MiVoice 5000 – CAC management

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AMT/PTD/PBX/0019/6/0/EN

OPERATING MANUAL

Mitel®

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CONTENTS

1 ABOUT THIS DOCUMENT

1.1 PURPOSE OF THIS DOCUMENT

This document describes how to program the call admission control (CAC) function and the geographic location of IP terminals.

1.2 SCOPE OF THIS DOCUMENT

This document is applicable to MiVoice 5000 series Mitel PBXs: XS, XL, XD, and to MiVoice 5000 Server as of software release R5000.1.

1.3 NEW FEATURES BROUGHT IN BY R5.4 SP1

To facilitate the use of video on the client network, MiVoice 5000 offers in this release the possibility to manage the bandwidth used by video calls.

Video flows can now be managed by CAC; this consists in:

- Taking account of the dynamic bandwidth which may be used by the terminals
- Choosing a video data rate while setting up video calls

Making available from Web Admin:

  - The CAC configuration, including video (maximum video bandwidth per internal call, external call to the IP subnet, total bandwidth for all the internal and external calls to the IP subnet)
  - Traffic display

- The return of alarms concerning terminals not assigned to any IP subnet.

1.4 NEW FEATURES BROUGHT IN BY R5.4 SP2

For contexts associated with BTIP needs and BluStar community, the CAC service has been improved and can now make some bandwidth-related checks during video and audio flow separation.

The improvements also concern the notion of transit class for data rate management on VPN and SBC.

1.5 TERMINOLOGY

1.5.1 DEFINITIONS

Centre

A centre is made up of a group of sites. The centre to which each site belongs is mentioned (maximum number of centres = 62).

CAC Centre

A CAC centre is a set of sites grouped together into one or more centres with no IP data rate restriction between them. By convention, the number of the CAC centre is that of the centre where the main CAC server is located (a CAC centre is also referred to as "CAC community", see Section 1.6, document [6]).

CAC Class

A CAC class represents one or more IP subnets belonging to the same centre.

Multi-site network

A multi-site network is made up of a group of interconnected sites which form a single virtual system.

Multi-centre network

A multi-centre network consists of several interconnected centres. This network has two architectural levels:

- One multi-site architecture linking the sites of a centre
- One multi-centre architecture linking the centres together.

Site

A local or remote site comprises one iPBX (the maximum number of sites is 99).

IP subnet

The IP network is divided into IP subnets so that flow restrictions between the various subnets can be defined and so that IP terminals can be located geographically when making emergency calls.

1.5.2 ABBREVIATIONS

Mitel 5000 Gateways	This term refers to all XS, XL and XD PBXs.
MiVoice 5000 Server	Telephone switching system hosted by a PC running with Linux Redhat or Centos
XS, XL, XD	MiVoice 5000 series physical gateways.
XS	This term includes XS, XS12 and XS6 systems
MiVoice 5000 Manager or M7450	Systems management centre
CAC:	Call Admission Control
IP:	Internet Protocol
LAN:	Local Area Network
iPBX:	IP Private Branch eXchange
MMC:	Man Machine Command, the commands of an iPBX
SBC	Server Base Computing
VPN	Virtual Private Network
WAN:	Wide Area Network

1.6 REFERENCE DOCUMENTS

- MiVoice 5000 Web Admin XD-XL-XS-XS12-MiVoice 5000 Server Operating manual - **AMT/PTD/PBX/0080/EN**
- Multi-site management - **AMT/PTD/PBX/0081/EN**
- MiVoice 5000 Manager Installation Manual - **AMT/PTD/NMA/0040/EN**
- MiVoice 5000 Manager User Manual - **AMT/PTD/NMA/0040/EN**

1.7 REMINDER CONCERNING THE LAW ON INFORMATION TECHNOLOGY

The user is reminded that the use of PBXs in the workplace must comply with the recommendations of the IT law in force.

The user's attention is also drawn to any clauses applicable in laws relating to the confidentiality of calls transmitted by means of telecommunications.

2 GENERAL INFORMATION

The CAC interface offers two distinct services:

- Call admission control
- Geographic location of IP terminals.

2.1 CALL ADMISSION CONTROL

On an IP network, audio and video calls are set up via IP.

If the IP network, to which the devices used to implement telephony over IP are connected, contains some sections with a limited bandwidth (for example WAN access via some routers), it is impossible to guarantee a proper operation of the system.

In fact, if too many calls are set up, the available bandwidth will not be enough, compared to the necessary data rate, and the calls will be disrupted by this overload.

This is why a bandwidth control system has been created in the iPBXs to reject the setting up of new calls and, thus, guarantee the quality of calls set up already.

The principle of call admission control is based on the notions of centre and CAC classes.

CAC manages inter-centre link data rates, but to allow full call management and take into account the calls set up on the same centre, the notion of CAC class is defined.

A CAC class represents a group of IP subnets (group of subscribers) belonging to the same centre. A CAC centre may contain several multi-site PBX centres.

A certain data rate is assigned to each CAC class, thereby allowing call control between devices belonging to different classes.

Three configurations are possible:

- **Multi-class (intra-centre) configuration**: if the call concerns two devices belonging to the same centre, the call is set up by making CAC-class-based control.
  If both devices belong to the same CAC class, the call is set up without control (a centre's CAC class is considered as a LAN without any bandwidth constraint).
  Otherwise, the control is made on the remaining data rate associated with this CAC class.
- **Multi-centre configuration**: if the call concerns two devices belonging to two distinct centres with low-data-rate links between the centres, the notion of inter-centre data rate is used to control the bandwidth.
- **Multi-class and multi-centre configuration**: if the call concerns two devices belonging to two distinct centres with low-data-rate links between the centres and inside the centres, the notion of inter-centre data rate and CAC class is used to control the bandwidth very closely.

2.2 OTHER REMARKS

Only audio or video calls are authorised for IP terminals not included in the CAC service (G729).

For video calls, the minimum video data rate must be 768 kb/s plus 100 kb/s for G711/G722 audio.

For video in VPN mode, there is an additional encapsulation involving a minimum data rate of 1050 kb/s.

2.3 MANAGING AUDIO AND VIDEO FLOWS

As of R5.4 SP2, audio and video flows can be separated for a CAC server.

This separation must be made in the CAC server parameters.

The distribution of associated data rates and thresholds must then be configured for each CAC class or inter-centre link.

Two modes must be considered:

- Global mode, without flow separation
- Flow separation mode.

2.3.1 GLOBAL MODE

In this mode, the maximum data rate of a class always corresponds to the global audio and video data rate.

The maximum video data rate is deduced from the difference between the maximum data rate and video threshold.

The audio and video bandwidth is taken from the available global bandwidth.

Video will be accepted as long as the bandwidth remains above the video threshold.

Below the video threshold, only audio will be accepted.

GLOBAL AUDIO/VIDEO MODE	
Maximum audio data rate	Maximum data rate
Maximum video data rate	(Maximum data rate - video threshold)

GLOBAL AUDIO/VIDEO MODE	
Maximum audio data rate	Maximum data rate
Maximum video data rate	(Maximum data rate - video threshold)

Alarms

An alarm is generated in the logbook when the overall bandwidth saturation rate used (audio and video) exceeds the value defined in the CAC server settings.

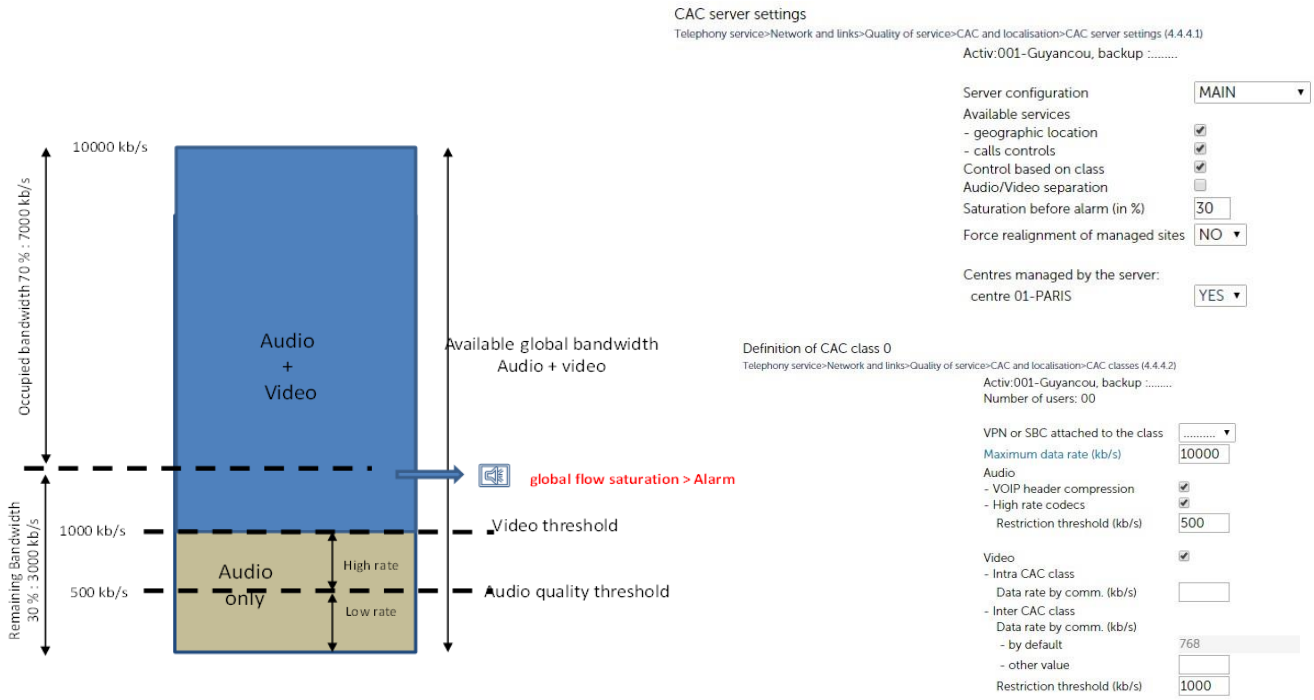
Example 1 (in inter-class):

The global bandwidth is 10000 Kb/s.

