

Avaya Solution & Interoperability Test Lab

Configuring Avaya G250 Media Gateway With Cisco Access Router Through Frame Relay-to-ATM Service Interworking Function - Issue 1.0

Abstract

Leading Internet Service Providers provide Frame Relay to ATM Service Interworking service, which allows customers to transmit data between Frame Relay and ATM ports. This service enables customers to have Frame Relay Service for endpoints that do not need high speed links and have ATM Services for endpoints that do need high speed links. These Application Notes provide the necessary steps to configure the communication between an Avaya G250 Media Gateway with Frame Relay access and a Cisco Access Router with ATM access through the FRF.8 Frame Relay-to-ATM Service Interworking Function. Detailed configuration for the FRF.8 Interworking Function on a Cisco 7206 Router is also provided.

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1 Introduction

The network diagram in **Figure 1** shows three offices. The Main Office contains a Cisco 3725 Access Router, and an Avaya S8500 Media Server with a local Avaya G650 Media Gateway. Remote Office 1 contains an Avaya G250-DCP Media Gateway and Remote Office 2 contains a Cisco 1751 Access Router and an Avaya IP telephone.

As shown in **Figure 1**, a service provider provides ATM access for the Cisco 3725 Access Router in the Main Office, and Frame Relay access for the Avaya G250-DCP Media Gateway in Remote Office 1 and the Cisco 1751 Access Router in Remote Office 2. For the sample configuration, a Cisco 7206 router is used to implement the FRF.8 Interworking Function (IWF) in the service provider network. The FRF.8 IWF will allow the interworking between ATM and Frame Relay services.

These Application Notes provide the configuration for the communication between an Avaya G250 Media Gateway with Frame Relay access and a Cisco Access Router with ATM access through the FRF.8 IWF. Detailed configuration for the FRF.8 Interworking Function on a Cisco 7206 Router is also provided. Standard Quality of Service features on the Cisco Access Router and Avaya G250 Media Gateway can be applied to prioritize Avaya Voice over IP traffic. QoS is not covered in these Application Notes.

