FabricPath环境的控制平面故障排除

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简介

本文档介绍排除FabricPath故障的基本步骤。

先决条件

要求

Cisco NXOS®建议您了解以下主题：

- 交换矩阵路径
- 中间系统到中间系统(IS-IS)
- 生成树协议 (STP)
- 嵌入式逻辑分析器模块(ELAM)

使用的组件

本文档仅限于Nexus 7000等特定硬件。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

FabricPath是一项思科技术，旨在增强以太网网络功能，特别是在大规模数据中心环境中。

以下是Cisco Nexus 7000系列上FabricPath的主要功能和优势：

1. 可扩展性：FabricPath旨在支持大量虚拟端口通道(vPC)，并提供可处理大量主机的高度可扩展的第2层网络，而不受通常与生成树协议(STP)相关的限制。

2. 无环路拓扑：FabricPath消除了FabricPath网络域中的STP需求。这通过使用类似于路由的技术来转发以太网帧(称为多链路透明互联(TRILL))来实现，该技术可防止环路并允许所有路径处于活动状态。

3. 高可用性：使用FabricPath，可以更高效地处理网络拓扑更改，从而缩短融合时间。这增强了整体网络稳定性，并提供了更好的网络可用性。

4. 易于使用：该技术可实现灵活且可扩展的第2层架构，从而简化网络设计。这使网络更易于管理并降低运营复杂性。

5. 等价多路径(ECMP)：FabricPath支持ECMP，可在网络中的任意两点之间使用多个并行路径。这可通过在所有可用路径之间均衡流量来优化带宽利用率。

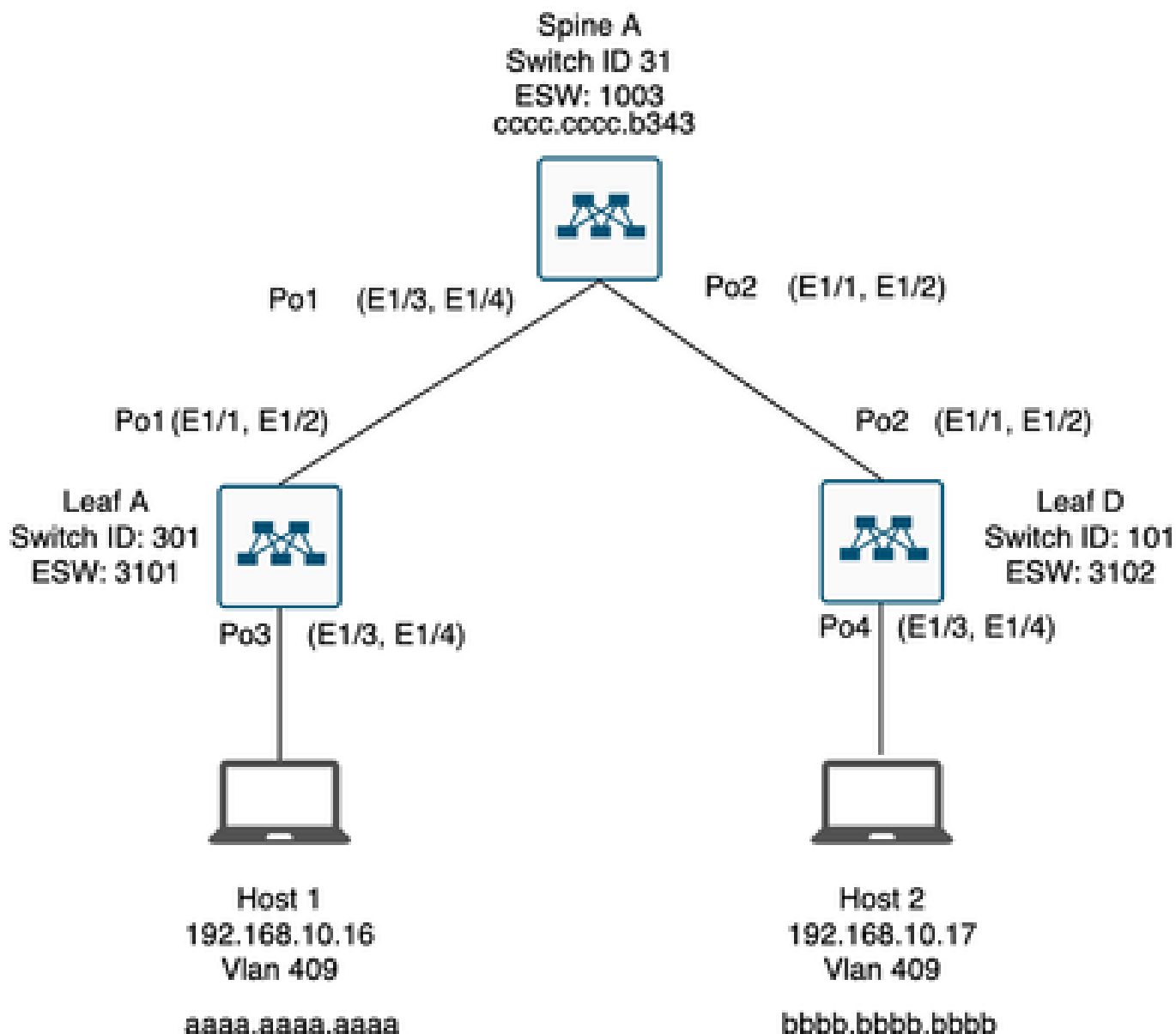6. 虚拟化支持：FabricPath为虚拟化数据中心和私有云部署提供理想的基础设施。它能够处理大量虚拟环境，因此非常适合这些类型的应用。