Video calls will no longer be accepted below 1000 kb/s.

The high-speed audio/video codec will no longer be accepted below 500 kb/s.

An alarm will be generated as from 30% bandwidth occupation rate.



2.3.1.1 Using global mode from Web Admin

2.3.1.1.1 Web AdminConfiguring CAC server parameters

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings:**

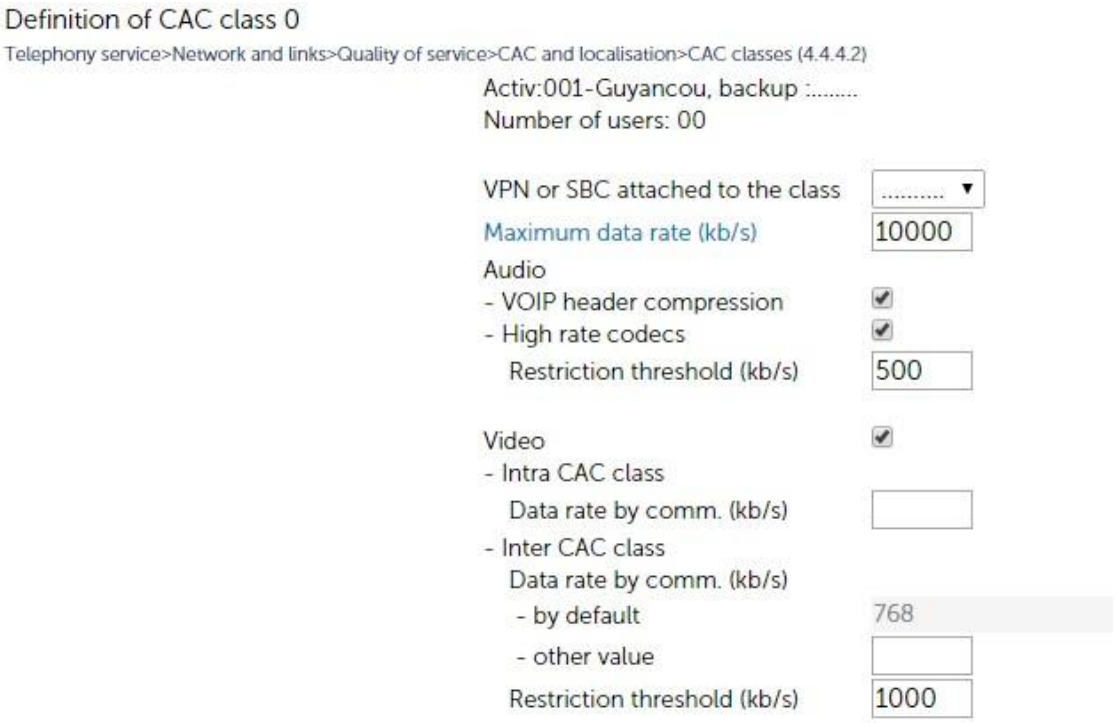
- Untick the **Audio/video separation** box if ticked (unticked by default).
- Enter the value Saturation before alarm (in %).

2.3.1.1.2 Configuring CAC classes in global mode

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes:**

Configure the different audio and video related fields:

The other fields are not described in this section. See Section 3.2.1.



MAXIMUM DATA RATE (KB/S)

This field is used to define the maximum data rate authorised for video and audio (in kbits/s) for the corresponding CAC class. This data rate my be between 0 and 65279 kbit/s.

This field may be left empty, in which case there will be no control on the bandwidth of this CAC class. However, this CAC class may be assigned to a subnet.

AUDIO parameters

VOIP HEADER COMPRESSION

Checkbox indicating whether the transport protocol on the WAN link compresses IP headers.

If this box is ticked, header compression is not taken into account in the calculation of connection data rate.

HIGH RATE AUDIO CODECS

- For the choice of high bandwidth laws, see Chapter 4.

When the box is ticked, the high rate audio codecs are accepted up to the restriction limit defined below.

The restriction threshold is set to 0 (codec authorised until the link is saturated). In this, case the high-rate codec is used without any restriction.

Note : The restriction on high-rate codec does not apply when the link data rate is not specified. In this case, all the audio codecs are always accepted without restrictions (even if the box is unticked).

RESTRICTION THRESHOLD (KB/S):

Values between 0 and 65279 Kbits/s.

To accept a high-rate audio codec, the remaining data rate available on the link (after counting the ongoing calls) must be above this threshold.

Video parameters

Box not ticked: The video codec is not accepted, neither in intra class nor in inter class.

- The prohibition of the video codec is reflected through the configuration of an indefinite restriction threshold (default video threshold value).

Box ticked: The video codec is accepted, in intra class and in inter class.

Intra CAC class

- Data rate by comm. (kb/s):

Field used to define the video data rate of calls between the intra CAC class terminals concerned.

Maximum value (in increments of 32) used per call (max. 65279 kb/s)

The field is empty by default when the Video box is ticked.

If the field is blank, no video data rate control takes place and the intra class call data rate is chosen by the terminals without CAC control.

Inter CAC class

Field used to define the video data rate of calls between the inter CAC class terminals concerned.

- Data rate by comm. (kb/s):
- **By default**: reminder (read only) about the default video data rate assigned in the "Specific coding laws" menu.

Other value:

  - Default blank field when the video box is ticked: The previous default value is taken into account
  - Value 0: inter-class video not allowed
  - Value (increments of 32): maximum value used per communication (max. 65279)

- Restriction threshold:

This field is used to define the threshold in Kbits/s to authorise inter-class video.

The remaining data rate available on the link must be above this threshold (maximum value: 65279).

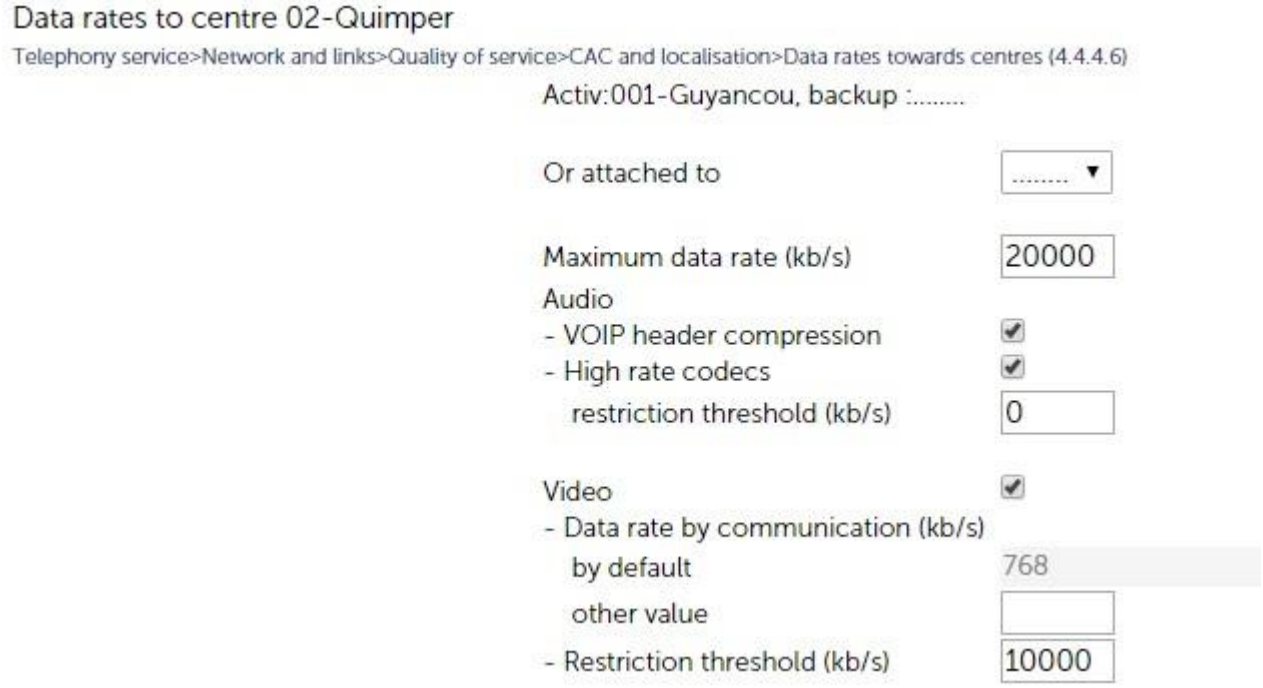
  - Value 0: no restriction until link saturation.

