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Configuring MPLS over RFC1483 PVCs on the Enhanced ATM Router Module (ARM)

Document ID: 25085

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Introduction

This document explains how to configure Multiprotocol Label Switching (MPLS) over an RFC1483 PVC on the Catalyst 8540MSR enhanced ATM Router Module (ARM) (also known as ARM2). This feature was introduced in Cisco IOS® Software Release 12.1(10)EY.

The routing tables used in this document are computed using Open Shortest Path First (OSPF). Both Label Distribution Protocol (LDP) and Tag Distribution Protocol (TDP) are supported on the ARM2. This document uses TDP.

The MPLS packet is encapsulated in an AAL5 frame and sent over the RFC1483 PVC.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

See the Network Diagram section for relevant components used.

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.

Feature Limitations

The implementation of this configuration has several feature limitations. The most important limitations are listed here:

- Packet counters are not implemented.
- Load balancing on the tagged path is not supported.
- Fragmentation based on maximum transmission unit (MTU) for IP to MPLS and MPLS to MPLS traffic are implemented in Route Processors (RP), but not in line cards.
- No Traffic Engineering tunnels are supported.

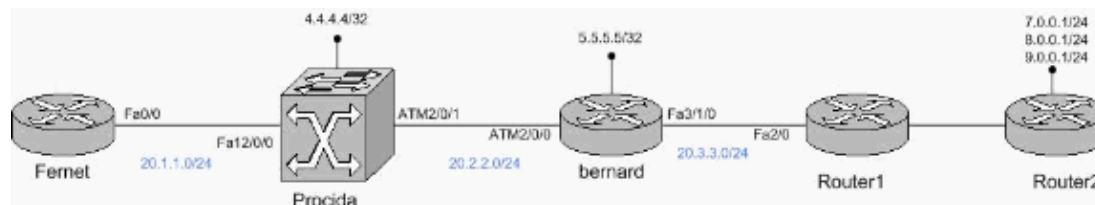
Configure

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:



- Procida is a Catalyst 8540MSR that runs Cisco IOS Software Release 12.1(10)EY and has an Enhanced ATM Router Module in slot 10 as seen in the **show hardware** command output.
- Bernard is a Cisco 7505 router that runs Cisco IOS Software Release 12.2(8)T with a PA-A3.
- Fernet is a Cisco 2620 and Router1 is a Cisco 3620 used to inject routes to Bernard.

```
Procida#show hardware
```

```
C8540 named Procida, Date: 09:08:50 UTC Fri May 24 2002
```

Slot	Ctrlr-Type	Part No.	Rev	Ser No	Mfg Date	RMA No.	Hw Vrs	Tst	EEP
2/*	Super Cam	73-2739-03	B0	03170TC6	Apr 27 99	0	3.0		
2/0	155MM PAM	73-1496-03	A0	10988822	Dec 09 98	00-00-00	3.2	0	2
10/*	CMPM Card	73-3944-05	A0	04209F5M	Aug 31 00	0	5.0		
10/0	ARM2 PAM	73-5533-01	A0	0424A16L	Aug 31 00	0	5.1		
10/1	ARM2 PAM	73-5533-01	A0	0424A17V	Aug 31 00	0	5.1		
12/*	ETHERNET PAM	73-3754-04	A0	0246013S	Nov 19 98	0	3.2		

Quick Configuration Guide

Complete these steps.

1. Set up your network as usual (MPLS needs a standard IP connection in order to establish forwarding bases).

2. Ensure that the routing protocol (in this case OSPF) works correctly.
3. Enable **ip cef** (for better performances use **ip cef** distributed when available) in the general configuration mode (shown in **bold** in the configurations used in this document).
4. Enable **tag-switching ip** (or **mpls ip** on newer Cisco IOS software releases) in the ATM interface (shown in **bold** in the configurations used in this document).

Note: The Label Switch Routers (LSRs) must have (up) Loopback interfaces with an address mask of 32 bits. These interfaces must be reachable via the global IP routing table.