另外需要注意的是，虽然FabricPath提供了许多好处，但最适合其特定优势与网络设计目标一致的环境（例如需要大型、动态且可扩展的第2层域的数据中心）。

拓扑

为简单起见，此拓扑中只显示一个主干和两个枝叶。

模拟交换机ID枝叶A：3101

模拟交换机ID枝叶 D：3102

Spine A
Switch ID 31
ESW: 1003
cccc.cccc.b343

Po1　(E1/3, E1/4)　　　　Po2　(E1/1, E1/2)

Po1 (E1/1, E1/2)　　　　　　　　　Po2　(E1/1, E1/2)

Leaf A
Switch ID: 301
ESW: 3101

Leaf D
Switch ID: 101
ESW: 3102

Po3　(E1/3, E1/4)　　　　Po4　(E1/3, E1/4)

Host 1
192.168.10.16
Vlan 409

aaaa.aaaa.aaaa

Host 2
192.168.10.17
Vlan 409

bbbb.bbbb.bbbb

故障排除

Host 1无法与Host 2通信。

<#root>

Leaf_A#

ping 192.168.10.17

PING 192.168.10.17 (192.168.10.17): 56 data bytes
ping: sendto 192.168.10.17 64 chars, No route to host
Request 0 timed out
ping: sendto 192.168.10.17 64 chars, No route to host
^C
--- 192.168.10.17 ping statistics ---
2 packets transmitted, 0 packets received, 100.00% packet loss
Leaf_A#

1)验证两台主机的MAC地址表是否已正确填充。

<#root>

Leaf_A#

show mac address-table vlan 409

Note: MAC table entries displayed are getting read from software.
Use the 'hardware-age' keyword to get information related to 'Age'

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link,
(T) - True, (F) - False , ~~~ - use 'hardware-age' keyword to retrieve age info
VLAN MAC Address Type age Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 409 aaaa.aaaa.aaaa dynamic ~~~ F F Po3
                                                        <------ Leaf A is not learning the mac address of Host

Leaf_A#

<#root>

Leaf_D#

show mac address-table vlan 409

Note: MAC table entries displayed are getting read from software.
Use the 'hardware-age' keyword to get information related to 'Age'

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link,
(T) - True, (F) - False , ~~~ - use 'hardware-age' keyword to retrieve age info
VLAN MAC Address Type age Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 409 bbbb.bbbb.bbbb dynamic ~~~ F F Po4
409 aaaa.aaaa.aaaa dynamic ~~~ F F 3101.1.65535   <------ Leaf D is correctly learning both Mac Address

```
Leaf_D#
```

