Large Branch—Inverse Multiplexing over ATM (IMA)

This configuration is similar to Chapter 10, “Large Branch—Multilink PPP.” This chapter substitutes the previous solution of Multilink PPP (over two serial T1 links) with Inverse Multiplexing over ATM (IMA) using a bundle of two ATM circuits, and shows only the relevant configuration portions and performance results.

This chapter includes the following sections:

- Topology
- Implementation and Configuration
- Performance
- Summary

Topology

The topology is identical to the previous section with the exception of replacing the Multilink PPP configured dual serial links with IMA adapters. (See Figure 11-1.)

Figure 11-1 Large Branch—ATM (IMA)
Implementation and Configuration

This section describes the configuration of the components of the inverse multiplexing over ATM (ATA) solution.

Head-end Router

Following is the head-end router configuration:

```bash
! hostname vpn-jk2-3725-4
!
interface ATM2/0
description ATM2/0
no ip address
no atm ilmi-keepalive
ima-group 0
clock source internal
no scrambling-payload
!
interface ATM2/1
description ATM2/1
no ip address
no atm ilmi-keepalive
ima-group 0
clock source internal
no scrambling-payload
!
interface ATM2/2
no ip address
shutdown
no atm ilmi-keepalive
clock source internal
no scrambling-payload
!
interface ATM2/3
no ip address
shutdown
no atm ilmi-keepalive
clock source internal
no scrambling-payload
!
interface ATM2/IMA0
description ATM2/IMA0
no ip address
ip route-cache flow
load-interval 30
no atm ilmi-keepalive
ima active-links-minimum 2
ima clock-mode common 0
ima differential-delay-maximum 26  # Default value is 25ms, 26 used so it will show in the configuration
!
interface ATM2/IMA0.1 point-to-point
description ATM2/IMA0.1
bandwidth 3072
ip address 192.168.193.13 255.255.255.252
crypto map DYNO-MAP # Same dynamic crypto map/tunnel interface as MLPPP
pvc YELLOW 0/100
vbr-nrt 3072 3072 # Highest value supported.
oam-pvc manage
```
Remote Router

Following is the remote router configuration:

```
! hostname vpn-jk2-3725-3
!
interface ATM2/0
description ATM2/0
no ip address
no atm ilmi-keepalive
ima-group 0
no scrambling-payload
!
interface ATM2/1
description ATM2/1
no ip address
no atm ilmi-keepalive
ima-group 0
no scrambling-payload
!
interface ATM2/2
no ip address
shutdown
no atm ilmi-keepalive
no scrambling-payload
!
interface ATM2/3
no ip address
shutdown
no atm ilmi-keepalive
no scrambling-payload
!
interface ATM2/IMA0
description ATM2/IMA0
no ip address
ip route-cache flow
load-interval 30
no atm ilmi-keepalive
ima active-links-minimum 2
ima clock-mode common 0
ima differential-delay-maximum 26
!
interface ATM2/IMA0.1 point-to-point
description ATM2/IMA0.1
bandwidth 3072
ip address 192.168.193.14 255.255.255.252
crypto map PRIMARY_LINK
pvc YELLOW 0/100
vbr-nrt 3072 3072
oam-pvc manage
oam retry 5 5 5
```

oam retry 5 5 5
```
  service-policy output V3PN_Branch # Same as MLPPP
  
  !
  ip route 0.0.0.0 0.0.0.0 ATM2/IMA0.1 250
  ip route 10.0.80.0 255.255.255.128 Tunnel0 237
  ...
  end
```
Performance

The performance results shown in Table 11-1 were produced using similar traffic profiles and QoS policies as described in Chapter 10, “Large Branch—Multilink PPP.”

Table 11-1 3725 ATM IMA Performance

<table>
<thead>
<tr>
<th>Cisco 3725 ATM/ATA</th>
<th>Voice milliseconds</th>
<th>Number data</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 links 3072 Kbps total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default WRED</td>
<td>Jitter (goal &lt;8)</td>
<td>Latency (goal &lt; 50)</td>
<td>G.729 Calls</td>
</tr>
<tr>
<td></td>
<td>5.4</td>
<td>16.7</td>
<td>15</td>
</tr>
<tr>
<td>Tuned WRED</td>
<td>5.3</td>
<td>14.1</td>
<td>15</td>
</tr>
<tr>
<td>Voice + Video</td>
<td>Tuned WRED</td>
<td>4.7</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Because the amount of raw bandwidth was slightly higher in the IMA configuration, one additional voice call was added in the IMA voice and video test. The Chariot test for the IMA testing included proportionally more flows of the same applications as well.

In the PVC configuration for the IMA subinterface, the vbr-nrt parameter was configured at the highest configurable value, 3072 kbps, while the Multilink PPP interfaces were clocked individually at 1,300,000. This difference accounts for the slightly higher throughput of data in the test results. However recall that the ATM cell tax is appreciably higher than the overhead associated with Multilink PPP, so that the gain in bandwidth is offset to some extent.

It should be noted that although the voice latency in these tests was well within the goal of being less than 50 ms, it was higher than the Multilink PPP values. However overall CPU averaged lower.

Summary

These performance results along with the Multilink PPP results demonstrate the viability of V3PN with data rates above E1.

```
service-policy output V3PN_Branch
!
!
ip route 0.0.0.0 0.0.0.0 ATM2/IMA0.1 250
ip route 10.3.0.0 255.255.255.128 Tunnel10 237
end
```