2.3.1.1.3 Configuring data rates to the centres in global mode

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>Data rates to the centres:**

Configure the different audio and video related fields:

The other fields are not described in this section. See Sections 3.2.2 and 3.2.3.



MAXIMUM DATA RATE (KB/S)

This field is used to define the maximum data rate authorised for video and audio (in kbits/s) for the corresponding inter-centre link. This data rate might be between 0 and 65279 kbit/s.

This field may be left empty, in which case there will be no control on the bandwidth of this inter-centre link.

AUDIO PARAMETERS

VOIP HEADER COMPRESSION

Checkbox indicating whether the transport protocol on the WAN link compresses IP headers.

If this box is ticked, header compression is not taken into account in the calculation of connection data rate.

HIGH RATE AUDIO CODECS

- For the choice of high bandwidth laws, see Chapter 4.

When the box is ticked, the high rate audio codecs are accepted up to the restriction limit defined below.

The restriction threshold is set to 0 (codec authorised until the link is saturated). In this, case the high-rate codec is used without any restriction.

RESTRICTION THRESHOLD (KB/S):

Values between 0 and 65279 Kbits/s.

To accept a high-rate audio codec, the remaining available data rate on the link must be above this threshold.

Video parameters

Box not ticked: The video codec is not accepted on the inter-centre link.

The prohibition of the video codec is reflected through the configuration of an indefinite threshold (default video threshold value).

Box ticked: The video codec is accepted.

- Data rate by comm. (kb/s):

  Field used to define the call data rate on the inter-centre link concerned.

  By default: reminder (read only) about the default video data rate assigned in the "Specific coding laws" menu.

  Other value:

  - Default blank field when the video box is ticked: The previous default value is taken into account
  - Value 0: inter-class video not allowed
  - Value (increments of 32): maximum value used per call (max. 65279)

- Restriction threshold:

  This field is used to define the threshold in Kbits/s to authorise video on the inter-centre link.

  The remaining data rate available on the link must be above this threshold (maximum value: 65279).

  - Value 0: no restriction until link saturation.

2.3.2 AUDIO AND VIDEO FLOW SEPARATION MODE

2.3.2.1 General information

In this mode, the administrator can separately define the audio and video bandwidths.

This separation must be made in the CAC server settings and will apply to all the inter-centre classes or link of the multi-site configuration associated with this CAC server.

There is no video threshold like in global mode.

Alarms

When the video is deleted due to lack of bandwidth, an alarm is always generated.

An alarm is generated in the logbook when the bandwidth saturation rate used by audio (only) exceeds the value defined in the CAC server settings.

Note : Unlike the global mode in which an alarm is generated when the saturation rate of the overall bandwidth used (audio and video) exceeds the value defined in the CAC server settings.

Example 2 (in inter class):

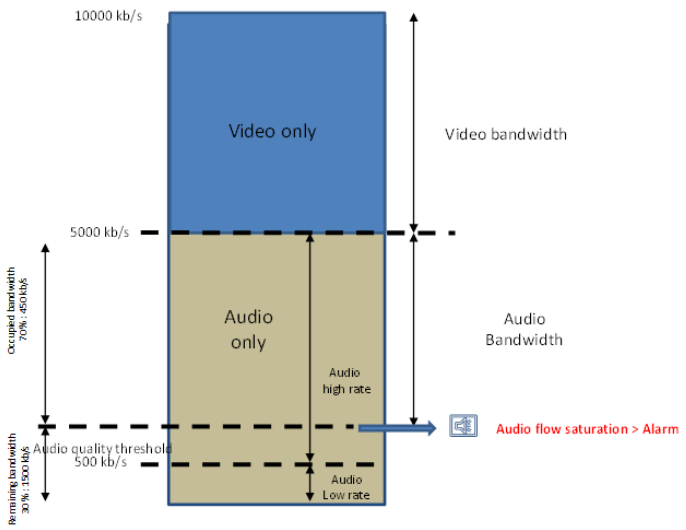
The global bandwidth is 10000 Kb/s.

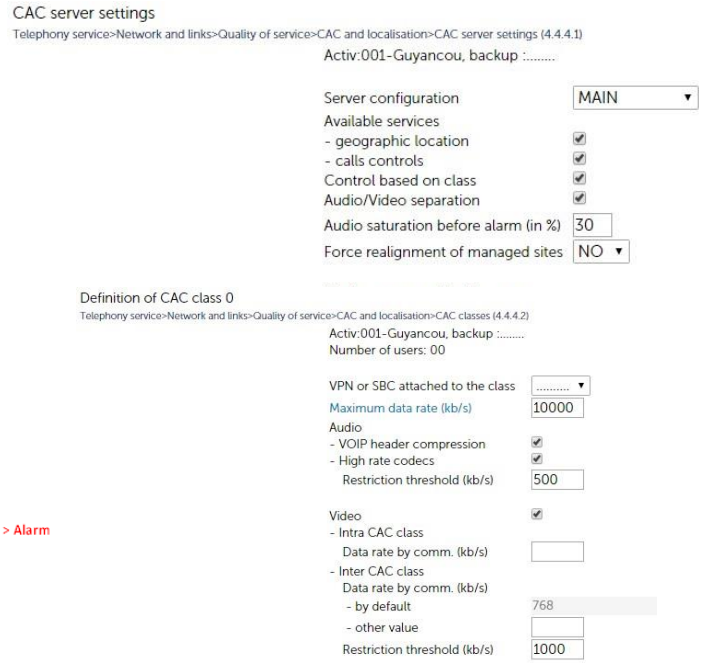
5000kb/s are reserved for video, and 5000kb/s for audio.

Audio calls will no longer be accepted below 5000 kb/s.

The high-speed audio/video codec will no longer be accepted below the 500 kb/s remaining on the audio part.

An alarm will be generated as from 30% audio bandwidth occupation rate.





2.3.2.2 Using separation mode from Web Admin

2.3.2.2.1 Configuring CAC server parameters

In Menu NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings:

- Tick the Audio/video separation box.
- Enter the value Audio saturation before alarm (in %).

2.3.2.2.2 Configuring CAC classes in separation mode

In Menu NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes:

Configure the different audio and video related fields.

The other fields are not described in this section. See Section 3.2.1.

Working rules

The maximum audio data rate must be defined before the maximum video data rate.

Deleting any of the maximum data rates (video or audio) deletes the other.

The maximum data rate field may be left empty, in which case there will be no control on the bandwidth of this CAC class. However, this CAC class may be assigned to a subnet.

If the video data rate is enough, but not the audio data rate, call setup is rejected.

If the maximum data rate is indefinite (blank field) for audio, it is also indefinite for video and vice versa.

AUDIO parameters

MAXIMUM DATA RATE (KB/S)

This field is used to define the maximum data rate authorised for audio (in kbits/s) for the corresponding CAC class. This data rate may be between 0 and 65279 kbit/s.

VOIP HEADER COMPRESSION

Checkbox indicating whether the transport protocol on the WAN link compresses IP headers.

If the box is ticked, header compression is not taken into account in the calculation of connection data rate (see Section **Erreur ! Source du renvoi introuvable.**).

HIGH RATE AUDIO CODECS

- For the choice of high bandwidth laws, see Chapter 4.

When the box is ticked, the high rate audio codecs are accepted up to the restriction limit defined below.

The restriction threshold is set to 0 (codec authorised until the link is saturated). In this case, the high-rate codec is used without any restriction.

Note : The restriction on high-rate codec does not apply when the link data rate is not specified. In this case, all the audio codecs are always accepted without restrictions (even if the box is unticked)

RESTRICTION THRESHOLD (KB/S):

Values between 0 and 65279 Kbits/s.

To accept a high-rate audio codec, the remaining available data rate on the link must be above this threshold.

Video parameters

Box not ticked: The video codec is not accepted, neither in intra class nor in inter class.

The prohibition of the video codec is reflected through the configuration of an indefinite threshold (default video threshold value).

Box ticked: The video codec is accepted, in intra class and in inter class.

MAXIMUM DATA RATE (KB/S)

This field is used to define the maximum data rate authorised for video (in kbits/s) for the corresponding CAC class. This data rate my be between 0 and 65279 kbit/s.

