

Multiple Routed Protocols over ATM PVCs Using LLC Encapsulation

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Introduction

This document illustrates a sample configuration between two routers and an Asynchronous Transfer Mode (ATM) switch, using multiple routed protocols over permanent virtual circuits (PVCs). The configuration uses Logical Link Control (LLC) Encapsulation, and the protocols used are IP and Internetwork Packet Exchange (IPX).

Note: This document focuses on PVC configurations on Cisco routers running Cisco IOS® Software. For PVC configuration examples on Cisco WAN switches, please [click here](#).

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

To implement this configuration, you need these software and hardware versions:

- Cisco IOS Software Release 10.3 or later. (Commands were enhanced in Cisco IOS Software Release 11.3T, and the enhanced commands are used in the configurations immediately following the network diagram. Configurations using the earlier commands are provided at the end of this document.)
- Two Cisco routers
- An ATM switch

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

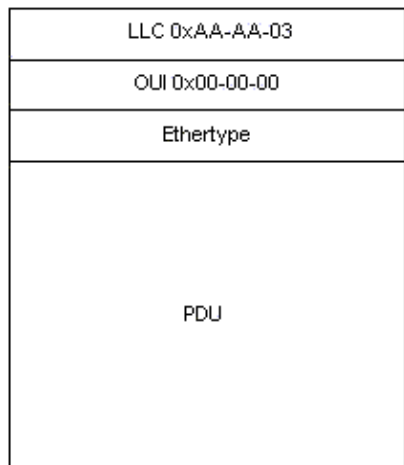
For more information on document conventions, refer to Cisco Technical Tips Conventions.

Routed RFC1483

When using PVCs, a user has two ways of carrying multiple protocols over ATM.

- **virtual circuit (VC) based multiplexing** The user defines one PVC per protocol. This uses more VCs than LLC encapsulation but reduces overhead because a header is not necessary. For a sample configuration of Multiple Routed Protocols Over ATM PVCs Using VC Multiplexing, please click [here](#).
- **LLC 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 an LLC header.

The format of the ATM adaptation layer 5 (AAL5) common part convergence sublayer (CPCS)–PDU Payload field for routed PDUs is as follows:



For IP, the Ethertype would be 0x08–00.

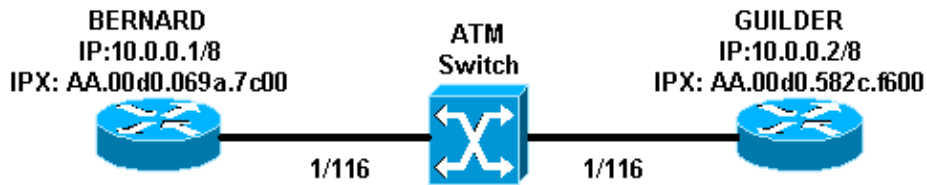
Configure

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:



- In the example, 1/116 is switched to 1/116 by the ATM switch and 1/117 is switched to 1/117.
- Instead of using a static mapping with the IP or IPX remote address as shown in the configurations, Inverse Address Resolution Protocol (InARP) can be used on the PVCs configured on the multipoint sub-interface using the following commands:

```
protocol ip inarp broadcast
protocol ipx inarp broadcast
```

InARP does the mapping automatically.

- You can also use a point-to-point interface and configure both IP and IPX on the same interface/PVC without any mapping.

Configurations

This document uses these configurations:

- Bernard
- Guilder

Bernard
<pre>interface ATM2/0/0.116 multipoint ip address 10.0.0.1 255.0.0.0 no ip directed-broadcast pvc ip-ipx 1/116 protocol ip 10.0.0.2 broadcast protocol ipx AA.00d0.582c.f600 broadcast encapsulation aal5snap ! ipx network AA</pre>

Guilder
<pre>interface ATM1/0.1 multipoint ip address 10.0.0.2 255.0.0.0 no ip directed-broadcast pvc ip-ipx 1/116 protocol ipx AA.00d0.069a.7c00 broadcast protocol ip 10.0.0.1 broadcast encapsulation aal5snap ! ipx network AA</pre>

Commands Used

- **pvc** *[name] vpi/vci* Creates an ATM PVC on a main interface or subinterface. Assigns a name to an ATM PVC network virtual path identifier (VPI) for this PVC.
- **encapsulation** *aal5snap|aal5mux* Configures the ATM adaptation layer (AAL) and encapsulation type for an ATM PVC, SVC, or VC class. Use one of the **aal5mux** encapsulation options to dedicate the specified PVC to a single protocol; use the **aal5snap** encapsulation option to multiplex two or

more protocols over the same PVC.