2)检验路径中涉及的每个接口和vlan的配置。必须启用FabricPath。

<#root>

```
Leaf_A#
```

show run fabricpath

```
!Command: show running-config fabricpath
!Time: Mon Apr 22 23:12:40 2024

version 6.2(12)
install feature-set fabricpath
feature-set fabricpath

vlan 409
mode fabricpath
fabricpath domain default

fabricpath switch-id 301

vpc domain 301
fabricpath switch-id 3101

interface port-channel1
switchport mode fabricpath

interface port-channel2
switchport mode fabricpath

interface Ethernet1/1
switchport mode fabricpath

interface Ethernet1/2
switchport mode fabricpath

Leaf_A#
```

<#root>

```
Leaf_D#
```

show run fabricpath

```
!Command: show running-config fabricpath
!Time: Mon Apr 22 23:12:40 2024

version 6.2(12)
install feature-set fabricpath
feature-set fabricpath
```

<--------- FabricPath is not enabled for VLAN 409

fabricpath switch-id 101

vpc domain 302
fabricpath switch-id 3102

interface port-channel1
switchport mode fabricpath

interface port-channel2
switchport mode fabricpath

interface Ethernet1/1
switchport mode fabricpath

interface Ethernet1/2
switchport mode fabricpath

Leaf_D#
Leaf_D#

<#root>

Spine_A#

show run fabricpath

!Command: show running-config fabricpath
!Time: Mon Apr 22 23:12:40 2024

version 6.2(12)
install feature-set fabricpath
feature-set fabricpath

vlan 409
mode fabricpath
fabricpath domain default

fabricpath switch-id 31

vpc domain 101
fabricpath switch-id 1003

interface port-channel1
switchport mode fabricpath

interface port-channel2
switchport mode fabricpath

interface Ethernet1/1
switchport mode fabricpath

interface Ethernet1/2
switchport mode fabricpath

```
interface Ethernet1/3
switchport mode fabricpath

interface Ethernet1/4
switchport mode fabricpath

Spine_A#
```

3)验证参与FabricPath的每个设备的交换机ID。

<#root>

Leaf_A#

show fabricpath switch-id local

```
Switch-Id: 301
System-Id: aaaa.aaaa.b341
Leaf_A#
```

<#root>

Leaf_D#

show fabricpath switch-id local

```
Switch-Id: 101
System-Id: bbbb.bbbb.b342
Leaf_D#
```

<#root>

Spine_A#

show fabricpath switch-id local

```
Switch-Id: 31
System-Id: cccc.cccc.b343
Spine_A#
```

4)检验是否为每台设备的交换机ID配置了正确的路由。

<#root>

Leaf_A#

show fabricpath route switchid 101

```
FabricPath Unicast Route Table
'a/b/c' denotes ftag/switch-id/subswitch-id
'[x/y]' denotes [admin distance/metric]
ftag 0 is local ftag
subswitch-id 0 is default subswitch-id


FabricPath Unicast Route Table for Topology-Default

1/101/0, number of next-hops: 1
via Po1, [115/5], 1 day/s 12:21:29, isis_fabricpath-default
```

<------ The route from Leaf A to Leaf D is correctly configured.

Leaf_A

<#root>

Leaf_D#

show fabricpath route switchid 301

```
FabricPath Unicast Route Table
'a/b/c' denotes ftag/switch-id/subswitch-id
'[x/y]' denotes [admin distance/metric]
ftag 0 is local ftag
subswitch-id 0 is default subswitch-id


FabricPath Unicast Route Table for Topology-Default

1/301/0, number of next-hops: 1
via Po2, [115/5], 1 day/s 12:21:29, isis_fabricpath-default
```

 <------ The route from Leaf D to Leaf A is correctly configured.

Leaf_D

<#root>

Spine_A#

show fabricpath route switchid 301

```
FabricPath Unicast Route Table
'a/b/c' denotes ftag/switch-id/subswitch-id
'[x/y]' denotes [admin distance/metric]
ftag 0 is local ftag
subswitch-id 0 is default subswitch-id


FabricPath Unicast Route Table for Topology-Default

1/301/0, number of next-hops: 1
via Po1, [115/20], 1 day/s 06:13:21, isis_fabricpath-default
```

<------ The route from Spine A to Leaf A is correctly configured.