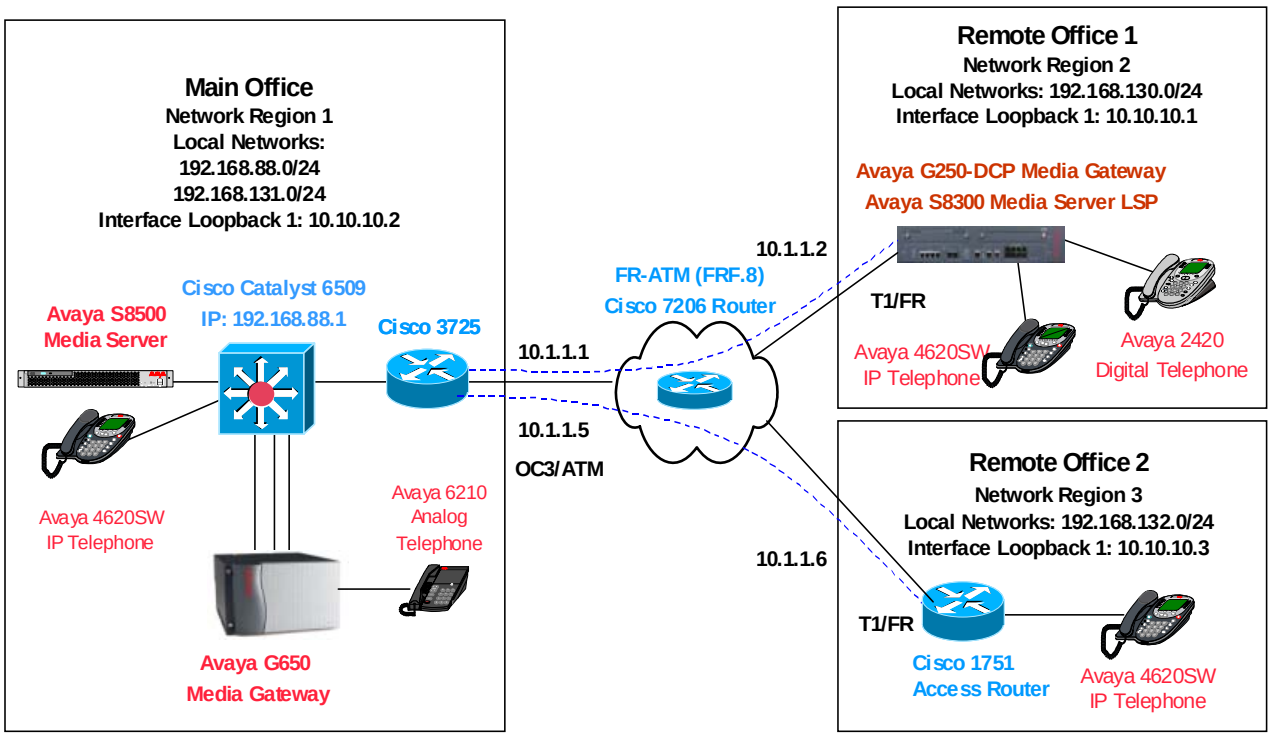


Figure 1: Network Configuration

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2 Equipment and Software Validated

Table 1 below shows the versions verified in these Application Notes.

Equipment	Software
Avaya Communication Manager Avaya S8500 Media Server Avaya S8300 Media Server LSP	 3.1 (load 626) 3.1 (load 626)
Avaya G650 Media Gateway IPSI (TN2312BP) C-LAN (TN799DP) MEDPRO (TN2302AP)	 HW12 FW021 HW01 FW016 HW11 FW108
Avaya G250-DCP Media Gateway MM340 (T1/E1) WAN Media Module	25.22.0
Avaya 4620SW IP Telephone	2.30
Avaya 2420 Digital Telephone	N/A
Avaya 6210 Analog Telephone	N/A
Cisco 7206 Router	12.2(19a)
Cisco 3725 Access Router	12.3(13a)
Cisco 1751 Access Router	12.3(8)T8

Table 1: Equipment and Software Validated

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3 Configurations

3.1 Configure the Cisco 7206 Router for the FRF.8 Frame Relay-ATM IWF

The following shows the annotated configuration on the Cisco 7206 Router. The Cisco 3725 Access Router is connected to **interface ATM 2/0** with two ATM PVCs. The Avaya G250-DCP Media Gateway is connected to **interface Serial6/0:1** and the Avaya 1751 Access Router is connected to **interface Serial6/1:1** with Frame Relay Access. The 7206 Router FRF.8 IWF is configured to connect an ATM PVC (interface/VPI/VCI) with a Frame Relay PVC (interface DLCI).

```
! --- Enable Frame Relay switching

frame-relay switching
!
! --- Configure channel-groups for Remote Office 1
! --- Configure clock source to internal

controller T1 6/0
 framing esf
 clock source internal
 linecode b8zs
 channel-group 1 timeslots 1-24
!
! --- Configure channel-groups for Remote Office 2
! --- Configure clock source to internal

controller T1 6/1
 framing esf
 clock source internal
 linecode b8zs
 channel-group 1 timeslots 1-24
!
! --- Configure ATM interface for the Cisco 3725 Router with two ATM PVCs
!
interface ATM2/0
 no ip address
 no atm ilmi-keepalive

! --- Create an ATM PVC (VPI/VCI)

 pvc 1/32

! --- ATM encapsulation must be configured to aal5mux for Frame Relay/ATM
! Service Interworking

  encapsulation aal5mux fr-atm-srv
 !
! --- Create another ATM PVC (VPI/VCI)
 pvc 1/33
```


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```
! --- ATM encapsulation must be configured to aal5mux for Frame Relay/ATM
! Service Interworking

  encapsulation aal5mux fr-atm-srv
 !
interface Serial6/0:1
 description Connect to Avaya G250-DCP Media Gateway