Note : The audio data rate must be defined before the video data rate.

Intra CAC class

- Data rate by comm. (kb/s):

Field used to define the data rate of calls between the intra CAC class terminals concerned.

Maximum value (in increments of 32) used per call (max. 65279 kb/s)

The field is empty by default when the Video box is ticked.

If the field is blank, no video data rate control takes place and the intra class call data rate is chosen by the terminals without CAC control.

Inter CAC class

Field used to define the data rate of calls between the inter CAC class terminals concerned.

- Data rate by comm. (kb/s):
- **By default**: reminder (read only) about the default video data rate assigned in the "Specific coding laws" menu.

Other value:

  - Default blank field when the video box is ticked: the previous default value is taken into account
  - Value 0: inter-class video not allowed
  - Value (increments of 32): maximum value used per call (max. 65279).

2.3.2.2.3 Configuring data rates to the centres in separation mode

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>Data rates to the centres:**

Configure the different audio and video related fields.

The other fields are not described in this section. See Sections 3.2.2 and 3.2.3.

Working rules

The maximum audio data rate must be defined before the maximum video data rate.

Deleting any of the maximum data rates (video or audio) deletes the other.

The maximum data rate field may be left empty, in which case there will be no control on the bandwidth of this CAC class. However, this CAC class may be assigned to a subnet.

If the video data rate is enough, but not the audio data rate, call setup is rejected.

If the maximum data rate is indefinite (blank field) for audio, it is also indefinite for video and vice versa.

AUDIO parameters

Maximum data rate (kb/s)

This field is used to define the maximum data rate authorised for audio (in kbits/s) for the corresponding CAC class. This data rate my be between 0 and 65279 kbit/s.

VOIP HEADER COMPRESSION

Checkbox indicating whether the transport protocol on the WAN link compresses IP headers.

If this box is ticked, header compression is not taken into account in the calculation of connection data rate.

HIGH RATE AUDIO CODECS

- For the choice of high bandwidth laws, see Chapter 4.

When the box is ticked, the high rate audio codecs are accepted up to the restriction limit defined below.

The restriction threshold is set to 0 (codec authorised until the link is saturated). In this, case the high-rate codec is used without any restriction.

RESTRICTION THRESHOLD (KB/S):

Values between 0 and 65279 Kbits/s.

To accept a high-rate audio codec, the remaining available data rate on the link must be above this threshold.

Video parameters

Box not ticked: The video codec is not accepted, neither in intra class nor in inter class.

The prohibition of the video codec is reflected through the configuration of an indefinite threshold (default video threshold value).

Box ticked: The video codec is accepted, in intra class and in inter class.

MAXIMUM DATA RATE (KB/S)

This field is used to define the maximum data rate authorised for video (in kbits/s) for the corresponding CAC class. This data rate may be between 0 and 65279 kbit/s.

Note : The audio data rate must be defined before the video data rate.

Intra CAC class

- Data rate by comm. (kb/s):

Field used to define the data rate of calls between the intra CAC class terminals concerned.

Maximum value (in increments of 32) used per call (max. 65279 kb/s)

The field is empty by default when the Video box is ticked.

If the field is blank, no video data rate control takes place and the intra class call data rate is chosen by the terminals without CAC control.

Inter CAC centre

Field used to define the data rate of calls between the inter CAC class terminals concerned.

- Data rate by comm. (kb/s):

  By default: reminder (read only) about the default video data rate assigned in the "Specific coding laws" menu.

  Other value:

  - default blank field when the video box is ticked: the previous default value is taken into account
  - Value 0: inter-class video not allowed
  - Value (increments of 32): maximum value used per communication (max. 65279).

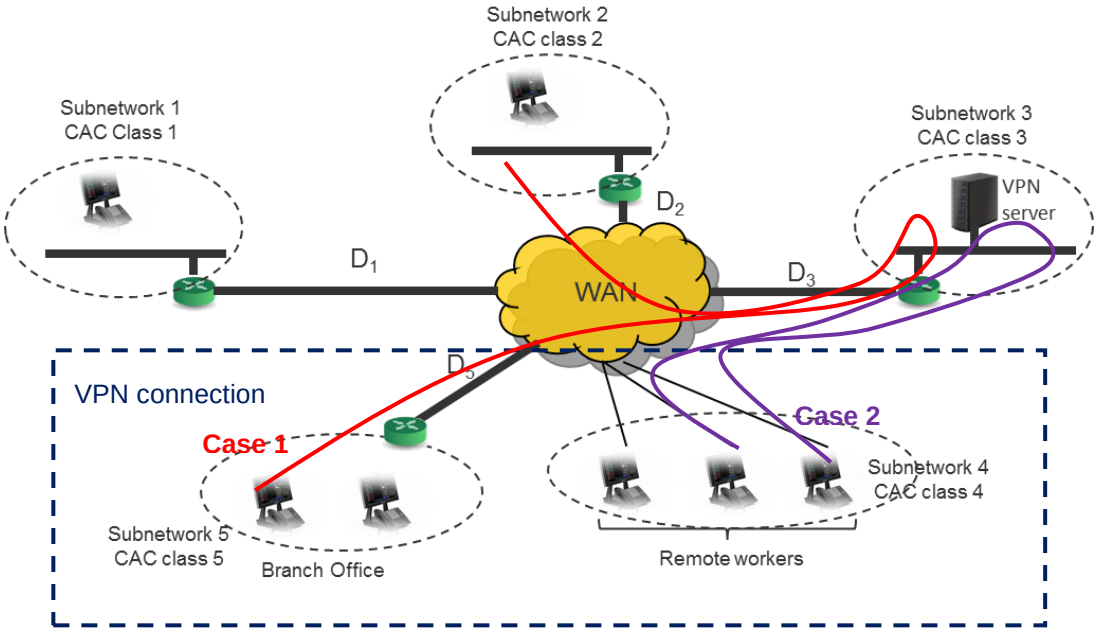
2.4 VPN AND SBC CONFIGURATIONS

2.4.1 PRINCIPLE

As of R5.4 SP2, in configurations including a VPN server, some specific classes called membership (or transit) classes may be defined to control call data rates between the different subnets.

While defining the classes associated with the subnets, a list-based field is proposed to define the associated membership class in which the VPN is located (Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes**).

Example of architecture representing two current cases:



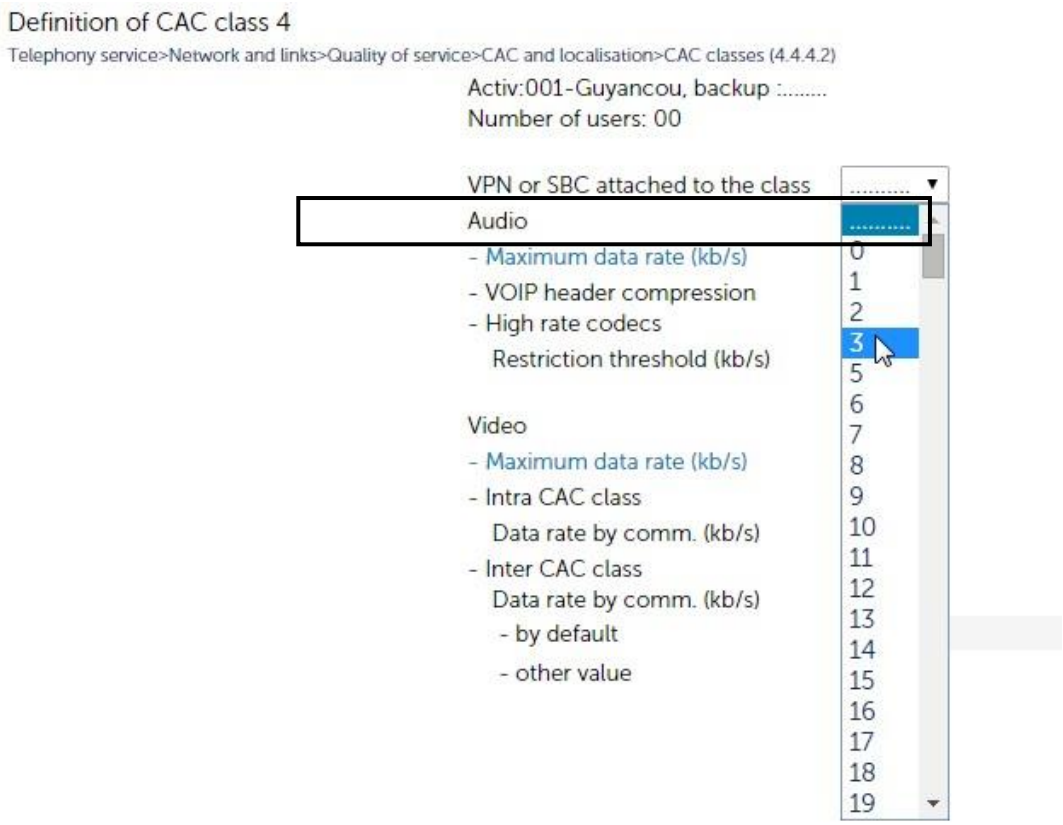
In this example for cases 1 and 2:

The terminals of classes CAC4 and CAC5 connect via the VPN.

