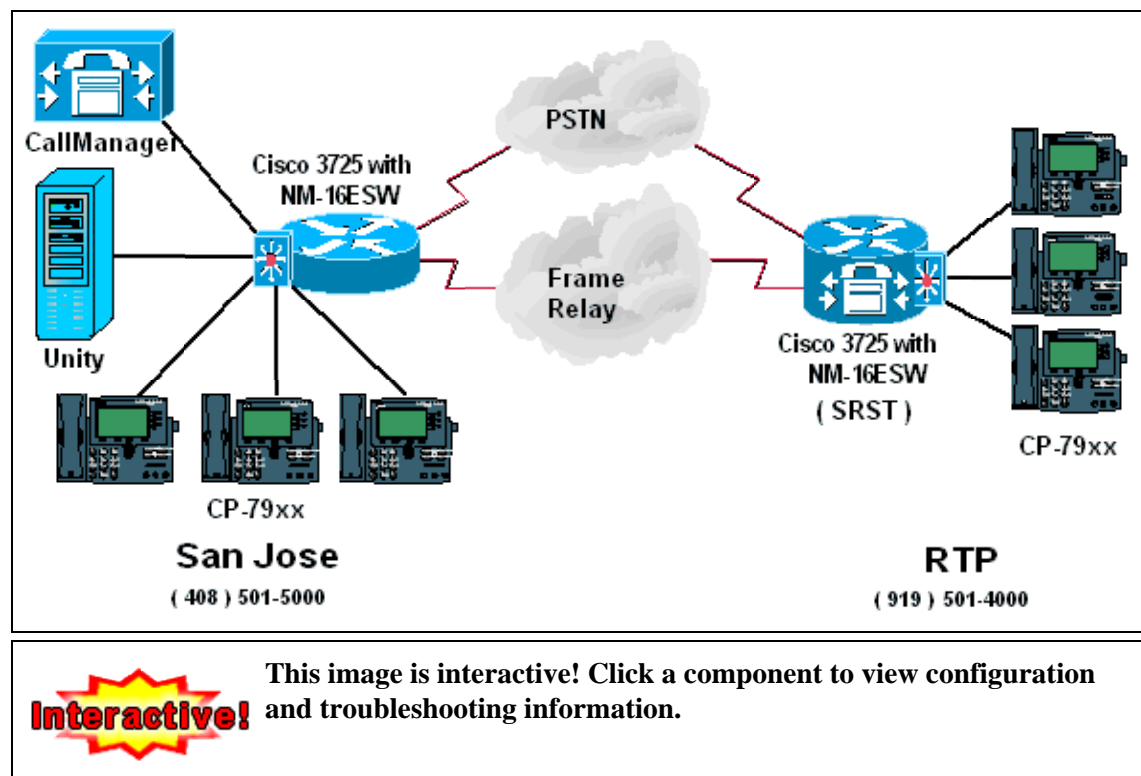


# Quality of Service Interactive Voice Network Configuration Example

Document ID: 82059

## Introduction

This series of interactive documents uses a typical head office and branch office in order to demonstrate some common voice network configurations. This interactive diagram allows you to view network configurations:



Refer to Unified CallManager Interactive Voice Network Configuration and Troubleshooting Case Study for requirements assumed by this series of interactive documents.

## Configure

This configuration assumes that the Frame Relay PVC between the San Jose head office and RTP remote office is 256Kbps. The requirement for voice is to guarantee 2 x G.729 calls across the Frame Relay circuit even at times of traffic congestion.

This configuration example follows the recommendations stated in the *Network Infrastructure* chapter in Cisco Unified Communications SRND Based on Cisco Unified CallManager 4.x and the *WAN Aggregator* section of the Enterprise QoS Solution Reference Network Design Guide Version 3.3, as well as the Branch Router QoS design.

The parameters in this section are used based on Cisco's best practices in the SRNDs. For more information, refer to table 3-1 in the *WAN Aggregator* section of the Enterprise QoS Solution Reference Network Design Guide Version 3.3.

## For slow-speed (768 kbps) Frame Relay links:

FRF.12 with Fragment size of 320 Bytes  
Enable cRTP (Real-time Transport Protocol Header Compression)

### This example uses this configuration:

```
Link Speed 256Kbps
CIR = 95% of PVC speed = 243200bps
BC = 2432 Bits per Tc
Frame Relay Traffic Shaping
LLQ or Low Latency Queuing
```

**Note:** Locations-based CAC does not take into account bandwidth used by multicast MOH. Therefore, if you provision CAC for 2 x G.729 calls and have placed two calls over the WAN, multicast MOH is still permitted over the WAN. This will result potentially in poor audio quality for your existing calls. In order to prevent this from happening, make sure you provision extra bandwidth for each multicast session over the WAN. For more information, refer to the *Call Admission Control* and the *Music on Hold* sections in Cisco Unified Communications SRND Based on Cisco Unified CallManager 4.x.