!--- Frame Relay encapsulation is configured to IETF

 encapsulation frame-relay IETF

! --- Configures a switched Frame Relay DLCI

 frame-relay interface-dlci 100 switched

! --- Configures Frame Relay LMI type to ansi

 frame-relay lmi-type ansi

!--- Frame Relay interface type is configured to dce (FR switching)

 frame-relay intf-type dce
!
interface Serial6/1:1
description Connect to Cisco 1751 Access Router

!--- Frame Relay encapsulation is configured to IETF

 encapsulation frame-relay IETF

! --- Configures a switched Frame Relay DLCI

 frame-relay interface-dlci 200 switched

! --- Configures Frame Relay LMI type to ansi

 frame-relay lmi-type ansi

!--- Frame Relay interface type is configured to dce (FR switching)

 frame-relay intf-type dce
!
! --- Creates a connection between the Frame Relay DLCI (Remote Office 1)
! --- and the ATM PVC (the Main Office) with the FRF.8 IWF

connect service-1 Serial6/0:1 100 ATM2/0 1/32 service-interworking
 efci-bit map-fecn
 !
! --- Creates a connection between the Frame Relay DLCI (Remote Office 2)
! --- and the ATM PVC (the Main Office) with FRF.8 IWF

connect service-2 Serial6/1:1 200 ATM2/0 1/33 service-interworking
 efci-bit map-fecn
```


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3.2 Configure the Avaya G250-DCP Media Gateway In Remote Office 1

The following screen shows the configuration of the LAN interfaces on the Avaya G250-DCP Media Gateway. VLAN 1 is associated with network 192.168.130.0/24. This is a local network used by the Avaya G250-DCP Media Gateway. Interface Loopback 1 will be used as the OSPF route-id for the OSPF configuration.

```
interface Vlan 1
 icc-vlan
 ip address 192.168.130.1   255.255.255.0
 pmi
 exit
!
interface Loopback 1
 ip address 10.10.10.1      255.255.255.255
 exit
!
```

The following shows the configuration for a WAN interface (MM340 WAN Media Module). A T1 is configured to a full T1 (24 timeslots). Sub-interface **Serial 2/1:1.1** is configured to Frame Relay IETF encapsulation and is connected to the Cisco 3725 ATM PVC (**interface ATM2/0.1** in Section 3.3) through the Cisco 7206 Router FRF.8 IWF.

```
! --- Default mode for the T1/E1 port

ds-mode t1

! --- Channel-group 1 is configured with a full T1
! --- Default clock source is from the line

controller t1 2/1
 linecode b8zs
 framing esf
 channel-group 1 timeslots 1-24 speed 64
 exit

! --- Configure Frame Relay IETF encapsulation on the main interface

interface Serial 2/1:1
 encapsulation frame-relay ietf
 exit
!
! --- Configure a sub-interface with Frame Relay IETF encapsulation

interface Serial 2/1:1.1 point-to-point
 frame-relay interface-dlci 100 ietf
 ip address 10.1.1.2        255.255.255.252
 exit
!
```


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The following shows the Open Shortest Path First (OSPF) configuration. Loopback interface 1 is configured as the OSPF router-id.

```
! --- Configure interface Loopback 1 as the OSPF route-id

ip ospf router-id 10.10.10.1

router ospf

! --- Configure Passive interface for the local network

 passive-interface Vlan 1

! --- Configure the OSPF for the Frame Relay interface

 network 10.1.1.0        0.0.0.3         area 0.0.0.0

! --- Configure the OSPF for Interface Loopback 1

 network 10.10.10.1      0.0.0.0         area 0.0.0.0

! --- Configure the OSPF for a local network

 network 192.168.130.0   0.0.0.255       area 0.0.0.0

! --- Configure the MGC list to the C-LAN IP 192.168.88.22 on the Avaya G650
! --- Media Gateway in the Main Office and the Avaya S8300 Media Server LSP
! --- IP 192.168.130.2

 set mgc list 192.168.88.22,192.168.130.2
```


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3.3 Configure the Cisco 3725 Access Router In the Main Office

The following shows the annotated configuration on the Cisco 3725 Access Router. Two point-to-point ATM PVCs are configured on the Cisco 3725 Access Router. One PVC is associated with the Avaya G250-DCP Media Gateway and another PVC is associated with the Cisco 1751 Access Router through the Cisco 7206 Router FRF.8 IWF.

