

Using OAM for PVC Management

Document ID: 10480

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Introduction

This sample configuration solves a communication problem that occurs on a permanent virtual circuit (PVC). The network connectivity is lost (no traffic), but the PVC remains up on the end devices. The result is that routing entries that point to the PVC remain in the routing table, and therefore packets are lost. The solution is to use the Operation, Administration, and Maintenance (OAM) feature to detect such failures and allow the PVC to go down if there is a disruption along its path. This document shows two router configurations with and without OAM.

Note: This document provides an introductory sample configuration for OAM. Refer to Troubleshooting PVC Failures When Using OAM Cells and PVC Management for more detailed information on OAM.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS® Software Release 12.0 and later. Limited support exists in Cisco IOS Software Release 11.1CC. However, an upgrade to Cisco IOS Software Release 12.0 or later is recommended.
- A card such as a 7200+PA-A1. This is the card that is used in testing this sample configuration with Cisco IOS® Software Release 12.0. However, the card type is not important in this sample configuration. If you use a PA-A3, for example, the **show atm pvc** command gives more information, but none of the information is relevant to this feature.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

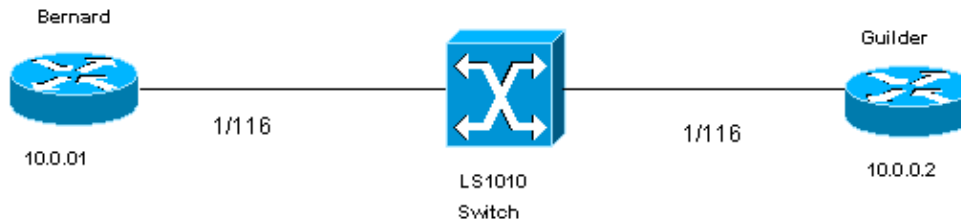
Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Configure

Network Diagram

This document uses this network setup:



For this document, these statements apply:

- 1/116 is the Virtual Path Identifier/Virtual Channel Identifier (VPI/VCI) assigned for the PVC on both sides of the ATM switch.
- 1/116 is switched to 1/116 by the ATM switch.
- Logical Link Control (LLC) encapsulation is used for the configuration example. This is configured using **aal5snap**.

Configurations

Without OAM

Without OAM, the router configurations on both sides of the switch look like the output shown in these tables:

Guilder
<pre>interface ATM1/0.116 multipoint ip address 10.0.0.2 255.0.0.0 pvc 1/116 protocol ip 10.0.0.1 broadcast encapsulation aal5snap</pre>

Bernard
<pre>interface ATM2/0/0.116 multipoint ip address 10.0.0.1 255.0.0.0 pvc 1/116 protocol ip 10.0.0.2 broadcast encapsulation aal5snap</pre>

If the PVC on Guilder goes down, it remains up on Bernard, as shown in these tables:

Guilder

```
Guilder(config)#interface ATM1/0.116 multipoint

Guilder(config-subif)#shutdown

Guilder#show interface atm 1/0.116
  ATM1/0.116 is administratively down, line protocol is down
[snip]
```

Bernard

```
Bernard#show interface atm 2/0/0.116
  ATM2/0/0.116 is up, line protocol is up
[snip]
Bernard#show atm vc interface atm 2/0/0.116

      VCD /
Interface  Name          VPI  VCI  Type  Encaps  Peak Avg/Min Burst
2/0/0.116  4                1   116  PVC   SNAP   149760          Sts
                                         UP

Bernard#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

Gateway of last resort is not set

R    100.0.0.0/8 [120/1] via 10.0.0.2, 00:00:07, ATM2/0/0.116
C    10.0.0.0/8 is directly connected, ATM2/0/0.116C

C    40.0.0.0/8 is directly connected, BVI2
     11.0.0.0/22 is subnetted, 1 subnets
C    11.200.8.0 is directly connected, Ethernet0/0/0
```

With OAM

These tables show what the router configurations look like with OAM and PVC management enabled:

Guilder With OAM and PVC Management

```
interface ATM1/0.116 multipoint
 ip address 10.0.0.2 255.0.0.0
 pvc 1/116
  protocol ip 10.0.0.1 broadcast
  oam-pvc manage
  encapsulation aal5snap
```

Bernard With OAM and PVC Management

```
interface ATM2/0/0.116 multipoint
 ip address 10.0.0.1 255.0.0.0
 pvc 1/116
  protocol ip 10.0.0.2 broadcast
  oam-pvc manage
  encapsulation aal5snap
```

If the PVC on Guilder goes down, the PVC goes down on Bernard, as shown in these tables:

Guilder With OAM and PVC Management

Guilder#**configure terminal**

Enter configuration commands, one per line. End with CNTL/Z.

