Nexus 5000系列交换机上的生成树协议故障排除

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简介

本文档介绍各种方法来排除与生成树协议(STP)相关的常见问题。

先决条件

要求

Cisco 建议您了解以下主题：

- Nexus操作系统CLI
- STP

使用的组件

本文档不限于特定的软件和硬件版本。

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。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

故障排除

本节介绍一些排除STP常见问题的方法。

STP根

要排除STP问题，必须知道哪台交换机当前是根交换机。显示Nexus 5000系列交换机上STP根的命令是：

```
Nexus-5000# show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol rstp
Root ID Priority 32769
Address c84c.75fa.6000
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address c84c.75fa.6000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

以下是一些其他相关命令：

```
Nexus-5000# show spanning-tree vlan 1 detail
Nexus-5000# show spanning-tree vlan 1 summary
```

确定当前根用户后，可以检查事件历史记录，查看其是否已更改以及拓扑更改通知的来源。

```
Nexus-5000# show spanning-tree internal event-history tree 1 brief
2012:11:06 13h:44m:20s:528204us T_EV_UP
VLAN0001 [0000.0000.0000.0000 C 0 A 0 R none P none]
2012:11:06 13h:44m:21s:510394us T_UT_SBPDU
VLAN0001 [8001.547f.ee18.e441 C 0 A 0 R none P Po1]
2012:11:06 13h:44m:21s:515129us T_EV_M_FLUSH_L
VLAN0001 [1001.001b.54c2.5a42 C 6 A 5 R Po1 P none]
2012:11:06 13h:44m:23s:544632us T_EV_M_FLUSH_R
VLAN0001 [1001.001b.54c2.5a42 C 6 A 5 R Po1 P Po1]
2012:11:06 13h:44m:24s:510352us T_EV_M_FLUSH_R
VLAN0001 [1001.001b.54c2.5a42 C 6 A 5 R Po1 P Po1]
```

> **提示：**以下是命令输出中显示的缩写词的一些定义。 **SBPDU:**收到上级网桥协议数据单元； **FLUSH_L:**本地刷新； **FLUSH_R:**从远程交换机刷新。

> **注意：**版本5.1(3)N1(1)之前的NX-OS版本不记录超过149个事件，并且日志不会滚动。

STP接口

此命令用于显示接口的事件。

```
Nexus-5000# show spanning-tree internal event-history tree 1 interface
ethernet 1/3 brief
2012:11:05 13h:42m:20s:508027us P_EV_UP Eth1/3 [S DIS R Unkw A 0 Inc no]
2012:11:05 13h:42m:20s:508077us P_STATE Eth1/3 [S BLK R Desg A 0 Inc no]
```

```
2012:11:05 13h:42m:20s:508294us P_STATE Eth1/3 [S LRN R Desg A 0 Inc no]
2012:11:05 13h:42m:20s:508326us P_STATE Eth1/3 [S FWD R Desg A 0 Inc no]
```

此命令用于检查接口上的STP更改。此输出提供了许多详细信息：

```
Nexus-5000# show spanning-tree internal info tree 1 interface port-channel 11
------- STP Port Info (vdc 1, tree 1, port Po11) ---------
dot1d info: port_num=4106, ifi=0x1600000a (port-channel11)
ISSU FALSE non-disr, prop 0, ag 0, flush 0 peer_not_disputed_count 0
if_index               0x1600000a
namestring port-channel11
..................... cut to save space .............

stats
fwd_transition_count   1       bpdus_in      40861   bpdus_out    40861
config_bpdu_in         0       rstp_bpdu_in  40861   tcn_bpdu_in  0
config_bpdu_out        0       rstp_bpdu_out 40861   tcn_bpdu_out 0
bpdufilter_drop_in     0
bpduguard_drop_in      0
err_dropped_in         0
sw_flood_in            0
..................... cut to save space .............
```

使用Ethanalyzer进行BPDU调查

本节介绍如何使用Ethanalyzer捕获BPDU:

```
Ethanalyzer local interface inbound-hi display-filter "vlan.id == 1 && stp"

Example:
Nexus-5000# ethanalyzer local interface inbound-hi display-filter "vlan.id
== 1 && stp"
Capturing on eth4
2013-05-11 13:55:39.280951 00:05:73:f5:d6:27 -> 01:00:0c:cc:cc:cd STP RST.
Root = 33768/00:05:73:ce:a9:7c  Cost = 1  Port = 0x900a
2013-05-11 13:55:40.372434 00:05:73:ce:a9:46 -> 01:00:0c:cc:cc:cd STP RST.
Root = 33768/00:05:73:ce:a9:7c  Cost = 0  Port = 0x900a
2013-05-11 13:55:41.359803 00:05:73:f5:d6:27 -> 01:00:0c:cc:cc:cd STP RST.
Root = 33768/00:05:73:ce:a9:7c  Cost = 1  Port = 0x900a
2013-05-11 13:55:42.372405 00:05:73:ce:a9:46 -> 01:00:0c:cc:cc:cd STP RST.
Root = 33768/00:05:73:ce:a9:7c  Cost = 0  Port = 0x900a
```

要查看详细数据包，请使用detail命令：

```
Nexus-5000# ethanalyzer local interface inbound-hi detail display-filter
"vlan.id == 1 && stp"
Capturing on eth4
Frame 7 (68 bytes on wire, 68 bytes captured)
   Arrival Time: May 11, 2013 13:57:02.382227000
   [Time delta from previous captured frame: 0.000084000 seconds]
   [Time delta from previous displayed frame: 1368280622.382227000 seconds]
   [Time since reference or first frame: 1368280622.382227000 seconds]
   Frame Number: 7
   Frame Length: 68 bytes
   Capture Length: 68 bytes
   [Frame is marked: False]
   [Protocols in frame: eth:vlan:llc:stp]
Ethernet II, Src: 00:05:73:ce:a9:46 (00:05:73:ce:a9:46), Dst: 01:00:0c:cc:cc:cd
(01:00:0c:cc:cc:cd)
```

```
   Destination: 01:00:0c:cc:cc:cd (01:00:0c:cc:cc:cd)
       Address: 01:00:0c:cc:cc:cd (01:00:0c:cc:cc:cd)
       .... ...1 .... .... .... .... = IG bit: Group address (multicast/broadcast)
       .... ..0. .... .... .... .... = LG bit: Globally unique address
(factory default)
   Source: 00:05:73:ce:a9:46 (00:05:73:ce:a9:46)
       Address: 00:05:73:ce:a9:46 (00:05:73:ce:a9:46)
       .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
       .... ..0. .... .... .... .... = LG bit: Globally unique address
(factory default)
   Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
   111. .... .... .... = Priority: 7
   ...0 .... .... .... = CFI: 0
   .... 0000 0000 0001 = ID: 1
   Length: 50
Logical-Link Control
   DSAP: SNAP (0xaa)
   IG Bit: Individual
   SSAP: SNAP (0xaa)
   CR Bit: Command
   Control field: U, func=UI (0x03)
       000. 00.. = Command: Unnumbered Information (0x00)
       .... ..11 = Frame type: Unnumbered frame (0x03)
   Organization Code: Cisco (0x00000c)
   PID: PVSTP+ (0x010b)
Spanning Tree Protocol
   Protocol Identifier: Spanning Tree Protocol (0x0000)
   Protocol Version Identifier: Rapid Spanning Tree (2)
   BPDU Type: Rapid/Multiple Spanning Tree (0x02)
   BPDU flags: 0x3c (Forwarding, Learning, Port Role: Designated)
       0... .... = Topology Change Acknowledgment: No
       .0.. .... = Agreement: No
       ..1. .... = Forwarding: Yes
       ...1 .... = Learning: Yes
       .... 11.. = Port Role: Designated (3)
       .... ..0. = Proposal: No
       .... ...0 = Topology Change: No
   Root Identifier: 33768 / 00:05:73:ce:a9:7c
   Root Path Cost: 0
   Bridge Identifier: 33768 / 00:05:73:ce:a9:7c
   Port identifier: 0x900a
   Message Age: 0
   Max Age: 20
   Hello Time: 2
   Forward Delay: 15
   Version 1 Length: 0
```

要将此信息写入PCAP文件，请使用以下命令：

