



## Configuration Tasks

This section describes how to configure VoFR, including the Cisco implementations for FRF.11 and FRF.12. The following major tasks are covered and are divided into the following sections:

- Configuration Tasks, page 1
- Preliminary Frame Relay Configuration for Voice, page 1

This section specifically describes the commands to configure VoFR applications. It is assumed you have already configured your Frame Relay backbone network, including the map class and the LMI. For more information about Frame Relay configuration, see the *Wide-Area Networking Configuration Guide*.

## Preliminary Frame Relay Configuration for Voice

This section describes preliminary Frame Relay configuration tasks that are necessary to support VoFR:

- Configuring a Map Class to Support Voice over Frame Relay, page 1
- Verifying Your Frame Relay Configuration, page 6

## Configuring a Map Class to Support Voice over Frame Relay

Before configuring a Frame Relay DLCI for voice traffic, you must create a Frame Relay map class and configure it to support voice traffic. Configuring a Frame Relay map class is required because the voice bandwidth and fragmentation size attributes are configured on the map class. These attributes are required for sending voice traffic on the PVC.

This section is divided into the following procedures:

- Configure a Frame Relay Map Class to Support Voice Traffic (Required), page 2
- Configure a Frame Relay Map Class to Support FRF.12 Fragmentation (Required), page 4

A map class applies to a single DLCI or to a group of DLCIs, depending on how the class has been applied to the virtual circuit. If you have a large number of PVCs to configure, you can assign the PVCs the same traffic-shaping properties without statically defining the values for each PVC. You can create multiple map classes with different variables for each map class.

## Configure a Frame Relay Map Class to Support Voice Traffic (Required)

To configure a Frame Relay map class to support voice traffic on a single DLCI or a group of DLCIs, use the following commands, beginning in global configuration mode:

	Command	Purpose
Step 1	<code>router(config)# map-class frame-relay map-class-name</code>	Create a map-class name you will assign to a group of PVCs. The map-class name must be unique.
Step 2	<code>router(config-map-class)# frame-relay voice bandwidth bps reserved</code>	(FRF.11 only) Sets the bandwidth (in kpbs) reserved for voice traffic. This amount determines the number of voice calls allowed on the DLCIs associated with this map class. Set this value to no higher than the minimum CIR if you want to preserve voice quality when a burst is being transmitted. The valid range is from 8000 to 45,000,000 bps.  This command must be configured for voice calls to take place. The default for this command is 0, which disables all voice calls.

To configure the map class to support FRF.12 fragmentation, see the “Configure a Frame Relay Map Class to Support FRF.12 Fragmentation (Required)” section on page 4. To configure the map class to support traffic shaping if you want to send both voice traffic and data traffic on the same PVC, see the “Configure a Service Policy for Traffic-Shaping Parameters for Use on a Map Class (Optional)” section on page 4.

### Calculating Voice Bandwidth for FRF.11

The **frame-relay voice-bandwidth** map-class command is used to configure how much bandwidth is reserved for voice traffic. If not enough reserved voice bandwidth remains on the PVC, then any new call attempted will be rejected.

When you consider the amount of voice bandwidth to allocate to voice, your overall bandwidth calculation must include the voice packetization overhead and not just the raw compressed speech codec bandwidth. For VoFR voice packets, there are a total of 6 or 7 bytes total overhead per packet (including standard Frame Relay headers and flags). For subchannels (CIDs) less than number 64, the overhead is 6 bytes. For subchannels greater than or equal to number 64, the overhead is 7 bytes. Add one additional byte if voice sequence numbers are enabled in the voice packets.

To determine the required voice bandwidth, use the following calculation:

$$\text{required\_bandwidth} = \text{codec\_bandwidth} * (1 + \text{overhead}/\text{payload\_size})$$

This calculation addresses the amount of bandwidth consumed on the physical network interface. This does not necessarily represent the amount of connection bandwidth used within the Frame Relay network itself, which may be higher because of the overhead of switching small packets.

When using 30-millisecond duration voice packets, an approximate rule of thumb is to add 2000 bps overhead to the raw voice compressed speech codec rate. With the 32 kbps G.726 ADPCM speech coder, a 30-millisecond speech frame uses 120 bytes voice payload plus 6 to 7 bytes overhead, and the overall bandwidth requirement is around 34 kbps for each call.

The **codec** command is configured as part of the dial peer configuration procedures in the Appendix section of this document.