Spine_A#

Spine_A#

show fabricpath route switchid 101

FabricPath Unicast Route Table
'a/b/c' denotes ftag/switch-id/subswitch-id
'[x/y]' denotes [admin distance/metric]
ftag 0 is local ftag
subswitch-id 0 is default subswitch-id

FabricPath Unicast Route Table for Topology-Default

1/101/0, number of next-hops: 1
via Po2, [115/20], 1 day/s 06:13:21, isis_fabricpath-default

<------ The route from Spine A to Leaf D is correctly configured.

Spine_A#

5)验证枝叶和主干之间的IS-IS邻接关系。

<#root>

Leaf_A#

show fabricpath isis adjacency

Fabricpath IS-IS domain: default Fabricpath IS-IS adjacency database:
System ID SNPA Level State Hold Time Interface
cccc.cccc.b343 N/A 1 UP 00:00:27 port-channel1

Leaf_A#

<#root>

Leaf_D#

show fabricpath isis adjacency

Fabricpath IS-IS domain: default Fabricpath IS-IS adjacency database:
System ID SNPA Level State Hold Time Interface
cccc.cccc.b343 N/A 1 UP 00:00:27 port-channel2

Leaf_D#

6)验证当前部署中不存在冲突。

<#root>

Leaf_A#

show fabricpath conflict all

No Fabricpath ports in a state of resource conflict.

No Switch id Conflicts

No transitions in progress

Leaf_A#

<#root>

Leaf_D#

show fabricpath conflict all

No Fabricpath ports in a state of resource conflict.

No Switch id Conflicts

No transitions in progress

Leaf_D#

<#root>

Spine_A#

show fabricpath conflict all

No Fabricpath ports in a state of resource conflict.

No Switch id Conflicts

No transitions in progress

Spine_A#

7)验证是否已将VLAN添加到IS-IS VLAN范围。

<#root>

```
Leaf_A#
```

show fabricpath isis vlan-range

```
Fabricpath IS-IS domain: default
MT-0
Vlans configured:1,409
Leaf_A#
```

<#root>

```
Leaf_D#
```

show fabricpath isis vlan-range

```
Fabricpath IS-IS domain: default
MT-0
Vlans configured:1              <------ VLAN 409 is not present
Leaf_D
```

<#root>

```
Spine_A#
```

show fabricpath isis vlan-range

```
Fabricpath IS-IS domain: default
MT-0
Vlans configured:1, 409
Spine_A#
```

8)验证主干A中是否触发了ELAM。

<#root>

```
module-1# show hardware internal dev-port-map       <------ Determine the
```

F4

```
 ASIC that is used for the FE on port
```

Eth1/2

```
. Enter this command in order to verify this.
----------------------------------------------------------------
CARD_TYPE: 48 port 10G
>Front Panel ports:48
----------------------------------------------------------------
Device name Dev role Abbr num_inst:
----------------------------------------------------------------
> Flanker Eth Mac Driver DEV_ETHERNET_MAC MAC_0 6
> Flanker Fwd Driver DEV_LAYER_2_LOOKUP L2LKP 6
> Flanker Xbar Driver DEV_XBAR_INTF XBAR_INTF 6
```

```
> Flanker Queue Driver DEV_QUEUEING QUEUE 6
> Sacramento Xbar ASIC DEV_SWITCH_FABRIC SWICHF 2
> Flanker L3 Driver DEV_LAYER_3_LOOKUP L3LKP 6
> EDC DEV_PHY PHYS 7
+------------------------------------------------------------------------+
+----------------+++FRONT PANEL PORT TO ASIC INSTANCE MAP+++------------+
+------------------------------------------------------------------------+
FP port | PHYS | MAC_0 |
```

L2LKP

```
 | L3LKP | QUEUE |SWICHF
    1       0      0       0       0       0      0,1

    2       0      0       0       0       0      0,1


...
module-1#
module-1#
module-1# elam asic flanker instance 0
module-1(fln-elam)#
module-1(fln-elam)# elam asic flanker instance 0
module-1(fln-elam)# layer3
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# trigger dbus ipv4 ingress if source-ipv4-address 192.168.10.17
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# trigger rbus ingress if trig
module-1(fln-l2-elam)# start
module-1(fln-l2-elam)#
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# status
ELAM Slot 1 instance 0: L2 DBUS Configuration: trigger dbus ipv4 ingress if source-ipv4-address 192.168
L2 DBUS: Armed
ELAM Slot 1 instance 0: L2 RBUS Configuration: trigger rbus ingress if trig
L2 RBUS: Armed
module-1(fln-l2-elam)# status
ELAM Slot 1 instance 0: L2 DBUS Configuration: trigger dbus ipv4 ingress if source-ipv4-address 192.168
L2 DBUS: Armed
ELAM Slot 1 instance 0: L2 RBUS Configuration: trigger rbus ingress if trig
L2 RBUS: Armed
module-1(fln-l2-elam)#
```

