Basic PVC Configuration Using Bridged RFC 1483

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Introduction

This document illustrates a sample configuration between three routers and an ATM switch, using Logical Link Control (LLC) encapsulation. Router A routes on the Ethernet and performs bridging between Router B and Router C. Router B and Router C bridge between the ATM and Ethernet. No mapping is done on the PVC for bridging, because all VCs on a bridged subinterface are automatically used for bridging.

In the sample configuration, Router B and Router C are only used as Layer 2 devices, with end stations attached to their Ethernets. Therefore, you need to turn off **ip routing** on Router B and C.

Note: This document focuses on permanent virtual circuit (PVC) configurations on Cisco routers that run Cisco IOS® software. For PVC configuration examples on Cisco WAN switches, click here.

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 11.2 or later is needed for integrated routing and bridging (IRB). Commands were enhanced in Cisco IOS Software Release 11.3T, and the enhanced commands are used in the configurations that immediately follow the network diagram.

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

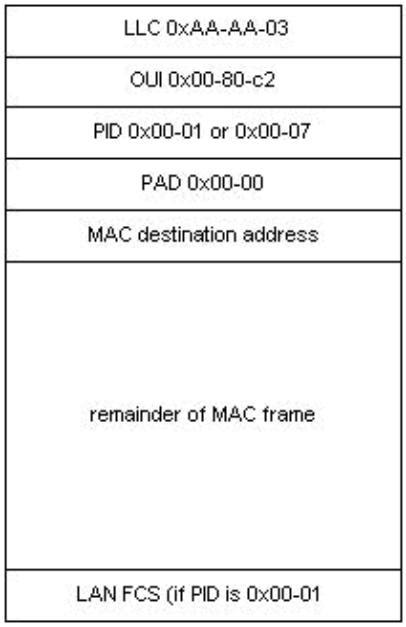
For more information on document conventions, refer to Cisco Technical Tips Conventions.

Bridged RFC 1483

When PVCs are used, a user has two ways to carry multiple protocols over Asynchronous Transfer Mode (ATM).

- **virtual circuit (VC) multiplexing**—The user defines one PVC per protocol. This method uses more VCs than LLC encapsulation, but reduces overhead. This is because a header is not necessary.
- **LLC/SNAP Encapsulation**—The user multiplexes multiple protocols over a single ATM VC. The protocol of a carried protocol data unit (PDU) is identified by prefixing the PDU with a Logical Link Control (LLC)/Subnetwork Access Protocol (SNAP) header.

LLC/SNAP headers use a routed format or a bridged format. The format of the ATM Adaptation Layer 5 (AAL5) common part convergence sublayer (CPCS)-PDU Payload field for bridged Ethernet/802.3 PDUs is seen here:



A bridged format does not necessarily mean that the encapsulated protocol is not routable. Rather, it typically is used when one side of the link supports only the bridged-format PDUs. For example, in a connection between a router and a Catalyst switch in a corporate campus ATM network. In this application, the router interface typically serves as the default gateway for the remote users. Then, integrated routing and bridging (IRB), routed bridge encapsulation (RBE) or bridged-style PVCs (BPVCs) provide the mechanism to route traffic off-network.

These protocols allow the ATM interface to receive bridged-format PDUs. However, they have important differences in performance. Cisco recommends that you consider RBE when the configuration supports it.

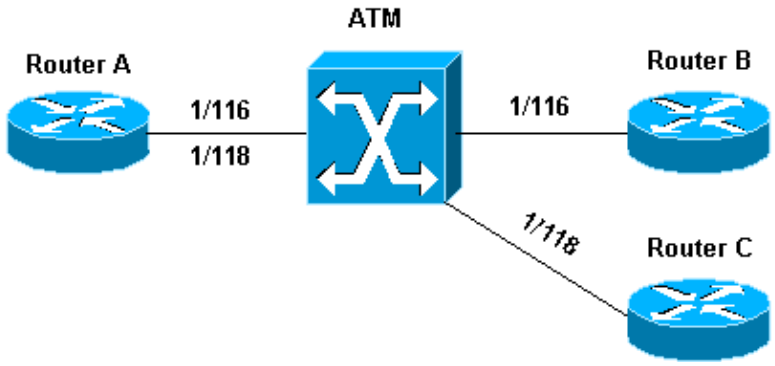
Configure

In this section, you are presented with the information to configure the features described in this document.