```
! --- Configure interface Loopback 1

interface Loopback1
 ip address 10.10.10.2 255.255.255.0
!
! --- Configure interface FastEthernet 0/0 (a local network)

interface FastEthernet0/0
 ip address 192.168.131.1 255.255.255.0
 duplex auto
 speed auto
!
! --- Configure interface FastEthernet 0/1 (a local network)

interface FastEthernet0/1
 ip address 192.168.88.4 255.255.255.0
 duplex auto
 speed auto
!
! --- Main ATM interface 2/0

interface ATM2/0
 no ip address
 no atm ilmi-keepalive
!
! --- Configure ATM sub-interface with the Cisco 7206 Router

interface ATM2/0.1 point-to-point
 ip address 10.1.1.1 255.255.255.252
 pvc 1/32

! --- Configure ATM encapsulation to aal5snap, which is compatible with the
! --- aal5mux encapsulation on the Cisco 7206 Router

  encapsulation aal5snap
 !
! --- Configure ATM sub-interface with the Cisco 7206 Router

interface ATM2/0.2 point-to-point
 ip address 10.1.1.5 255.255.255.252
 pvc 1/33

! --- Configure ATM encapsulation to aal5snap, which is compatible with the
! --- aal5mux encapsulation on the Cisco 7206 Router

  encapsulation aal5snap
```


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```
! --- Configure the OSPF routing protocol

router ospf 1

! --- Configure interface Loopback 1 as the OSPF route-id

 router-id 10.10.10.2
 log-adjacency-changes

! --- Configure the OSPF for the ATM sub-interface with the Avaya G250-DCP
! --- Media Gateway

 network 10.1.1.0 0.0.0.3 area 0

! --- Configure the OSPF for the ATM sub-interface with the Cisco 1751
! --- Access Router

 network 10.1.1.4 0.0.0.3 area 0

! --- Configure the OSPF for interface Loopback 1

 network 10.10.10.2 0.0.0.0 area 0

! --- Configure OSPF for the local networks

 network 192.168.88.0 0.0.0.255 area 0
 network 192.168.131.0 0.0.0.255 area 0
!
! --- Configure the default route

ip route 0.0.0.0 0.0.0.0 192.168.88.1
```


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3.4 Configure the Cisco 1751 Access Router In Remote Office 2

The following shows the annotated configuration on the Cisco 1751 Access Router. A T1 is configured to a full T1 (24 timeslots). Sub-interface **Serial 0/0.1** is configured to Frame Relay IETF encapsulation and is connected to the Cisco 3725 ATM PVC (**interface ATM2/0.2** in Section 3.3) through the Cisco 7206 Router FRF.8 IWF.

```
! --- Configure interface Loopback 1

interface Loopback1
 ip address 10.10.10.3 255.255.255.0
!
! --- Configure interface FastEthernet 0/0 (a local network)

interface FastEthernet0/0
 ip address 192.168.132.1 255.255.255.0
 speed auto
!
! --- Configure the main interface

interface Serial0/0
 no ip address

! --- Configure Frame Relay encapsulation to IETF

 encapsulation frame-relay IETF

! --- Configure T1 to a full T1 (24 timeslots)

 service-module t1 timeslots 1-24

! --- Configure FR LMI type to match the service provider's configuration

 frame-relay lmi-type ansi

! ---Configure the sub-interface (point-to-point) with the Cisco 7206 Router

interface Serial0/0.1 point-to-point

! --- Configure the IP address for the sub-interface (point-to-point)

 ip address 10.1.1.6 255.255.255.252

! --- Disable OSPF MTU mismatch detection so that the OSPF neighbor can be
! --- formed with the Cisco 3725 Access Router.

 ip ospf mtu-ignore

! --- Configure the interface DLCI for the sub-interface

 frame-relay interface-dlci 200
!
```