Configurations

For clarity purposes, only the configurations of Procida and its TDP neighbor Bernard are shown. These are the only devices involved in the MPLS configuration. Fernet and Router1 consist of a typical OSPF configuration.

This document uses these configurations:

- Procida
- Bernard

Procida
<pre> ip cef ! interface FastEthernet12/0/0 ip address 20.1.1.2 255.255.255.0 ! interface Loopback0 ip address 4.4.4.4 255.255.255.255 ! interface ATM10/0/1.100 multipoint ip address 20.2.2.1 255.255.255.0 ip ospf network point-to-multipoint map-group mpls atm pvc 2 100 pd on encap aal5snap interface ATM2/0/1 0 100 tag-switching ip ! map-list mpls ip 20.2.2.2 atm-vc 100 broadcast ! router ospf 1 log-adjacency-changes network 4.4.4.4 0.0.0.0 area 0 network 20.1.1.0 0.0.0.255 area 0 network 20.2.2.0 0.0.0.255 area 0 </pre>

Bernard
<pre> ip cef ! interface ATM2/0/0.2 point-to-point ip address 20.2.2.2 255.255.255.0 no ip directed-broadcast ip ospf network point-to-multipoint </pre>

```

no atm enable-ilmi-trap
pvc 0/100
!
tag-switching ip
!
interface FastEthernet3/1/0
ip address 20.3.3.1 255.255.255.0
no ip directed-broadcast
no ip route-cache distributed
tag-switching ip
!
interface Loopback0
ip address 5.5.5.5 255.255.255.255
!
router ospf 1
log-adjacency-changes
network 5.5.5.5 0.0.0.0 area 0
network 20.2.2.0 0.0.0.255 area 0
network 20.3.3.0 0.0.0.255 area 0

```

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 tag-switching interfaces** Displays information about interfaces where tag switching is enabled. This example command output shows that tagging is operational on the ARM2 in slot 10.

```
Procida#show tag-switching interfaces atm 10/0/1.100 detail
```

```

Interface ATM10/0/1.100:
  IP tagging enabled (tdp)
  TSP Tunnel tagging not enabled
  Tagging operational
  MTU = 4470

```

- **show tag-switching tdp neighbor** Use the **show tag-switching tdp *** commands to verify the state of TDP.

```
Procida#show tag-switching tdp neighbor detail
```

```

Peer TDP Ident: 5.5.5.5:0; Local TDP Ident 4.4.4.4:0
TCP connection: 5.5.5.5.14920 - 4.4.4.4.711
State: Oper; PIEs sent/rcvd: 6/6; Downstream; Last TIB rev sent 55
Up time: 00:02:21; UID: 10; Peer Id 1;
TDP discovery sources:
  ATM10/0/1.100; Src IP addr: 20.2.2.2
    holdtime: 15000 ms, hello interval: 5000 ms
Addresses bound to peer TDP Ident:
  10.48.73.65      5.5.5.5          20.3.3.1          20.2.2.2
Peer holdtime: 180000 ms; KA interval: 60000 ms; Peer state: estab

```

- **show tag-switching discovery** Displays the status of the TDP discovery process.

```
Procida#show tag-switching tdp discovery
```

```

Local TDP Identifier:
  4.4.4.4:0
Discovery Sources:
  Interfaces:
    ATM10/0/1.100 (tdp): xmit/recv      TDP Id: 5.5.5.5:0

```

```

Procida#show ip ospf neighbor
Neighbor ID      Pri   State           Dead Time   Address      Interface
5.5.5.5          1    FULL/ -         00:01:57   20.2.2.2    ATM10/0/1.100
20.1.1.1         1    FULL/DR         00:00:39   20.1.1.1    FastEthernet12/0/0
Procida#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
       P - periodic downloaded static route