Note: To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only) .

Network Diagram

This document uses this network setup:



Network Diagram Notes:

- In the example, 1/116 is switched to 1/116 by the ATM switch and 1/118 is switched to 1/118.
- The topology is a hub-and-spoke topology where Router A is the hub. Each PVC uses a different subinterface to ensure that PDUs received from Router B can be forwarded back out to Router C. Otherwise, flooded traffic that comes on one PVC on a subinterface is not flooded back on another PVC on the same subinterface.
- All ATM subinterfaces are configured as multipoint. A multipoint subinterface supports multiple VCs. A point-to-point subinterface supports only one VC.
- This example uses IRB for routing off-network. Refer to Configuring Integrated Routing and Bridging in the Cisco IOS Bridging and IBM Networking Configuration Guide for guidance on the use of IRB commands. See the "Related Information" section for links to sample configurations of RBE and BPVCs.

Configurations

This document uses these configurations:

- Router A: IRB Configuration
- Router B
- Router C

Router A: IRB Configuration

```
bridge irb
 !
 interface ATM1/0
  no ip address
 !
 interface ATM1/0.116 point-to-point
  pvc 1/116
   encapsulation aal5snap
  !
  bridge-group 1
 !
 interface ATM1/0.118 point-to-point
  pvc 1/118
   encapsulation aal5snap
```

```
  !
  bridge-group 1
 !
 interface BVI1
  ip address 10.1.1.1 255.255.255.0
 !
  bridge 1 protocol ieee
   bridge 1 route ip
```

Router B

```
no ip routing
 !
 interface Ethernet0/0
  no ip address
  bridge-group 1
  !
 interface ATM1/0
  no ip address
 !
  interface ATM1/0.116 point-to-point
  pvc 1/116
   encapsulation aal5snap
   !
   bridge-group 1
  !
  bridge 1 protocol ieee
```

Router C

```
no ip routing
 !
 interface Ethernet0/0
  no ip address
  bridge-group 1
  !
 interface ATM1/0
  no ip address
 !
 interface ATM1/0.118 point-to-point
  pvc 1/118
   encapsulation aal5snap
   !
   bridge-group 1
  !
  bridge 1 protocol ieee
```

Configurations for Cisco IOS Software Release 11.3T and Earlier

With Cisco IOS Software Releases earlier than 11.3T, the configurations appear similar to these:

Router B

```
no ip routing
 !
 interface Ethernet0/0
  no ip address
  bridge-group 1
 !
 interface ATM1/0
  no ip address
 !
 interface ATM1/0.116 point-to-point
```

```
 atm pvc 6 1 116 aal5snap bridge
 bridge-group 1
!
bridge 1 protocol ieee
```

Router C

```
no ip routing
 !
 interface Ethernet0/0
  no ip address
  bridge-group 1
 !
 interface ATM1/0
  no ip address
 !
 interface ATM1/0.118 point-to-point
  atm pvc 8 1 118 aal5snap bridge
  bridge-group 1
 !
 bridge-group 1 protocol ieee
```

Verify

This section provides information you can use to confirm your configuration is working properly.

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

- **show atm pvc <vpi/vci>** (for Cisco IOS Software Release 11.3T and later)—Displays all ATM PVCs and traffic information. This includes the ATM VPI and VCI numbers.

```
Router_A#show atm pvc 1/116
ATM1/0.116: VCD: 6, VPI: 1, VCI: 116
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM Managed VC Status: Not Managed
ILMI Managed VC status: Not Managed
InARP frequency: 15 minutes(s)
InPkts: 258, OutPkts: 258, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0
OAM cell drops: 0
Status: UP
Router_A#
```