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```
! --- Configure the OSPF routing protocol

router ospf 1

! --- Configure interface Loopback 1 as the OSPF route-id

 router-id 10.10.10.3
 log-adjacency-changes

! --- Configure the OSPF for the Frame Relay PVC with the Cisco 3725
! --- Access Router in the Main Office

 network 10.1.1.4 0.0.0.3 area 0

! --- Configure the OSPF for interface loopback 1

 network 10.10.10.3 0.0.0.0 area 0

! --- Configure the OSPF for the local networks

 network 192.168.132.0 0.0.0.255 area 0
!
ip classless
no ip http server
no ip http secure-server
```


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4 Verification

4.1 Verify FRF.8 Operation on the Cisco 7206 Router

Use the command **show connection all** on the Cisco 7206 Router to display all connections and status.

```
C7206#show connection all

ID   Name               Segment 1            Segment 2           State
=====================================================================
1    service-1         Serial6/0:1 100      ATM2/0 1/32          UP
2    service-2         Serial6/1:1 200      ATM2/0 1/33          UP
```

Use the command **show connection name <connection name>** for detailed configuration and status. The following shows that a FR/ATM FRF.8 connection is configured between Serial 6/0:1 with DLCI 100 (to Remote Office 1) and ATM 2/0 with VPI 1 and VCI 32 (to the Main Office). The service status is up.

```
C7206#show connection name service-1

FR/ATM Service Interworking Connection: service-1
  Status    - UP
  Segment 1 - Serial6/0:1 DLCI 100
  Segment 2 - ATM2/0 VPI 1 VCI 32
Interworking Parameters -
    service translation
    efci-bit map-fecn
    de-bit map-clp
    clp-bit map-de
```

The following shows that a FR/ATM FRF.8 connection is configured between Serial 6/1:1 with DLCI 200 (to Remote Office 2) and ATM 2/0 with VPI 1 and VCI 33 (to the Main Office). The service status is up.

```
C7206#show connection name service-2

FR/ATM Service Interworking Connection: service-2
  Status    - UP
  Segment 1 - Serial6/1:1 DLCI 200
  Segment 2 - ATM2/0 VPI 1 VCI 33
Interworking Parameters -
    service translation
    efci-bit map-fecn
    de-bit map-clp
    clp-bit map-de
```


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4.2 Verify the ATM Operation on the Cisco 3725 Access Router In the Main Office

Use the command **show atm PVC** to show the ATM PVC configuration and status on the Cisco 3725 Access Router.

```
C3725-MAIN#show atm  pvc
           VCD /                                        Peak  Avg/Min Burst
Interface  Name         VPI   VCI  Type   Encaps   SC   Kbps   Kbps   Cells  Sts
2/0.1      1              1    32  PVC    SNAP     UBR  155000                UP
2/0.2      2              1    33  PVC    SNAP     UBR  155000                UP
```

Use the command **show atm PVC <VPI/VCI>** to show the detailed configuration and status for an ATM PVC. The following shows the output for the ATM PVC 1/32.

```
C3725-MAIN#show atm pvc 1/32
Description: N/A
ATM2/0.1: VCD: 1, VPI: 1, VCI: 32
UBR, PeakRate: 155000 (365567 cps)
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0, Encapsize: 12
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 VC Status: Not Managed
ILMI VC status: Not Managed
InARP frequency: 15 minutes(s)
Transmit priority 4
InPkts: 481829, OutPkts: 487635, InBytes: 37427870, OutBytes: 41001090
InPRoc: 123654, OutPRoc: 123508
InFast: 358175, OutFast: 364127, InAS: 0, OutAS: 0
InPktDrops: 0, OutPktDrops: 0/0/0 (holdq/outputq/total)
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0, LengthViolation: 0,
CPIErrors: 0

Out CLP=1 Pkts: 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
```


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4.3 Verify Frame Relay Operation on the Avaya G250-DCP Media Gateway and the Cisco 1751 Access Router in the Remote Offices

Use the command **show frame-relay PVC** to show the Frame Relay PVC configuration and status on the Avaya G250-DCP Media Gateway. **PVC STATUS** must be **ACTIVE** for successful communication with the Cisco 3725 Access Router in the Main Office.