```
Nexus-5000# ethanalyzer local interface inbound-hi display-filter
"vlan.id == 1 && stp" write bootflash:bpdu.pcap
Capturing on eth4
3 << Lists how many packets were captured.
```

在BPDU捕获中，源MAC地址是远端设备的接口MAC地址。

在Ethanalyzer捕获中，端口以十六进制格式显示。要标识端口号，您需要先将端口号转换为十六进制：

0x900a（来自上一跟踪）= 36874

以下命令可将该号码解码为端口：

```
Nexus-5000# show spanning-tree internal info all  |
grep -b 50 "port_id                36874" | grep "Port Info"
------- STP Port Info (vdc 1, tree 1, port Po11) ----------
------- STP Port Info (vdc 1, tree 300, port Po11) ---------
------- STP Port Info (vdc 1, tree 800, port Po11) ---------
------- STP Port Info (vdc 1, tree 801, port Po11) ---------
------- STP Port Info (vdc 1, tree 802, port Po11) ---------
------- STP Port Info (vdc 1, tree 803, port Po11) ---------
------- STP Port Info (vdc 1, tree 999, port Po11) ---------
```

在本例中，它是port-channel 11。

STP 收敛

如果需要检查STP收敛，请使用**show spanning-tree internal interactions**命令。此命令可以深入了解触发STP更改的事件。在问题发生时立即收集此信息非常重要，因为日志很大，而且会随时间而换行。

```
Nexus-5000#show spanning-tree internal interactions
- Event:(null), length:123, at 81332 usecs after Sat May 11 12:01:47 2013
Success: pixm_send_set_mult_cbl_vlans_for_multiple_ports, num ports 1
VDC 1, state FWD, rr_token 0x21b9c3 msg_size 584
- Event:(null), length:140, at 81209 usecs after Sat May 11 12:01:47 2013
vb_vlan_shim_set_vlans_multi_port_state(2733): Req (type=12) to PIXM
vdc 1, inst 0, num ports 1, state FWD
[Po17 v 800-803,999-1000]
- Event:(null), length:123, at 779644 usecs after Sat May 11 12:01:46 2013
Success: pixm_send_set_mult_cbl_vlans_for_multiple_ports, num ports 1
VDC 1, state FWD, rr_token 0x21b99a msg_size 544<
- Event:(null), length:127, at 779511 usecs after Sat May 11 12:01:46 2013
vb_vlan_shim_set_vlans_multi_port_state(2733): Req (type=12) to PIXM
vdc 1, inst 0, num ports 1, state FWD
[Po17 v 300]
- Event:(null), length:123, at 159142 usecs after Sat May 11 12:01:32 2013
Success: pixm_send_set_mult_cbl_vlans_for_multiple_ports, num ports 1
VDC 1, state LRN, rr_token 0x21b832 msg_size 584
- Event:(null), length:140, at 159023 usecs after Sat May 11 12:01:32 2013
vb_vlan_shim_set_vlans_multi_port_state(2733): Req (type=12) to PIXM
vdc 1, inst 0, num ports 1, state LRN
[Po17 v 800-803,999-1000]
- Event:(null), length:123, at 858895 usecs after Sat May 11 12:01:31 2013
Success: pixm_send_set_mult_cbl_vlans_for_multiple_ports, num ports 1
VDC 1, state LRN, rr_token 0x21b80b msg_size 544
- Event:(null), length:127, at 858772 usecs after Sat May 11 12:01:31 2013
vb_vlan_shim_set_vlans_multi_port_state(2733): Req (type=12) to PIXM
vdc 1, inst 0, num ports 1, state LRN
[Po17 v 300]
..................... cut to save space ............
```

外部VLAN映射

Nexus 5000系列交换机使用内部VLAN来映射到外部VLAN号以进行转发。有时VLAN ID是内部VLAN ID。要获取到外部VLAN的映射，请输入：