During a call, the data rate must be controlled on the terminal classes CAC4 and CAC5 and on VPN server class CAC3.

Classes CAC4 and CAC5 must be associated with membership class CAC3 for the VPN server in order to control the D3 link.

In case 2, to attach class CAC4 to class CAC 3 (VPN):



Calculating the data rate

In the example for case 1, the data rate is calculated as follows:

The call data rate is counted on class 5, then twice on class 3 (once between the terminal and VPN server and once from the VPN server to the remote device), then once on class 2.

2.4.2 WORKING RULES

The classes presented on the list as transit (membership) classes must meet the following conditions:

- They should not have any defined transit class (no cascade transit).

For the classes defined as transit class, the line will not appear on the menu.

2.5 GEOGRAPHIC LOCATION OF IP TERMINALS

As of software release 5.1B, the CAC server offers geographic location of terminals during a call.

Geographic location consists in assigning each (IP or TDM) terminal during a call:

- a "site/location cluster" pair according to its IP address for an IP terminal, or the IP address of the physical connection site for a TDM terminal; this site/cluster pair will be used to route the call.
- a special numbers code which will be used to translate the number dialled.

The configuration principles and phases are indicated in the document **Multisite management AMT/PTD/PBX/0081/EN**.

3 CONFIGURING CALL ADMISSION CONTROL

3.1 PREREQUISITES

Programming call admission control requires knowing the IP subnets of the centre(s) managed by the CAC server.

It also requires knowing the data rate offered for each IP subnet.

Only one active CAC server must be configured per centre.

As the CAC service uses the location service function, both services must be declared.

For the MiVoice 5000 range, selecting "Call control" while declaring the servers activates the two services.

3.2 CONFIGURING CALL ADMISSION CONTROL

3.2.1 MANAGING CAC IN A MULTI-CLASS CONFIGURATION (INTRA-CENTRE)

In a multi-class (intra-centre) configuration, several CAC classes are defined within the same centre.

To implement this CAC-class-based call control, proceed as follows.

Note : A subnet can only belong to one CAC class. Several subnets can belong to the same CAC class.

3.2.1.1 Programming a MiVoice 5000 iPBX

1. **MiVoice 5000Activate multi-site mode.**

Menu **SYSTEM>>Configuration>Services**

- Tick the corresponding box on the **Multi-site management** line.

2. **Configure the multi-site network.**

See the operating manual "Multi-site management", see Section 1.6, document [5]).

3. **Configure the main CAC server parameters.**

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings:**

- On the SERVER CONFIGURATION line, select MAIN.
- In the AVAILABLE SERVICES area:
- Tick **Geographic location** (if the function must be activated)
- Tick Call controls.
- Tick Control based on class.

Tick this box if class-based control must be activated.

Note : This parameter is only available if the "call control" service is activated.

AUDIO/VIDEO SEPARATION

Checkbox used to activate or deactivate audio/video flow separation.

For more information about these operating modes, see Section 2.2.

CAUTION : While activating this mode, check the CAC class configuration and, in particular, that the maximum audio data rate is not on 0.

The line below concerns the saturation rate before alarm and depends on the active mode.

This parameter defines the critical rate which triggers message sending in the logbook as soon as there is a given occupation rate of the bandwidth. Values between 0 and 100.

In flow separation mode, the saturation rate indicated concerns audio only.

AUDIO SATURATION BEFORE ALARM (IN %)

In global mode (no flow separation), the saturation rate indicated concerns audio and video.

SATURATION BEFORE ALARM (IN %)

Note : The following columns only appear if the iPBX is used in multi-site mode.

FORCE REALIGNMENT OF MANAGED SITES

YES / NO

This line allows the operator to generate the sending of an update message to all sites and centres in order to reset all location information (CAC classes, CAC centre, location number) in case of malfunctions.

Note : Realigning the sites deletes the location information updated again during the next call.

CENTRES MANAGED BY THE SERVER

CENTRE XXXXXXXX:

YES / NO

These columns are used to define a list of the centres managed by the CAC server of the local site.

Select YES for the centres managed by the CAC server.

Note : Only the available centres which have no limited throughput for contacting the local centre are proposed (that is, all the centres forming a CAC centre. This means that for a particular centre to be displayed, at least one access must be declared to access that centre (it is not sufficient merely to declare its name or a gateway leading to the centre) and the data rate to this centre must be infinite. The local centre is always proposed on this list.

4. **Configure the CAC classes**

Note : CAC classes must be defined only on the sites where the main and secondary CAC servers are located.

Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes>Names**

In this menu, enter the various CAC class names to be defined.

The CAC class definition menu allows you to define a maximum allowed rate per CAC class and to specify whether this CAC class handles VOIP header compression. It allows to define up to:

- For Mitel gateways systems, 255 CAC classes,
- For MiVoice 5000 systems, 3000 CAC classes.

CAC classes are declared in the site hosting the CAC server but used in all sites.

MiVoice 5000 Server, the CAC server will be declared on the MiVoice 5000 server and will allow to declare 3000 CAC classes and subscribers declared on the Mitel 5000 Gateways can have CAC classes (through IP subnets) greater than 255.

Interworking cases:

The creation of more than 254 classes is not prohibited on a MiVoice 5000 in R6.3 but an alert message will be displayed when an operator will define the name of a CAC class ≥ 255 on a MiVoice 5000 Server configured in interworking .

A link allows to directly access the management of these characteristics by clicking on the class in question.

CHARACTERISTICS OF THE CLASS

Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes>Characteristics**

- Select the class in the selection list
- Click Select Item to access the configuration menu for that class.

Note : The class is changed using the > or < button. The CAC class number is displayed in the title of the current page.

ACTIVE: XXXXX, BACKUP: YYYYY

This line shows the names of the sites where the CAC server and backup server are located.

VPN OR SBC ATTACHED TO THE CLASS

If necessary, define the membership class dedicated to the VPN function.

For more information, see Section 2.4.

In the two areas **Audio** and **Video**:

Define the characteristics of the audio and video flows according to the mode concerned (global or audio and video flow separation).

See Section 2.2.

5. **Define the IP subnets associated with the CAC classes.**

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>IP subnet:**

On the **IP subnet selection screen**

- On the **IP ADDRESS(V4 OU V6)** line, enter the subnet IP address (IPV4 or IP V6, or IPV4 and IPV6).

Depending on the configuration of the network, the addressing can be done in IPV4 or IPV6 alone or by defining in parallel for the considered networks, an address in IPV4 and one in IPV6.

Note : Any IP address may be entered (for instance a terminal IP address), but the IP address written on the table will be that of the subnet calculated by the MMC.

- On the **MASK** line, enter the subnet mask (for IPV4 or IP V6, or for IPV4 and IPV6).
- On the **ACTION** line, select **CREATE**. Press **Enter** to confirm.

The **IP subnet selection** screen reappears with different parts:

- The first part of the menu displays the previously selected information: the current status of the CAC server, the IP address and subnet mask concerned, as well as the subnet base stations (all the IP addresses contained in the subnet).
- On the **CAC CLASS** line, indicate the CAC class associated with the IP subnet. The (audio and video) data rates assigned to this class appear concerning the configuration made in Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes**.
- To display all the IP subnets created, go to Menu NETWORK AND LINKS>Quality of service>CAC and localisation>Display IP subnets>Display by IP address.
- To display all the IP subnets created, go to Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>Classes users display** (select the class in question).

6. **If the iPBXs are not of the same type or do not have the same software release,** configure the backup server (on a site other than the one on which the main CAC server is located) in the same way as the main server, **otherwise, return to Step 5.**

- Repeat steps 1 to 3. Only step 1 changes: in the CAC server parameters (menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings**), on the **SERVER CONFIGURATION** line, select **SECONDARY**.

7. **If the iPBXs are of the same type and have the same software release,** configure the backup server (on a site other than the one on which the main CAC server is located) by copying the **CAC server data**

From Menu **NETWORK AND LINKS>Multi-sites>Copy of site**

On the **Copy of site screen**

- On the **REFERENCE SITE** line, select the active CAC server site.
- On the **COPY CAC SERVER DATA** line, tick the box.
- On the **CONFIRMATION** LINE, SELECT **YES**. Press **Enter** to confirm.
- Go to Menu NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings.

- On the **SERVER CONFIGURATION** line, select **SECONDARY**. The other parameters are not entered since the data of the active CAC server has not been copied. The backup data has been configured.