## Configure a Frame Relay Map Class to Support Voice over Frame Relay/FRF.11 Fragmentation (Required)

To configure the map class to support FRF.11, use the following commands to configure a service policy and apply this service policy in map-class configuration mode:

	Command	Purpose
Step 1	<code>router(config)# <b>class-map</b> <i>class-map-name</i></code>	Creates a class map that will be assigned to a group of PVCs. The map class name must be unique.
Step 2	<code>router(config-class-map)# <b>match protocol</b> <i>vofr</i></code>	Specifies Voice over Frame Relay packets as a matching criterion.
Step 3	<code>router(config-class-map)# <b>exit</b></code>	Exits class map configuration mode.
Step 4	<code>router(config)# <b>policy-map</b> <i>policy-map-name</i></code>	Specifies the name of the service policy to configure.
Step 5	<code>router(config-pmap-c)# <b>class</b> <i>class-map-name</i></code>	Specifies the name of a predefined class, which was defined with the <b>class-map</b> command, included in the service policy. In this particular example, the <i>class-map-name</i> might have been specified in Step 1.
Step 6	<code>router(config-pmap-c)# <b>priority</b> <i>kpbs</i></code>	Specifies the guaranteed allowed bandwidth (in kbps) for priority traffic.
Step 7	<code>router(config-pmap-c)# <b>exit</b></code>	Exits policy map class configuration mode.
Step 8	<code>router(config-pmap)# <b>exit</b></code>	Exits policy map configuration mode.
Step 9	<code>router(config)# <b>map-class frame-relay</b> <i>map-class-name</i></code>	Creates a map class name that will be assigned to a group of PVCs. The map class name must be unique.
Step 10	<code>router(config-map-class)# <b>frame-relay fragment</b> <i>fragment-size</i></code>	Configures Frame Relay fragmentation for the map class. The <i>fragment_size</i> defines the payload size of a fragment, and excludes the Frame Relay headers and any Frame Relay fragmentation header. The valid range is from 16 to 1600 bytes, and the default is 53.  The <i>fragment_size</i> should be less than or equal to the MTU size.  Set the fragmentation size such that the largest data packet is not larger than the voice packets.
Step 11	<code>router(config-map-class)# <b>service-policy</b> <i>output policy-map-name</i></code>	Specifies the name of the service policy to be attached to the interface.

## Configure a Frame Relay Map Class to Support FRF.12 Fragmentation (Required)

To configure the map class to support FRF.12 fragmentation, use the following command in map-class configuration mode:

```
router(config-map-class)# frame-relay fragment fragment_size
```

This command configures Frame Relay fragmentation for the map class. The *fragment\_size* defines the payload size of a fragment, and excludes the Frame Relay headers and any Frame Relay fragmentation header. The valid range is from 16 to 1600 bytes, and the default is 53.

The *fragment\_size* should be less than or equal to the MTU size.

Set the fragmentation size such that the largest data packet is not larger than the voice packets.

To configure the map class to support traffic shaping if you want to send both voice traffic and data traffic on the same PVC, see the next section, “Configure a Service Policy for Traffic-Shaping Parameters for Use on a Map Class (Optional)” section of this document.

## Configure a Service Policy for Traffic-Shaping Parameters for Use on a Map Class (Optional)

When you configure a Frame Relay PVC to support voice traffic, you must ensure that the carrier can accommodate the traffic rate or profile transmitted on the PVC. If too much traffic is sent at once, the carrier might discard frames, which causes disruptions to real-time voice traffic. The carrier might also deal with traffic bursts by queuing up the bursts and delivering them at a metered rate. Excessive queuing also causes disruption to real-time voice traffic.

To compensate for this condition, traffic shaping is required if you are sending both voice traffic and data traffic over the same PVC.



### Note

When you configure the outgoing Excess Burst size, the Committed Burst size, and the committed information rate (CIR) values, obtain the appropriate values from your carrier. The values configured on the router must match those of the carrier. Traffic shaping is necessary to prevent your carrier from discarding Discard Eligible (DE) bits on ingress or to prevent excessive burst data from affecting voice quality.