```
Nexus-5000# show platform afm info global
Gatos Hardware version 0
Hardware instance mapping
-------------------------
Hardware instance: 0 asic id: 0 slot num: 0
------------- cut to save space -------------------------
Hardware instance: 12 asic id: 1 slot num: 3
AFM Internal Status
-------------------
[unknown label ]: 324
[no free statistics counter ]: 2
[number of verify ]: 70
[number of commit ]: 70
[number of request ]: 785
[tcam stats full ]: 2

Vlan mapping table
------------------
Ext-vlan: 1 - Int-vlan: 65
```

STP调试

排除STP问题的另一种方法是使用调试。但是，使用STP调试可能会导致CPU使用率峰值，这会在某些环境中引起问题。为了在运行调试时显着减少CPU使用率，请使用debug-filter，并将活动记录到日志文件中。

1. 创建日志文件，该文件保存在目录日志下。

```
Nexus-5000#debug logfile spanning-tree.txt
Nexus-5548P-L3# dir log:
31 Nov 06 12:46:35 2012 dmesg
----- cut to save space----
7626 Nov 08 22:41:58 2012 messages
0 Nov 08 23:05:40 2012 spanning-tree.txt
4194304 Nov 08 22:39:05 2012 startupdebug
```

2. 运行调试。

```
Nexus-5000# debug spanning-tree bpdu_rx interface e1/30
<<<setup your spanning-tree for bpdus
Nexus-5000# copy log:spanning-tree.txt bootflash:
```

日志文件示例：

```
2012 Nov 8 23:08:24.238953 stp: BPDU RX: vb 1 vlan 300, ifi 0x1a01d000
(Ethernet1/30)
2012 Nov 8 23:08:24.239095 stp: BPDU Rx: Received BPDU on vb 1 vlan 300
port Ethernet1/30 pkt_len 60 bpdu_len 36 netstack flags 0x00ed enc_type ieee
2012 Nov 8 23:08:35.968453 stp: RSTP(300): Ethernet1/30 superior msg
2012 Nov 8 23:08:35.968466 stp: RSTP(300): Ethernet1/30 rcvd info remaining 6
2012 Nov 8 23:08:36.928415 stp: BPDU RX: vb 1 vlan 300, ifi 0x1a01d000
(Ethernet1/30)
2012 Nov 8 23:08:36.928437 stp: BPDU Rx: Received BPDU on vb 1 vlan 300
port Ethernet1/30 pkt_len 60 bpdu_len 36 netstack flags 0x00ed enc_type ieee
2012 Nov 8 23:08:36.928476 stp: RSTP(300): msg on Ethernet1/30
..................... cut to save space .............
```

Nexus 5000未处理BPDU

要排除此问题，请检查事件历史记录以确定Nexus 5000系列交换机是否采用根。如果Nexus 5000未处理BPDU或未收到BPDU，则Nexus 5000将成为根桥。为了调查原因，您应确定是否有其它交换机连接到指定网桥也存在此问题。如果没有其他网桥出现问题，则Nexus 5000很可能未处理BPDU。如果其他网桥确实存在问题，则很可能网桥未发送BPDU。

> **注意**：排除STP和虚拟端口通道(vPC)故障时应牢记的事项。 只有vPC主交换机发送BPDU。当vPC辅助是STP根时，主交换机仍然发送BPDU。如果根通过vPC连接，则仅主要增加Rx BPDU计数器，即使次要设备收到计数器时也是如此。