- **show atm pvc interface atm** <*slot/port*> —Displays all ATM PVCs and traffic information. This includes the interface number or subinterface number of the PVC. Displays all PVCs on the specified interface or subinterface.

```
Router_A#show atm pvc interface atm1/0
           VCD /                                        Peak  Avg/Min Burst
Interface  Name         VPI   VCI  Type   Encaps   SC   Kbps   Kbps   Cells  Sts
```

```
1/0.116    6              1   116  PVC    SNAP     UBR  155000               UP
1/0.118    8              1   118  PVC    SNAP     UBR  155000               UP
Router_A#
```

- **show atm map**—Displays the list of all configured ATM static maps to remote hosts on an ATM network.
- **show atm traffic**—Display current, global ATM traffic information to and from all ATM networks connected to the router.

```
Router_A#show atm traffic
Input OAM Queue: 0/1063 (size/max)
1772 Input packets
1772 Output packets
0 Broadcast packets
0 Packets received on non-existent VC
0 Packets attempted to send on non-existent VC
0 OAM cells received
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F5 InEndcc: 0, F5 InSegcc: 0,
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
0 OAM cells sent
F5 OutEndloop: 0, F5 OutSegloop: 0,     F5 OutRDI: 0
F5 OutEndcc: 0, F5 OutSegcc: 0,
F4 OutEndloop: 0, F4 OutSegloop: 0,     F4 OutRDI: 0
0 OAM cell drops
Router_A#
```

- **show atm interface atm** <*slot/port*> —Displays ATM-specific information about an ATM interface.

```
Router_A#show atm interface atm 1/0
Interface ATM1/0:
AAL enabled:  AAL5  , Maximum VCs: 4095, Current VCCs: 2

Maximum Transmit Channels: 0
Max. Datagram Size: 4528
PLIM Type: SONET - 155000Kbps, TX clocking: LINE
Cell-payload scrambling: ON
sts-stream scrambling: ON
4407 input, 5386 output, 774 IN fast, 387 OUT fast, 0 out drop
 Avail bw = 155000
Config. is ACTIVE
Router_A#
```

- **show spanning-tree**—Displays the spanning-tree topology known to the router.

```
Router_A#show spanning-tree

 Bridge group 1 is executing the ieee compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, address 0000.0c7b.bf70
  Configured hello time 2, max age 20, forward delay 15
  We are the root of the spanning tree
  Topology change flag not set, detected flag not set
  Number of topology changes 1 last change occurred 00:42:00 ago
          from ATM1/0.116
  Times:  hold 1, topology change 35, notification 2
          hello 2, max age 20, forward delay 15
  Timers: hello 1, topology change 0, notification 0, aging 300

 Port 6 (ATM1/0.116) of Bridge group 1 is forwarding
   Port path cost 14, Port priority 128, Port Identifier 128.6.
   Designated root has priority 32768, address 0000.0c7b.bf70
   Designated bridge has priority 32768, address 0000.0c7b.bf70
   Designated port id is 128.6, designated path cost 0
   Timers: message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   BPDU: sent 1266, received 0
```

```
 Port 7 (ATM1/0.118) of Bridge group 1 is forwarding
   Port path cost 14, Port priority 128, Port Identifier 128.7.
   Designated root has priority 32768, address 0000.0c7b.bf70
   Designated bridge has priority 32768, address 0000.0c7b.bf70
   Designated port id is 128.7, designated path cost 0
   Timers: message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   BPDU: sent 1266, received 0

Router_A#
```

- **show bridge**—Displays classes of entries in the bridge forwarding database.

```
Router_A#show bridge

Total of 300 station blocks, 298 free
Codes: P - permanent, S - self

Bridge Group 1:

    Address       Action   Interface       Age   RX count   TX count
0010.7bb9.bd20   forward   ATM1/0.116        0       5571       4544
0010.7bb9.bd14   forward   ATM1/0.118        0       5245       4214
Router_A#
```

Troubleshoot

Refer to Troubleshooting Bridging and IRB over ATM PVCs for detailed troubleshooting tips.

Related Information

- **Frequently Asked Questions About Bridging on ATM Interfaces**
- **Configuring Bridged-Style PVCs on ATM Interfaces in the GSR and 7500 Series**
- **Routed Bridged Encapsulation Baseline Architecture**
- **RFC 1483**
- **Technical Support - Cisco Systems**

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