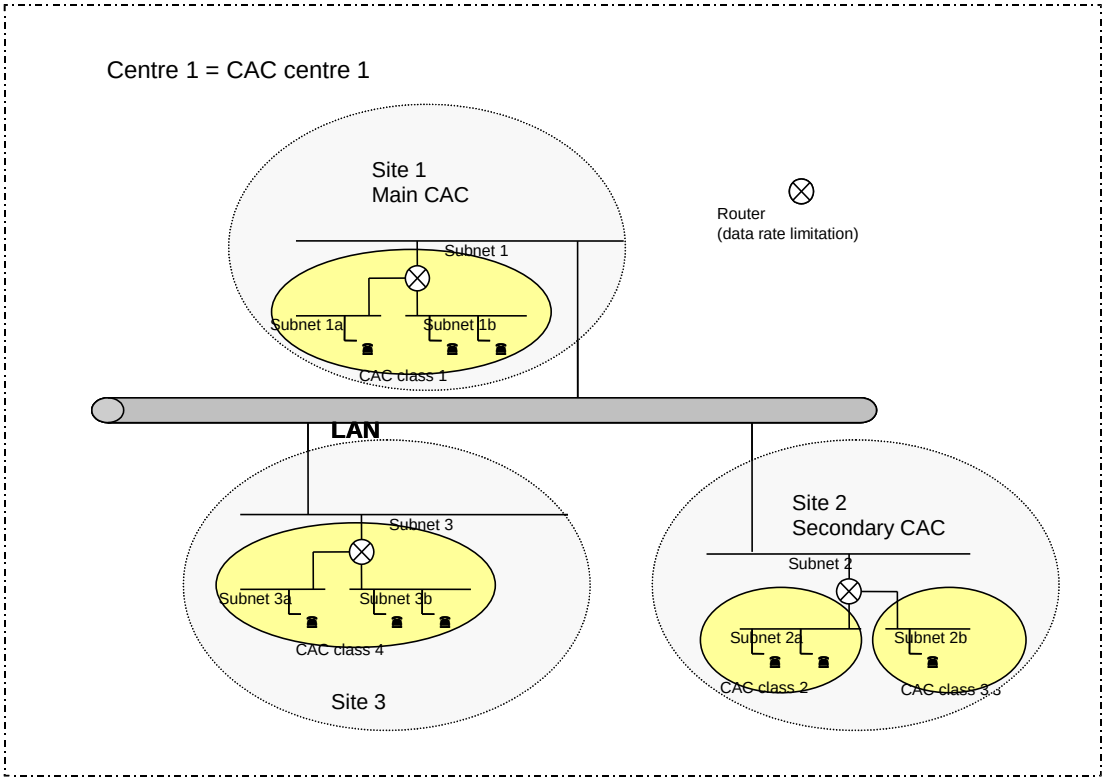
8. **Go to Menu SYSTEM**>Supervision>Traffic observation>CAC server monitoring>Disp. data rate per class **to view the class counters.**

9. **Go to menu** SYSTEM>Supervision>Traffic observation>CAC server monitoring>Class counters reinitialization **to reset the class counters.**

3.2.1.2 Example

IPV4 or IPV6 configuration

Let us take a centre 1 with 3 sites (site 1, site 2 and site 3). A main CAC server is declared on site 1. A backup CAC server is declared on site 2. Subnets 1, 1a, 1b, 2, 2a, 2b, 3, 3a and 3b are defined, as well as associated CAC classes 1, 2, 3 and 4.



Managing CAC in a multi-class configuration (IPV4 or IPV6)

3.2.2 MANAGING CAC IN A MULTI-CENTRE CONFIGURATION

In a multi-centre configuration, the devices belong to distinct centres. If a call is set up between two devices belonging to two distinct centres with low-data-rate links between the centres, the notion of inter-centre data rate is used to control the bandwidth.

CAUTION : When a call is made between two centres with low-data-rate links between the centres, a main CAC server must be declared on each centre. A backup CAC server may also be declared (optional). In this case, the backup CAC server must be declared on the same centre as the main CAC server.
The set of sites grouped together on one or more centres, without any IP data rate restriction between them and containing the main CAC server (and backup CAC server), is called CAC centre.

To implement this centre-based call control, proceed as follows.

3.2.2.1 Programming on a MiVoice 5000 iPBX

1. **Activate multi-site mode.**

Menu SYSTEM>>Configuration>Services

- Tick the corres ponding box on the **Multi-site management** line.

2. **Configure the multi-site** (see the "Multi-site management" operating manual, see also Section 1.6, document [5]).

3. **Configure the main CAC server.**

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings**:

- On the SERVER CONFIGURATION line, select MAIN.

  In the AVAILABLE SERVICES area:

- Tick **Geographic location** (if the function must be activated)
- Tick Call controls.
- Tick Control based on class.

Tick this box if class-based control must be activated.

Note : This parameter is only available if the "call control" service is activated.

AUDIO/VIDEO SEPARATION

Checkbox used to activate or deactivate audio/video flow separation.

For more information about these operating modes, see Section 2.2.

CAUTION : While activating this mode, check the CAC class configuration and, in particular, that the maximum audio data rate is not on 0.

The line below concerns the saturation rate before alarm and depends on the active mode.

This parameter defines the critical rate which triggers message sending in the logbook as soon as there is a given occupation rate of the bandwidth. Values between 0 and 100.

In flow separation mode, the saturation rate indicated concerns audio only.

AUDIO SATURATION BEFORE ALARM (IN %)

In global mode (no flow separation), the saturation rate indicated concerns audio and video.

SATURATION BEFORE ALARM (IN %)

FORCE REALIGNMENT OF MANAGED SITES

YES / NO

This line allows the operator to generate the sending of an update message to all sites and centres in order to reset all location information (CAC classes, CAC centre, location number) in case of malfunctions.

Note : Realigning the sites deletes the location information updated again during the next call.

CENTRES MANAGED BY THE SERVER

CENTRE XXXXXXXX:

YES / NO

These columns are used to define a list of the centres managed by the CAC server of the local site.

Select YES for the centres managed by the CAC server.

Note : Only the available centres which have no limited throughput for contacting the local centre are proposed (that is, all the centres forming a CAC centre. This means that for a particular centre to be displayed, at least one access must be declared to access that centre (it is not sufficient merely to declare its name or a gateway leading to the centre) and the data rate to this centre must be infinite. The local centre is always proposed in this list.

4. **Configure the CAC classes**

Note : CAC classes must be defined only on the sites where the main and secondary CAC servers are located.

Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes>Names**

In this menu, enter the various CAC class names to be defined.

The CAC class definition menu allows you to define a maximum allowed rate per CAC class and to specify whether this CAC class handles VOIP header compression. It allows to define up to:

- For Mitel gateways systems, 255 CAC classes,
- For MiVoice 5000 systems, 3000 CAC classes.

CAC classes are declared in the site hosting the CAC server but used in all sites.

MiVoice 5000 Server, the CAC server will be declared on the MiVoice 5000 server and will allow to declare 3000 CAC classes and subscribers declared on the Mitel 5000 Gateways can have CAC classes (through IP subnets) greater than 255.

Interworking cases:

The creation of more than 254 classes is not prohibited on a MiVoice 5000 in R6.3 but an alert message will be displayed when an operator will define the name of a CAC class ≥ 255 on a MiVoice 5000 Server configured in interworking .

A link allows to directly access the management of these characteristics by clicking on the class in question.

CHARACTERISTICS OF THE CLASS

Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC classes>Characteristics**

- Select the class in the selection list
- Click Select Item to access the configuration menu for that class.

Note : The class is changed using the > or < button. The CAC class number is displayed in the title of the current page.

ACTIVE: XXXXX, BACKUP: YYYYY

This line shows the names of the sites where the CAC server and backup server are located.

VPN or SBC attached to the class

If necessary, define the membership class dedicated to the VPN function.

For more information, see Section 2.4.

In the two areas **Audio** and **Video**:

Define the characteristics of the audio and video flows according to the mode concerned (global or audio and video flow separation).

See Section 2.2.

5. **Define the data rates to other centres**

Menu **NETWORK AND LINKS>CAC and localisation>Data rates to the centres**

This command is used to define the maximum data rate to centres managed by their own CAC server.

In the drop-down menu, select the name of the centre to be modified. The next screen displays the parameters of this centre. It is possible to change from one centre to the other using the  and  command buttons.

ACTIVE: XXXXX, BACKUP: YYYYY

This information line shows the name of the site where the active server and backup server are located.

Audio/video parameters of the inter-centre link concerned

In the two areas **Audio** and **Video**:

Define the characteristics of the audio and video flows according to the mode concerned (global or audio and video flow separation).

See Section 2.2.

Note : When the centre is attached to another centre, the information is read on the centre to which it is attached (the lines from VOIP header compression do not appear).

TO *CENTRE NAME*, MAX. DATA RATE

Maximum data rate authorised for this centre (between 0 and 65279 Kbits/s).

The default flow is infinite (field empty).

Note : Only the available centres not managed by the CAC server are proposed. For a particular centre to be displayed at least one access must be declared to access that centre. It is not sufficient merely to declare its name or a gateway leading to the centre.

