN:0 SA:0 X7:0
Change record 0x0
LSIDs changed 2
Changed LSAs. Recorded is LS ID and LS type:
198.51.100.2(R) 198.51.100.10(R)
```

show ospf events neighbor

這是用於檢查OSPF鄰居狀態的有用命令，特別是在OSPF抖動的情況下。它為每個鄰居提供事件和狀態轉換的清單以及這些事件的時間戳。在本例中，鄰居10.10.40.1通過狀態從DOWN轉換為FULL。

```
asa(config)# show ospf events neighbor
```

```
OSPF Router with ID (198.51.100.10) (Process ID 1)

279 May 15 13:07:31.737: Neighbor 198.51.100.2, Interface inside state changes from
LOADING to FULL
280 May 15 13:07:31.737: Neighbor 198.51.100.2, Interface inside state changes from
EXCHANGE to LOADING
281 May 15 13:07:31.737: Neighbor 198.51.100.2, Interface inside state changes from
EXSTART to EXCHANGE
290 May 15 13:07:31.737: Neighbor 198.51.100.2, Interface inside state changes from
2WAY to EXSTART
296 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from
INIT to 2WAY
297 May 15 13:07:31.728: Neighbor 198.51.100.2, Interface inside state changes from
DOWN to INIT
```

show ospf events lsa

此命令對於檢查已生成和接收哪些所有LSA非常有用。這些指令在連結擺動和LSA泛洪的情況下非常有用。

```
asa(config)# show ospf events lsa
```

```
OSPF Router with ID (198.51.100.10) (Process ID 1)

253 May 15 13:07:49.167: Rcv Changed Type-1 LSA, LSID 198.51.100.2,
Adv-Rtr 198.51.100.2, Seq# 80000002, Age 1, Area 0
271 May 15 13:07:32.237: Generate New Type-2 LSA, LSID 198.51.100.1,
Seq# 80000001, Age 0, Area 0
275 May 15 13:07:32.238: Generate Changed Type-1 LSA, LSID 198.51.100.10,
Seq# 80000002, Age 0, Area 0
276 May 15 13:07:32.228: Rcv New Type-1 LSA, LSID 198.51.100.2,
Adv-Rtr 198.51.100.2, Seq# 80000001, Age 1, Area 0
```

show ospf events neighbor rib

此命令提供有關在RIB中新增的路由以及安裝的路由型別（內部/外部）的資訊。

```
asa(config)# show ospf events neighbor rib
```

```
255 May 15 13:07:54.168: RIB Update, dest 172.18.124.0, mask 255.255.255.255,
gw 198.51.100.2, via inside, source 198.51.100.2, type Intra
287 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from
```

LOADING to FULL

288 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from EXCHANGE to LOADING

289 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from EXSTART to EXCHANGE

298 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from 2WAY to EXSTART

304 May 15 13:07:31.738: Neighbor 198.51.100.2, Interface inside state changes from INIT to 2WAY

305 May 15 13:07:31.728: Neighbor 198.51.100.2, Interface inside state changes from DOWN to INIT

show ospf events spf

運行SPF計算時，生成的運行時間和LSA機會將記錄在SPF事件清單中。

```
asa(config)# show ospf events spf
235 May 15 13:07:54.167: End of SPF, SPF time 0ms, next wait-interval 10000ms
240 May 15 13:07:54.167: Starting External processing in area 0
241 May 15 13:07:54.167: Starting External processing
244 May 15 13:07:54.167: Starting summary processing, Area 0
250 May 15 13:07:54.167: Starting Intra-Area SPF, Area 0, spf_type Full
251 May 15 13:07:54.167: Starting SPF, wait-interval 5000ms
254 May 15 13:07:49.167: Schedule SPF, Area 0, spf-type Full, Change in LSA
Type RLSID 198.51.100.2, Adv-Rtr 198.51.100.2
255 May 15 13:07:37.227: End of SPF, SPF time 0ms, next wait-interval 10000ms
260 May 15 13:07:37.228: Starting External processing in area 0
261 May 15 13:07:37.228: Starting External processing
264 May 15 13:07:37.228: Starting summary processing, Area 0
268 May 15 13:07:37.228: Starting Intra-Area SPF, Area 0, spf_type Full
269 May 15 13:07:37.228: Starting SPF, wait-interval 5000ms
272 May 15 13:07:32.238: Schedule SPF, Area 0, spf-type Full, Change in LSA
Type NLSID 198.51.100.1, Adv-Rtr 198.51.100.10
274 May 15 13:07:32.238: Schedule SPF, Area 0, spf-type Full, Change in LSA
Type RLSID 198.51.100.10, Adv-Rtr 198.51.100.10
277 May 15 13:07:32.228: Schedule SPF, Area 0, spf-type Full, Change in LSA
Type RLSID 198.51.100.2, Adv-Rtr 198.51.100.2
```

show ospf events generic

此輸出包含泛型進程範圍的事件，例如指定路由器(DR)選擇和鄰接關係更改。