Use the following commands to configure shaping parameters for Cisco 7500 routers with a VIP:

	Command	Purpose
Step 1	Router(config)# <b>policy-map</b> <i>policy-name</i>	Specifies the name of the service policy to be created.
Step 2	Router(config-pmap)# <b>class</b> <b>class-default</b>	Specifies the name of the default class to configure. Although the default class is not required to configure traffic-shaping parameters, Cisco Systems highly recommends that you configure traffic shaping on the default class.
Step 3	Router(config-pmap-c)# <b>shape</b> { <b>average</b>   <b>peak</b> } <i>mean-rate</i> [ <i>burst-size</i> [ <i>excess-burst-size</i> ]]	Shapes traffic to the indicated bit rate according to the algorithm specified.
Step 4	router(config-pmap-c)# <b>exit</b>	Exits policy map class configuration mode.
Step 5	router(config-pmap)# <b>exit</b>	Exits policy map configuration mode.

	Command	Purpose
Step 6	<code>router(config)# map-class frame-relay map-class-name</code>	Creates a map-class name you will assign to a group of PVCs. The map-class name must be unique.
Step 7	<code>router(config-map-class)# service-policy output policy-map-name</code>	Specifies the name of the service policy to be attached to the interface. In this particular example, the name of the service policy was specified in Step 1.

For additional information on the **shape** command, see the *Distributed Traffic Shaping* feature module on CCO.

If your shape configuration is complete, see the “Verifying Your Frame Relay Configuration” section on page 6. To begin your dial peer configuration, see Appendix section of this document.

## Creating a Service Policy for FRF.11 and FRF.12 (Optional)

To create a service policy for FRF.11 and FRF.12, enter the following commands:

	Command	Purpose
Step 1	<code>Router(config)# class-map class-name</code>	Specifies the name of the traffic class to configure.
Step 2	<code>Router(config-cmap)# match match-criterion</code>	Specifies the match criterion. IP precedence matching is the most commonly used match criterion for FRF.12. For FRF.11, the <b>match protocol vofr</b> command is the required match criterion.
Step 3	<code>Router(config-cmap)# exit</code>	Exits class map configuration mode.
Step 4	<code>Router(config)# policy-map policy-name</code>	Specifies the name of the service policy to configure.
Step 5	<code>Router(config-pmap)# class class-name</code>	Specifies the name of a predefined class, which was defined with the <b>class-map</b> command, included in the service policy. In this example, the class-name was defined in Step 1.
Step 6	<code>Router(config-pmap-c)# priority bandwidth</code>	Reserves a priority queue for CBWFQ traffic. For information on the <b>priority</b> command, see the <i>Low Latency Queueing for the Versatile Interface Processor</i> document on CCO.
Step 7	<code>Router(config-pmap-c)# exit</code>	Exits policy map class configuration mode.
Step 8	<code>Router(config-pmap)# exit</code>	Exits policy map configuration mode.
Step 9	<code>Router(config)# policy-map policy-name</code>	Specifies the name of the service policy to configure.
Step 10	<code>Router(config-pmap)# class class-name</code>	Specifies the name of a predefined class, which was defined with the <b>class-map</b> command, included in the service policy. In this example, the class-name was defined in step 1.

	Command	Purpose
Step 11	Router(config-pmap-c)# <b>shape</b> { <b>average</b>   <b>peak</b> } <i>mean-rate</i> [ <i>burst-size</i> [ <i>excess-burst-size</i> ]]	Shapes traffic to the indicated bit rate according to the algorithm specified.
Step 12	Router(config-pmap-c)# <b>service-policy</b> <i>policy-name</i>	Specifies the name of a previously configured service policy to use in the new service policy. For purposes of FRF.11 and FRF.12, the policy-name is specified in Step 10.
Step 13	Router(config-pmap-c)# <b>exit</b>	Exits policy map class configuration mode.
Step 14	Router(config-pmap)# <b>exit</b>	Exits policy map configuration mode.
Step 15	router(config)# <b>map-class frame-relay</b> <i>map-class-name</i>	Creates a map class name you will assign to a group of PVCs. The map class name must be unique.
Step 16	Router(map-class)# <b>service-policy</b> [ <b>input</b>   <b>output</b> ] <i>policy-map-name</i>	Specifies the name of the service policy to be attached to the interface.

## Verifying Your Frame Relay Configuration

You can check the validity of your Frame Relay configuration by performing the following tasks:

- To show the status of your PVCs, use the **show frame-relay pvc** command.
- To show statistics and information on the open subchannels, use the **show frame-relay vofr** *[[interface] [dlci/cid]]* command.
- To show the Frame Relay fragmentation configuration, use the **show frame-relay fragment** *[interface number [dlci]]* command.
- If you are using Frame Relay traffic shaping, use the **show policy-map interface** command to display the traffic-shaping information.