- **protocol protocol [broadcast]** Configures a static map for an ATM PVC, SVC, or VC class and enables InARP or InARP broadcasts on an ATM PVC by either configuring InARP directly on the PVC or in a VC class. The keyword **broadcast** indicates that this map entry is used when the corresponding protocol sends broadcast packets to the interface.

Earlier Cisco IOS Software Releases – Configurations

With Cisco IOS Software Releases earlier than 11.3T, the configurations look like these:

Bernard
<pre>interface atm 2/0/0.116 multipoint ip address 10.0.0.1 255.0.0.0 ipx network aa atm pvc 6 1 116 aal5snap map-group ip-ipx ! map-list ip-ipx ip 10.0.0.2 atm-vc 6 broadcast ipx AA.00d0.582c.f600 atm-vc 6 broadcast</pre>

Guilder
<pre>interface atm 1/0.1 multipoint ip address 10.0.0.2 255.0.0.0 ipx network aa atm pvc 6 1 116 aal5snap map-group ip-ipx ! map-list ip-ipx ip 10.0.0.1 atm-vc 6 broadcast ipx AA.00d0.069a.7c00 atm-vc 6 broadcast</pre>

Earlier Cisco IOS Software Releases – Commands Used

These commands are valid for Cisco IOS Software Releases earlier than 11.3T:

- **atm pvc vcd vpi vci aal-encap [[midlow midhigh] [peak average [burst]]] [inarp [minutes]]** Creates a permanent virtual circuit (PVC) on an ATM interface, and optionally, generates Operation and Maintenance (OAM) F5 loopback cells or enables Inverse ATM ARP
- **map-group name** Associates an ATM map list to an interface or subinterface for either a PVC or SVC.
- **map-list name** Defines an ATM map statement for either a PVC or SVC.
- **protocol protocol-address atm-vc vcd [broadcast]** Defines an ATM map statement for a PVC. Must be used with the **map-list name** command.

Note: It is always recommended to use the newer syntax.

Scrambling

Note: Scrambling can be added to the configurations shown above to resolve problems with flapping links. As explained in *When Should Scrambling Be Enabled on ATM Virtual Circuits?*, scrambling is designed to randomize the pattern of 1s and 0s carried in ATM cells or the physical layer frame. Randomizing the digital bits can prevent continuous, non-variable bit patterns, in other words long strings of all 1s or all 0s. Several physical layer protocols rely on transitions between 1s and 0s to maintain clocking.

One problem symptom that can be a good candidate for scrambling is link flaps that occur when particular files cross an ATM link. These files may be producing the long string of all 1s or all 0s.

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 IOS 11.3T and later) Displays all ATM PVCs and traffic information, including the ATM VPI and VCI numbers.
- **show atm pvc interface atm** *[interface number]* Displays all ATM PVCs and traffic information, including the interface number or subinterface number of the PVC. Displays all PVCs on the specified interface or subinterface.
- **show atm map** Displays the list of all configured ATM static maps to remote hosts on an ATM network.
- **show atm traffic** Displays current, global ATM traffic information to and from all ATM networks connected to the router.
- **show atm int atm** *slot/port* Displays ATM-specific information about an ATM interface.

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

Related Information

- [Multiple Routed Protocols Over ATM PVCs Using VC Multiplexing](#)
- [When Should Scrambling Be Enabled on ATM Virtual Circuits?](#)
- [ATM Technology Support Pages](#)
- [ATM Command Reference](#)
- [RFC1483](#)
- [Technical Support – Cisco Systems](#)

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