```
asa(config)# show ospf events generic
236 May 15 13:07:54.167: Generic: ospf_external_route_sync0x0
237 May 15 13:07:54.167: Generic: ospf_external_route_sync0x0
238 May 15 13:07:54.167: Generic: ospf_external_route_sync0x0
239 May 15 13:07:54.168: Generic: ospf_external_route_sync0x0
242 May 15 13:07:54.168: Generic: ospf_inter_route_sync0x0
243 May 15 13:07:54.168: Generic: ospf_inter_route_sync0x0
245 May 15 13:07:54.168: Generic: post_spf_intra0x0
246 May 15 13:07:54.168: Generic: ospf_intra_route_sync0x0
248 May 15 13:07:54.168: Generic: ospf_intra_route_sync0x0
249 May 15 13:07:54.168: DB add: 172.18.124.00x987668 204
252 May 15 13:07:51.668: Timer Exp: if_ack_delayed0xcb97dfe0
256 May 15 13:07:37.228: Generic: ospf_external_route_sync0x0
257 May 15 13:07:37.228: Generic: ospf_external_route_sync0x0
258 May 15 13:07:37.228: Generic: ospf_external_route_sync0x0
259 May 15 13:07:37.228: Generic: ospf_external_route_sync0x0
262 May 15 13:07:37.228: Generic: ospf_inter_route_sync0x0
```

```

263 May 15 13:07:37.228: Generic:  ospf_inter_route_sync0x0
265 May 15 13:07:37.228: Generic:  post_spf_intra0x0
266 May 15 13:07:37.228: Generic:  ospf_intra_route_sync0x0
267 May 15 13:07:37.228: Generic:  ospf_intra_route_sync0x0
270 May 15 13:07:34.728: Timer Exp:  if_ack_delayed0xcb97dfe0
273 May 15 13:07:32.238: DB add:   198.51.100.100x987848 206
278 May 15 13:07:32.228: DB add:   198.51.100.20x987938 205
283 May 15 13:07:31.738: Elect DR:  inside198.51.100.10
284 May 15 13:07:31.738: Elect BDR: inside198.51.100.2
285 May 15 13:07:31.736: i/f state nbr chg:  inside0x5
287 May 15 13:07:31.736: Elect DR:  inside198.51.100.10
288 May 15 13:07:31.736: Elect BDR: inside198.51.100.2
289 May 15 13:07:31.736: i/f state nbr chg:  inside0x5
291 May 15 13:07:31.736: nbr state adjok: 198.51.100.20x3
293 May 15 13:07:31.736: Elect DR:  inside198.51.100.10
294 May 15 13:07:31.736: Elect BDR: inside198.51.100.2
295 May 15 13:07:31.736: i/f state nbr chg:  inside0x5

```

show ospf rib detail

前面提到的這個命令允許管理員檢視從對等體獲知的路由，以及這些路由是否已安裝在RIB中。由於路由過濾（之前列出），可能未在RIB中安裝路由。

```
asa(config)# show ospf rib detail
```

```

                OSPF Router with ID (198.51.100.1) (Process ID 1)
OSPF local RIB
Codes: * - Best, > - Installed in global RIB

*> 172.18.124.0/32, Intra, cost 11, area 0
    SPF Instance 13, age 0:13:59
    Flags: RIB, HiPrio
         via 198.51.100.2, inside, flags: RIB
           LSA: 1/198.51.100.2/198.51.100.2
* 10.20.20.0/32, Intra, cost 11, area 0
    SPF Instance 13, age 0:13:59
    Flags: HiPrio
         via 198.51.100.2, inside, flags: none
           LSA: 1/198.51.100.2/198.51.100.2
*> 192.168.10.0/32, Intra, cost 11, area 0
    SPF Instance 13, age 0:13:59
    Flags: RIB, HiPrio
         via 198.51.100.2, inside, flags: RIB
           LSA: 1/198.51.100.2/198.51.100.2
* 198.51.100.0/24, Intra, cost 10, area 0
    SPF Instance 13, age 0:52:52
    Flags: Connected
         via 198.51.100.10, inside, flags: Connected
           LSA: 2/198.51.100.2/192.151.100.10

```

show ospf neighbor detail

show ospf neighbor detail命令可讓您詳述OSPF鄰接關係的狀態。

```
asa(config)# show ospf neighbor detail
```

```

Neighbor 198.51.100.2, interface address 198.51.100.2
In the area 0 via interface ISP
Neighbor priority is 1, State is FULL, 6 state changes
DR is 198.51.100.10 BDR is 198.51.100.2
Options is 0x12 in Hello (E-bit, L-bit)

```



```
Options is 0x52 in DBD (E-bit, L-bit, O-bit)
Dead timer due in 0:00:16
Neighbor is up for 00:02:45
Index 1/1, 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
```

OSPF重新分發BGP

為了支援邊界網關協定(BGP)重分發到其他路由協定中和從其他路由協定重分發，已在OSPF路由器配置中引入**redistribute bgp**命令。輸入以下命令可將通過BGP獲知的路由重新分發到正在運行的OSPF進程中。

```
asa(config)# router ospf 1
asa(config-router)# redistribute bgp ?
router mode commands/options:
100 Autonomous system number
ASA-1(config-router)# redistribute bgp 100
```

驗證

目前沒有適用於此組態的驗證程序。

疑難排解

目前尚無適用於此組態的具體疑難排解資訊。