OR ATTACHED TO

Shows the attachment centre if the link is not direct (transit centre). The applicable data rate is that of the attachment centre.

Example: ff the link between centre A and centre C passes through centre B, then the attachment centre is centre B and the flow applicable is that of centre B. The flow for centre B must be defined on the previous line.

Note : Only one transit centre is authorised.

6. **Define the IP subnets associated with the CAC classes.**

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>IP subnet:**

The IP network is divided into IP subnets so that data rate restrictions between the various subnets can be defined, and so the sets can be located geographically when handling emergency calls.

For each IP subnet, the following location information items are set:

- The subnet centre determined by the IP address used by the IP set to connect.
  This information is used for bandwidth control only. It identifies the CAC server to contact when a call is set up and is used to manage inter-centre flows.

WARNING : A subnet can only belong to one centre..

- The CAC class.
  A CAC class represents one or more subnets. 255 classes can be declared per CAC server. The CAC class to which the subnet belongs is set when the subnet is declared.

WARNING : A subnet can only belong to one CAC class. Several subnets can belong to the same CAC class.

- The geographic location associated with the subnet.
  This is used to determine the number translations to apply to the special numbers dialled by a set located on the subnet.
- The site/cluster pair to which the subnet is attached.
  It is used to determine the site and routing cluster (routing tables read) of the special and external numbers dialled by a terminal located on the subnet.

The subnet location number in EMERGENCY configuration only (location terminal).

This identifies the geographic area of the subnet for an emergency callback IP terminal connection. It is used to manage the emergency number. It may be the same for two closely located subnets.

On the **IP subnet selection screen**

- On the **`IP ADDRESS(V4 OU V6)`** line, enter the subnet IP address (IPV4 or IP V6, or IPV4 and IPV6).

Depending on the configuration of the network, the addressing can be done in IPV4 or IPV6 alone or by defining in parallel for the considered networks, an address in IPV4 and one in IPV6.

Note : Any IP address may be entered (for instance a terminal IP address), but the IP address written on the table will be that of the subnet calculated by the MMC.

- On the **`MASK`** line, enter the subnet mask (for IPV4 or IPV6 or for IPV4 and IPV6).
- On the **`ACTION`** line, select **`CREATE`**. Press **Enter** to confirm.

The **IP subnet selection** screen reappears with different parts:

- The first part of the menu displays the previously selected information: the current status of the CAC server, the IP address and subnet mask concerned, as well as the subnet base stations (all the IP addresses contained in the subnet).
- On the **`CAC CLASS`** line, indicate the CAC class associated with the IP subnet. The data rate assigned to this class appears.
- To display all the IP subnets created, go to Menu NETWORK AND LINKS>Quality of service>CAC and localisation>Display IP subnets>Display by IP address.
- To display all the IP subnets created, go to Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>Classes users display** (select the class in question).

7. **If the iPBXs are not of the same type or do not have the same software release,** configure the backup server (on a site other than the one on which the main CAC server is located) in the same way as the main server, **otherwise, return to Step 5.**

- Repeat steps 1 to 3. Only step 1 changes: in the CAC server parameters (menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings**), on the **SERVER CONFIGURATION** line, select **SECONDARY**.

8. **If the iPBXs are of the same type and have the same software release,** configure the backup server (on a site other than the one on which the main CAC server is located) by copying the **CAC server data:**

From Menu **NETWORK AND LINKS>Multi-sites>Copy of site**

On the Copy of site screen

- On the **REFERENCE SITE** line, select the active CAC server site.
- On the **COPY CAC SERVER DATA** line, tick the box.
- On the **CONFIRMATION** line, select **YES**. Press **Enter** to confirm.
- Go to Menu NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings.
- On the **SERVER CONFIGURATION** line, select **SECONDARY**. The other parameters are not entered since the data of the active CAC server has not been copied. The backup data has been configured.

9. Go to Menu SYSTEM**>Supervision>Traffic observation>CAC server monitoring>Disp. data rate per class** to view the class counters.

10. Go to menu **SYSTEM>Supervision>Traffic observation>CAC server monitoring>Class counters reinitialization** to reset the class counters.

11. Go to Menu 4.7.8.5 (CAC servers status) to see all the CAC servers of the multi-centre configuration.

3.2.2.2 Example

Let us take a multi-centre configuration consisting of three CAC centres, CAC centres 1, 3 and 4. This multi-centre configuration is also made up of centres 1, 2, 3 and 4. Centre 1 contains sites 1 and 2. Centre 2 contains site 3. Centre 3 contains sites 4 and 5. Centre 4 contains sites 6 and 7. In centre 1, a main CAC server is declared on site 1, and a backup CAC server on site 2. In centre 3, a main CAC server is declared on site 4, and a backup CAC server on site 5. In centre 4, a main CAC server is declared on site 6, and a backup CAC server on site 7.

Note : When a CAC server has several centres (case of CAC 1), the backup (or secondary) CAC server must be declared in the same centre as the main CAC server. By convention, the number of the CAC centre is that of the centre where the CAC server is located.

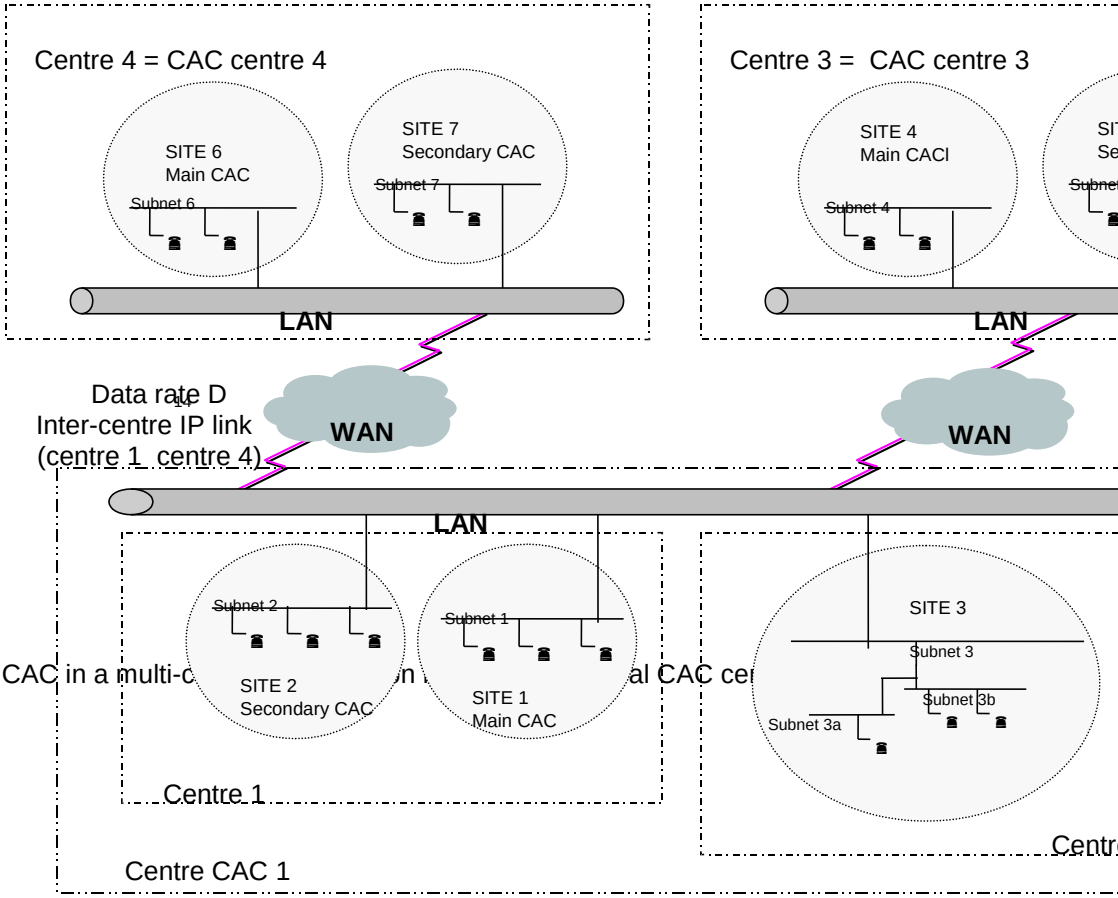


Figure 1 : Managing CAC in a multi-c n al CAC ce

3.2.3 MANAGING CAC IN A MULTI-CENTRE, MULTI-CLASS CONFIGURATION

In a multi-centre, multi-class configuration, if the call concerns two devices belonging to two distinct centres with low-data-rate links between the centres and inside the centres, the notion of inter-centre data rate and CAC class is used to control the bandwidth very closely.

3.2.3.1 Programming on a MiVoice 5000 iPBX

Follow the CAC management programming procedures in a multi-class configuration (see Section 1) and multi-centre configuration (see Section 3.2.2.1).