```

```

Gateway of last resort is 10.48.72.1 to network 0.0.0.0
 1.0.0.0/32 is subnetted, 1 subnets
O    1.1.1.1 [110/3] via 20.2.2.2, 00:14:21, ATM10/0/1.100
 4.0.0.0/32 is subnetted, 1 subnets
C    4.4.4.4 is directly connected, Loopback0
 20.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
O    20.4.4.0/24 [110/3] via 20.2.2.2, 00:14:21, ATM10/0/1.100
O    20.3.3.0/24 [110/2] via 20.2.2.2, 00:14:21, ATM10/0/1.100
C    20.1.1.0/24 is directly connected, FastEthernet12/0/0
C    20.2.2.0/24 is directly connected, ATM10/0/1.100
O    20.2.2.2/32 [110/1] via 20.2.2.2, 00:14:22, ATM10/0/1.100
 7.0.0.0/32 is subnetted, 1 subnets
O    7.0.0.1 [110/4] via 20.2.2.2, 00:14:22, ATM10/0/1.100
 8.0.0.0/32 is subnetted, 1 subnets
O    8.0.0.1 [110/4] via 20.2.2.2, 00:14:23, ATM10/0/1.100
 9.0.0.0/32 is subnetted, 2 subnets
O    9.9.9.9 [110/2] via 9.9.9.9, 00:14:23, ATM0/0/0
O    9.0.0.1 [110/4] via 20.2.2.2, 00:14:23, ATM10/0/1.100

```

```

Procida#show ip cef 7.0.0.1 detail
7.0.0.1/32, version 82, cached adjacency 20.2.2.2
0 packets, 0 bytes
tag information set
  local tag: 18
  fast tag rewrite with AT10/0/1.100, 20.2.2.2, tags imposed: {29}
  via 20.2.2.2, ATM10/0/1.100, 0 dependencies
  next hop 20.2.2.2, ATM10/0/1.100
  valid cached adjacency
  tag rewrite with AT10/0/1.100, 20.2.2.2, tags imposed: {29}

```

- **show tag-switching forwarding-table** Displays the tag-switching forwarding-table. This is the label switching equivalent of the IP routing table for standard IP routing. It contains incoming and outgoing labels and descriptions of the packets.

```

Procida#show tag-switching forwarding-table
Local  Outgoing  Prefix          Bytes tag  Outgoing  Next Hop
tag    tag or VC  or Tunnel Id    switched  interface
16     Pop tag   20.3.3.0/24     0          AT10/0/1.100 20.2.2.2
17     28        20.4.4.0/24     0          AT10/0/1.100 20.2.2.2
18     29        7.0.0.1/32     0          AT10/0/1.100 20.2.2.2
19     30        8.0.0.1/32     0          AT10/0/1.100 20.2.2.2
20     Untagged  20.2.2.2/32     0          AT10/0/1.100 20.2.2.2
21     31        9.0.0.1/32     0          AT10/0/1.100 20.2.2.2
22     32        1.1.1.1/32     0          AT10/0/1.100 20.2.2.2
23     Pop tag   5.5.5.5/32     0          AT10/0/1.100 20.2.2.2

```

- **show tag-switching forwarding-table 7.0.0.1 detail** Displays MPLS forwarding table details. For example, to look into more detail about route 7.0.0.1, you know that the Tag Stack is 29 and it uses per-packet load-sharing.

```

Procida#show tag-switching forwarding-table 7.0.0.1 detail
Local  Outgoing  Prefix          Bytes tag  Outgoing  Next Hop
tag    tag or VC  or Tunnel Id    switched  interface

```

```
18      29      7.0.0.1/32      0      AT10/0/1.100 20.2.2.2
      MAC/Encaps=12/16, MTU=4470, Tag Stack{29}
      00640900AAAA030000008847 0001D000
Per-packet load-sharing
```

Troubleshoot

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

Related Information

- [Implementing MPLS with the Cisco Catalyst 8540](#)
 - [Configuring Basic MPLS Using OSPF](#)
 - [Configuring ATM Label Edge Routing on the Enhanced ATM Router Module \(ARM\)](#)
 - [Understanding Session Establishment and Route Exchange in an MPLS-Enable ATM Core](#)
 - [Understanding MPLS Label Imposition in an ATM Environment](#)
 - [ATM Technical Support](#)
 - [MPLS Over ATM Technical Support](#)
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