9)将VLAN 409添加到FabricPath。

```
Leaf_D(config)# vlan 409
Leaf_D(config-vlan)# mode fabricpath
Leaf_D(config-vlan)# show run vlan

!Command: show running-config vlan
!Time: Wed Apr 24 20:27:29 2024

version 6.2(12)
vlan 1,409
vlan 409
mode fabricpath


Leaf_D(config-vlan)#
```

验证

1)检验mac地址表。

<#root>

Leaf_A#

show mac address-table vlan 409

Note: MAC table entries displayed are getting read from software.
Use the 'hardware-age' keyword to get information related to 'Age'

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link,
(T) - True, (F) - False , ~~~ - use 'hardware-age' keyword to retrieve age info
VLAN MAC Address Type age Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+-------+---------+------+----+-----------------
* 409 aaaa.aaaa.aaaa dynamic ~~~ F F Po3
409 bbbb.bbbb.bbbb dynamic ~~~ F F 3102.1.65535

Leaf_A#

<#root>

Leaf_D#

show mac address-table vlan 409

Note: MAC table entries displayed are getting read from software.
Use the 'hardware-age' keyword to get information related to 'Age'

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link,
(T) - True, (F) - False , ~~~ - use 'hardware-age' keyword to retrieve age info
VLAN MAC Address Type age Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+-------+---------+------+----+-----------------
* 409 bbbb.bbbb.bbbb dynamic ~~~ F F Po4
409 aaaa.aaaa.aaaa dynamic ~~~ F F 3101.1.65535

Leaf_D#

2) 验证主干A中是否触发了ELAM。

<#root>

module-1# elam asic flanker instance 0
module-1(fln-elam)#

```
module-1(fln-elam)# elam asic flanker instance 0
module-1(fln-elam)# layer2
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# trigger dbus ipv4 ingress if source-ipv4-address 192.168.10.17
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# trigger rbus ingress if trig
module-1(fln-l2-elam)# start
module-1(fln-l2-elam)#
module-1(fln-l2-elam)# status
ELAM Slot 1 instance 0: L2 DBUS Configuration: trigger dbus ipv4 ingress if source-ipv4-address 192.168
L2 DBUS: Armed
ELAM Slot 1 instance 0: L2 RBUS Configuration: trigger rbus ingress if trig
L2 RBUS: Armed
module-1(fln-l2-elam)# status
ELAM Slot 1 instance 0: L2 DBUS Configuration: trigger dbus ipv4 ingress if source-ipv4-address 192.168
```

L2 DBUS: Triggered   <-------- ELAM triggered

```
ELAM Slot 1 instance 0: L2 RBUS Configuration: trigger rbus ingress if trig
```

L2 RBUS: Triggered   <-------- ELAM triggered

```
module-1(fln-l2-elam)#
```

3)验证从枝叶A到主机A的连接。

<#root>

Leaf_A#

ping 192.168.10.17

```
PING 192.168.10.17 (192.168.10.17): 56 data bytes
64 bytes from 192.168.10.17: icmp_seq=0 ttl=254 time=1.703 ms
64 bytes from 192.168.10.17: icmp_seq=1 ttl=254 time=1.235 ms
64 bytes from 192.168.10.17: icmp_seq=2 ttl=254 time=1.197 ms
64 bytes from 192.168.10.17: icmp_seq=3 ttl=254 time=3.442 ms
64 bytes from 192.168.10.17: icmp_seq=4 ttl=254 time=1.331 ms

--- 192.168.10.17 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 1.197/1.781/3.442 ms
Leaf_A#
```

相关信息

思科FabricPath

Cisco Nexus 7000系列NX-OS FabricPath命令参考

Nexus 7000 M3模块ELAM流程