Use the Voice Codec Bandwidth Calculator (registered customers only) for 2 x G.729 calls with Frame Relay and cRTP our total bandwidth required is 24.36 kbps. An additional multicast stream requires 36.54 Kbps for the priority queue. Take into account an additional multicast stream brings up the total bandwidth required to 36.54 Kbps for the priority queue. Make this 50Kbps since it is still less than 33% of the total bandwidth of 256Kbps. (The recommendation for voice traffic in the priority queue should not exceed 33% of the total bandwidth.)

With regard to other traffic queues, use 8 kbps for signaling, as stated in the SRND recommendation for calls less than 10, and the remainder of the traffic is placed in weighted fair queue.

## San Jose Router

```
hostname SanJose

!
!--- Refer to the Network Infrastructure chapter in the SRND
class-map match-all ctraffic !--- Match voice signaling for DSCP 24 and 26
match ip dscp cs3 af31
class-map match-all vtraffic !--- Match voice bearer traffic for DSCP ef
match ip dscp EF
!
!
policy-map Voice
class vtraffic
priority 50
compress header ip rtp !--- Header compression
class ctraffic
bandwidth 8
class class-default
fair-queue
policy-map Shape
class class-default
shape average 243200 2432 0
service-policy Voice

interface Serial2/1:0
no ip address
ip pim sparse-dense-mode
encapsulation frame-relay
```

```

frame-relay intf-type dce
!
interface Serial2/1:0.100 point-to-point
ip address 192.168.10.1 255.255.255.0
ip pim sparse-dense-mode
frame-relay class FRTStoRTP
frame-relay interface-dlci 100

map-class frame-relay FRTStoRTP
frame-relay fragment 320
service-policy output Shape
!

```

## RTP Router

```

hostname RTP

!
!--- Refer to the Network Infrastructure chapter in the SRND
class-map match-all ctraffic !--- Match voice signaling for DSCP 24 and 26
match ip dscp cs3 af31
class-map match-all vtraffic !--- Match voice bearer traffic for DSCP ef
match ip dscp EF

policy-map Voice
class vtraffic
priority 50
compress header ip rtp !--- Header compression
class ctraffic
bandwidth 8
class class-default
fair-queue
policy-map Shape
class class-default
shape average 243200 2432 0
service-policy Voice

map-class frame-relay FRTStoSJ
frame-relay fragment 320
service-policy output Shape

```

## Verify

Use these commands in order to verify your configuration:

```

RTP#show frame-relay fragment
interface dlci frag-type size in-frag out-frag dropped-frag

Se0/1:0.100 100 end-to-end 320 1209 0 0

```

```

RTP#show policy-map
Policy Map Shape
Class class-default
Traffic Shaping
Average Rate Traffic Shaping
CIR 243200 (bps) Max. Buffers Limit 1000 (Packets)
Bc 2432 Be 0
service-policy Voice

```

```

Policy Map Voice
Class vtraffic

```

```
Strict Priority
Bandwidth 50 (kbps) Burst 1250 (Bytes)
compress:
header ip rtp
Class ctraffic
Bandwidth 8 (kbps) Max Threshold 64 (packets)
Class class-default
Flow based Fair Queueing
Bandwidth 0 (kbps) Max Threshold 64 (packets)
```

**RTP#show policy-map interface**

Serial0/1:0.100: DLCI 100 -

Service-policy output: Shape

```
Class-map: class-default (match-any)
51000 packets, 3259829 bytes
5 minute offered rate 26000 bps, drop rate 0 bps
Match: any
Traffic Shaping
Target/Average Byte Sustain Excess Interval Increment
Rate Limit bits/int bits/int (ms) (bytes)
243200/243200 304 2432 0 10 304
```

```
Adapt Queue Packets Bytes Packets Bytes Shaping
Active Depth Delayed Delayed Active
- 0 51000 1613958 1 64 no
```

Service-policy : Voice

```
Class-map: vtraffic (match-all)
43343 packets, 2773952 bytes
5 minute offered rate 26000 bps, drop rate 0 bps
Match: ip dscp ef (46)
Queueing
Strict Priority
Output Queue: Conversation 40
Bandwidth 50 (kbps) Burst 1250 (Bytes)
(pkts matched/bytes matched) 43474/1131487
(total drops/bytes drops) 0/0
compress:
header ip rtp
UDP/RTP (compression on, Cisco, RTP)
Sent: 43474 total, 43448 compressed,
1650849 bytes saved, 957591 bytes sent
2.72 efficiency improvement factor
99% hit ratio, five minute miss rate 0 misses/sec, 1 max
rate 17000 bps
```

```
Class-map: ctraffic (match-all)
3767 packets, 202414 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: ip dscp cs3 (24) af31 (26)
Queueing
Output Queue: Conversation 41
Bandwidth 8 (kbps) Max Threshold 64 (packets)
(pkts matched/bytes matched) 3768/202484
(depth/total drops/no-buffer drops) 0/0/0
```

```
Class-map: class-default (match-any)
3890 packets, 283463 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: any
Queueing
Flow Based Fair Queueing
```

Maximum Number of Hashed Queues 32  
(total queued/total drops/no-buffer drops) 0/0/0  
RTP#

---

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