Guilder(config)#**interface atm 1/0.116**

Guilder(config-subif)#**shutdown**

Guilder#**show interfaces atm 1/0.116**

ATM1/0.116 is administratively down, line protocol is down

[snip]

Guilder#**show atm vc**

Interface	VCD / Name	VPI	VCI	Type	Encaps	SC	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
1/0.116	3	1	116	PVC	SNAP	UBR	155000			INAC

Bernard With OAM and PVC Management

Bernard#**show atm vc**

Interface	VCD / Name	VPI	VCI	Type	Encaps	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
2/0/0.116	4	1	116	PVC	SNAP	155000			DOWN

Bernard#**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, * - candidate default
U - per-user static route, o - ODR
T - traffic engineered route

Gateway of last resort is not set

C 40.0.0.0/8 is directly connected, BVI2

11.0.0.0/22 is subnetted, 1 subnets

C 11.200.8.0 is directly connected, Ethernet0/0/0

Bernard#**show interfaces atm 2/0/0.116**

ATM2/0/0.116 is down, line protocol is down

[snip]

Bernard#**show atm pvc 1/116**

ATM2/0/0.116: VCD: 4, VPI: 1, VCI: 116

UBR, PeakRate: 155000

AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0

OAM frequency: 10 second(s), OAM retry frequency: 1 second(s)

OAM up retry count: 3, OAM down retry count: 5

OAM Loopback status: OAM Sent

OAM VC state: Not Verified

ILMI VC state: Not Managed

VC is managed by OAM.

InARP frequency: 15 minutes(s)

InPkts: 39, OutPkts: 53, InBytes: 3504, OutBytes: 5636

InPRoc: 36, OutPRoc: 21, Broadcasts: 33

InFast: 0, OutFast: 0, InAS: 3, OutAS: 0

OAM cells received: 345

F5 InEndloop: 194, F5 InSegloop: 0, F5 InAIS: 151, F5 InRDI: 0

F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0

OAM cells sent: 477

F5 OutEndloop: 326, F5 OutSegloop: 0, F5 OutRDI: 151

F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0

OAM cell drops: 0

Status: **DOWN**, State: NOT_VERIFIED

Verify

There is currently no verification procedure available for this configuration.

Troubleshoot

This section provides information you can use to troubleshoot your configuration.

Troubleshooting Commands

The Output Interpreter Tool (registered customers only) (OIT) supports certain **show** commands. Use the OIT to view an analysis of **show** command output.

Note: Refer to Important Information on Debug Commands before you issue **debug** commands.

- **debug atm oam** Displays the OAM cells and general information about OAM.
- **show interfaces atm** Displays information about the ATM interface.
- **show atm pvc** Displays all ATM permanent virtual circuits (PVCs) and traffic information. Works only in Cisco IOS Software Release 11.3T and later.
- **show atm vc** Displays all ATM virtual circuits and traffic information. Provides less information than **show atm pvc**, but is available in software releases prior to Cisco IOS Software Release 11.3T.
- **show ip route** Displays the IP routing table.

For OAM and PVC management, you can also use the **oam retry <count 1> <count 2> <count 3>** command:

- *<count 1>* is the OAM retry count before declaring a VC is up.
- *<count 2>* is the OAM retry count before a VC is declared down.
- *<count 3>* is the OAM retry polling frequency.

Summary

- With OAM disabled:
 - ◆ The status of a PVC depends on the status of the corresponding physical interface. Subsequently, PVCs underneath interfaces that are shutdown or in a failure status display as down, while PVCs underneath an interface that is connected show up.
- With **oam-pvc manage** enabled:
 - ◆ The status of a PVC depends on the receipt of OAM Loopback echo-replies.
 - ◆ PVC is declared down if:
 - ◇ Five (default) consecutive F5 Loopback Cells are not received back with a Loopback indicator of 1.
 - ◇ Alarm Indication Signal (AIS) or Remote Defect Indicator (RDI) cells are received that indicate a failure along the VC path.
- With **oam-pvc <0-600>** configured without the *manage* keyword:
 - ◆ The router sends OAM F5 Loopback Cells but does not disable the subinterface PVC if they are not received with a Loopback Indicator of 1. This is a pertinent tool for troubleshooting in a live network environment.

Related Information

- **Operation, Administration, and Maintenance (OAM) Enhancement**
 - **Technical Support & Documentation – Cisco Systems**
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Updated: Oct 23, 2005

Document ID: 10480