3.2.3.2 Example

Let us take a multi-centre configuration consisting of centres 1, 2 and 3. Centre 1 contains sites 1 and 2. Centre 2 contains site 3 while centre 3 contains sites 4 and 5. In centre 1, a main CAC server is declared on site 1, and a backup CAC server on site 2. In centre 3, a main CAC server is declared on site 4, and a backup CAC server on site 5. Subnets 1, 2, 3, 3a, 3b, 4 and 5 are defined, as well as the associated CAC classes 1, 2, 3, 4 and 5.

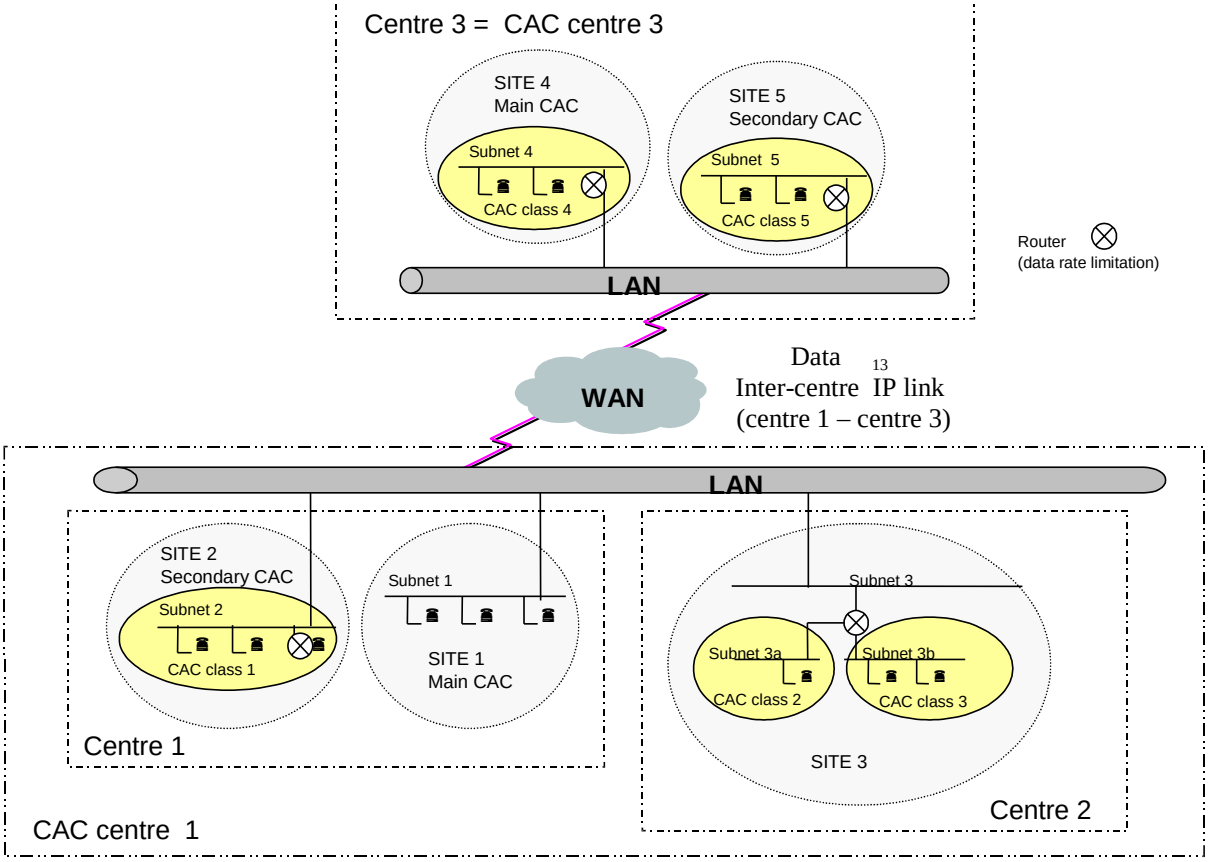


Figure 2: Managing CAC in a multi-centre, multi-class configuration

4 HIGH BANDWIDTH LAWS

Menu **NETWORK AND LINKS>Quality of service>CAC and localisation >High bandwidth laws**

This menu is used to configure the laws considered as high-speed laws by CAC which will be filtered when the data rate reaches a certain threshold. The list may be displayed in ascending or descending order, by clicking the column header.

By default, the laws whose data rate is above or equal to 24 Kbits/s are considered as high bandwidth laws (box ticked).

5 CAC SATURATION

If the bandwidth does not allow it, the CAC server may reject a call (due to CAC saturation). In this case, the iPBX queries its Telephony Translation Server (TTS) to implement a possible call rerouting operation on the PSTN.

Rerouting calls on the PSTN requires creating vital subscribers.

5.1 PROGRAMMING ON A MIVOICE 5000 IPBX

1. Go to Menu **TELEPHONY SERVICE>Numbering plan>Call rerouting>Update**:
2. On the **OPERATION TYPE** line, select **CREATE**.
3. On the **FEATURE** LINE, select **VITAL SUBSCRIBER.** Press **Enter**.
4. On the **NUMBER TO BE REROUTED** line, enter the directory number of the subscriber to be rerouted. On the **REPLACED BY** line, enter the directory number of the terminal to which the call will be rerouted.
5. Restart steps 1 to 3 to create other vital subscribers.

Note : Vital subscribers may be specifically declared one by one or by segments.

6 CONFIGURING THE GEOGRAPHIC LOCATION OF TERMINALS

The configuration principles and phases are listed in the document **Multisite management AMT/PTD/PBX/0081/EN**.

6.1 CALL LOCATION AND ADMISSION CONTROL

It is possible to use call location and call admission control at the same time.

In Menu **NETWORK AND LINKS>Quality of service>CAC and localisation>CAC server settings**:

Tick the two boxes:

- Geographic location
- Call control.

Then follow the configuration steps for each service (see the corresponding sections and documents).

7 LOGBOOK MESSAGES

The purpose of the logbook is to display information about the working of the iPBX. The CAC server provides some messages written in the logbook, which gives information about the CAC configuration.

LOGBOOK MESSAGES	DESCRIPTION
CAC: FALLBACK MODE START	Alarm sent to the logbook when the CAC server accepts a call without bandwidth control (fallback mode).
CAC: FALLBACK MODE END NB ???	The end of alarm message appears at the end of the fallback mode. The number of calls made without bandwidth control is also indicated.
CAC: START CRITIC. DATA RATE CLASS ???	Alarm sent to the logbook when the current data rate on an access to a CAC class exceeds N% of the maximum data rate indicated for the access (N declared by MMC in the CAC server general parameters).
CAC: END CRITIC CLASS ??? NB ???	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of calls made in a critical area is also indicated.
CAC: START CRITIC. DATA RATE CENTRE ???	Alarm sent to the logbook when the current data rate on an access to a CAC centre exceeds N% of the maximum data rate indicated for the access (N declared by MMC in the CAC server general parameters).
CAC: END CRITIC. CENTRE ??? NB ???	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of calls made in a critical area is also indicated.
CAC: START REFUSED CALLS CLASS ???	Alarm to a CAC class sent to the logbook when call setup attempts are made while the maximum data rate has been reached. From that moment, all the calls are rejected on the access to avoid disrupting ongoing calls until the current data rate is reduced.
CAC: END REFUSED CLASS ??? NB ???	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of rejected calls is also indicated.
CAC: START REFUSED CALLS CENTRE ???	Alarm to a CAC centre sent to the logbook when call setup attempts are made while the maximum data rate has been reached. From that moment, all the calls are rejected on the access to avoid disrupting ongoing calls until the current data rate is reduced.

CAC: END REFUSED CENTRE ??? NB ???	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of rejected calls is also indicated.
CAC:SERVER INCONSIST. WITH SITE???/??	Alarm sent to the logbook when a configuration error is detected (for example when two main CAC servers are declared in the same CAC centre).
CAC:_START_VIDEO_REFUSED_CENTRE_???__*	Alarm to a CAC class sent to the logbook when video call setup attempts are made while the maximum data rate has been reached. From that moment, all the calls are rejected on the access to avoid disrupting ongoing calls until the current data rate is reduced.
CAC:_END_VIDEO_REFUSED_CENTRE_???_NB_???*	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of rejected video calls is also indicated.
CAC:_START_VIDEO_REFUSED_CENTRE_???___*	Alarm to a CAC centre sent to the logbook when video call setup attempts are made while the maximum data rate has been reached. From that moment, all the calls are rejected on the access to avoid disrupting ongoing calls until the current data rate is reduced.
CAC:_END_VIDEO_REFUSED_CENTRE_???_NB_???*	The end of alarm message appears when the return to a level below the threshold is confirmed. The number of rejected video calls is also indicated.
CAC_SUBNET_ERROR_??????????????*	This message appears when one or more networks are not configured. The corresponding IP addresses are indicated for each non-configured network.