```
G250-R01-001(super)# show frame-relay pvc
Showing 1 PVC
PVC Statistics for interface Serial 2/1:1 (Frame Relay DTE)

              Active     Inactive      Deleted       Static
  Local          1            0            0            0
  Unused         0            0            0            0

DLCI =  100, USAGE = LOCAL   , PVC STATUS = ACTIVE, INTERFACE = Serial
2/1:1.1
             ROLE  = Primary , PRIORITY CLASS = None

  input pkts     485842,  output pkts    479922,  dropped pkts        0
  in bytes     38914206,  out bytes    33446110
  in FECN pkts        0
  in BECN pkts        0
  in DE pkts          0,  out DE pkts         0
  pvc create time 8d5h,  last time pvc status changed 8d5h
```

The following screen shows the output from the Cisco 1751 Access Router.

```
C1751-RO2#show frame-relay pvc

PVC Statistics for interface Serial0/0 (Frame Relay DTE)

              Active     Inactive      Deleted       Static
  Local          1            0            0            0
  Switched       0            0            0            0
  Unused         0            0            0            0

DLCI = 200, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0/0.1

  input pkts 137426        output pkts 136447       in bytes 13212814
  out bytes 14393219       dropped pkts 0           in pkts dropped 0
  out pkts dropped 0                 out bytes dropped 0
  in FECN pkts 0           in BECN pkts 0           out FECN pkts 0
  out BECN pkts 0          in DE pkts 0             out DE pkts 0
  out bcast pkts 136367    out bcast bytes 14378693
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
```


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4.4 Verify Voice Over IP Operation

Verify that the Avaya S8300 Media Server LSP and the Avaya G250-DCP Media Gateway in Remote Office 1 can register to Avaya Communication Manager in the Main Office. Make a phone call between any two offices, and verify that the call can get through with good quality.

Log in to the System Access Terminal (SAT) of the Avaya S8500 Media Server in the Main Office, and use the command **save translation lsp**. Verify that the translation file can be transferred successfully to the Avaya S8300 Media Server LSP in Remote Office 1.

Based on the sample configuration, a call can be made successfully between any two offices with good quality. The Avaya S8300 Media Server LSP and the Avaya G250-DCP Media Gateway can register to Avaya Communication Manager in the Main Office successfully.

5 Observations

Based on the sample configuration, IETF Frame Relay encapsulation must be configured on the Avaya G250 Media Gateway and Cisco 1751 Access Router in the remote offices for successful communication with the Cisco 3725 Access Router in the Main Office. Check service providers for the support of non-IETF Frame Relay encapsulation through the FRF.8 Service Interworking if needed.

Check the service provider for Frame Relay Fragmentation support through FRF.8 IWF. Based on the sample configuration, the Cisco 7206 Router does not support fragmented Frame Relay frame for the FRF.8 IWF.

The compressed Real Time Protocol (cRTP) feature is not supported on the ATM interface (ATM layer) of the Cisco 3725 Cisco Access Router in the Main Office. For the sample configuration, cRTP cannot be used between the remote offices and the Main Office.

6 Conclusion

As illustrated in these Application Notes, the Avaya G250 Media Gateway with Frame Relay access can communicate with a Cisco Access Router with an ATM access through the FRF.8 Frame Relay-ATM IWF configured on a Cisco Router. Since cRTP is an endpoint-to-endpoint feature, the cRTP feature cannot be used if either endpoint does not support it.

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