MiVoice 5000 – Multisite management

07/2024

AMT/PTD/PBX/0081/8/0/EN

OPERATING MANUAL

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1 ABOUT THIS DOCUMENT

1.1 PURPOSE OF THIS DOCUMENT

This document describes how to configure multi-site management in software release ≥ R5.1.

1.2 TARGET AUDIENCE OF THIS DOCUMENT

This document is intended for installation technicians responsible for configuring multi-site iPBXs and implementing the telephony features introduced in this software release.

1.3 SCOPE OF THIS DOCUMENT

This document applies to:

- The MiVoice 5000 range of Mitel 5000 Gateways PBXs, and MiVoice 5000 Server as of software release R5.1
- Mitel 500/A50 iPBXs as of R5.3 SP1
- MiVoice 5000 Manager (Management centre) as of software release R2.1.

1.4 CONTENTS OF THIS DOCUMENT

This document explains the general principles of a multi-site network and how the user can implement an R5.1 multi-site IP configuration.

Information about non-full-IP configurations of a multi-site network is given in the Appendix.

1.5 TERMINOLOGY

1.6 TERMS AND EXPRESSIONS

MiVoice 5000 range **PBX**	This term refers to all MiVoice 5000-range products: XS, XL, XD, Mitel 500/A50 and MiVoice 5000 Server.
MiVoice 5000 or MiVoice 5000 Server	Telephone switching system installed on a PC running with Linux Redhat.
Mitel 5000 Gateways	This term refers to all XS, XL and XD PBXs.
Mitel 500/A50	This term refers to all the NeXspan 500 and M6550 systems upgraded with the new USV cards, as well as the new Mitel 500 systems as of R5.3 SP1.
MiVoice 5000 Manager	Management Centre

1.7 ABBREVIATIONS

ACL	Access Control List
Web Admin	MiVoice 5000 Web Admin
IVB	Integrated Voice Mailbox
CAC	Call Admission Control
GSI	SIP gateway
LDAP	Lightweight Directory Access Protocol
LDIF	LDAP Data Interchange Format
MOVACS	Multi-switch Original Virtual Addressing Communication System
IID	Installation ID
NDS	Installation ID
MHG	MOVACS - H.323 Gateway

1.8 REFERENCE DOCUMENTS

The information in this manual refers to the following documents:

[1]	**MITEL MANAGER MIVOICE 5000 MANAGER**	
	User guide	AMT/PUD/NMA/0003/EN

[2]	**MITEL MANAGER MIVOICE 5000 MANAGER**	
	Installation and configuration	AMT/PTD/NMA/0040/EN

[3]	**MIVOICE 5000 WEB ADMIN - MIVOICE 5000 SERVER**	
	Operating manual	AMT/PTD/PBX/0080/EN

[4]	**CAC PROGRAMMING GUIDE**	
		AMT/PTD/PBX/0019/EN

[5]	**MIVOICE 5000 SERIES**	
	Installation and Maintenance Manual	AMT/PTD/PBX/0058/EN

[6]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	User Guide for MiVoice 5380 Digital Phone –I PhoneMiVoice 5380 IP Phone	AMT/PUD/TR/0015/EN

[7]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	User Guide for MiVoice 5370 Digital – Phone MiVoice 5370 IP Phone	AMT/PUD/TR/0016/EN

[8]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	User Guide for Mitel set 5360 SIP	AMT/PUD/TR/0042/EN

[9]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	Quick Reference Guide for Mitel set 6753 SIP	AMT/PTD/PBX/0010/EN

[10]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	Quick Reference Guide for Mitel set 6755 SIP	AMT/PTD/PBX/0011/EN

[11]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	Quick Reference Guide for Mitel set 6757 SIP	AMT/PTD/PBX/0012/EN

[12]	**MIVOICE 5000 COMMUNICATION SYSTEMS**	
	Quick Reference Guide for Mitel set 6751 SIP	AMT/PTD/PBX/0014/EN

[13]	Managing DID numbers as of R5.2	AMT/PTD/PBX/0099/EN

1.9 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 DEFINITIONS

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

LOCAL SITE
Site where MMCs are to be configured: indication of site number and NAME (example: Site 1 - PARIS) (Site A). Each site sees itself as a local site.

REMOTE SITE
Any site on the network apart from the local site (example for site 1: we shall indicate the existence of sites 2 and 3). All the sites are seen as remote sites from one site.

REFERENCE SITE
- In the context of site copying, a reference site is a site on which configuration is performed when the multi-site configuration is implemented, and which is used by the automatic table copying tool to configure the other sites on the network.
- In all other cases, the reference site is the site on which a subscription is declared.

CENTRE
A centre is made up of a group of sites (it is advisable to limit to 12 the number of sites per centre). Indicate, for each site, the centre to which the site belongs (max. number of centres = 62).

LOCAL CENTRE
Centre to which the local site belongs. Indicate, in the MMC, the NUMBER and NAME of the local centre to which the local site belongs. Each centre is seen as local from any site belonging to it.

REMOTE CENTRE
Centre to which sites other than the local centre sites belong: the local and remote centres constitute a MULTI-CENTRE network. Each centre is seen as remote from any site that does not belong to it.

MULTI-SITE NETWORK
A multi-site network consists of a group of interconnected sites configured to offer the same services as a single high-capacity site.

A multi-site network is a network with a single centre.

MULTI-CENTRE NETWORK
A multi-centre network comprises several interconnected centres.

This network has two architecture levels:
- One multi-site architecture connecting the sites of a centre
- One multi-centre architecture connecting the centres.

VOICE GATEWAY
Resource used to create a voice circuit between two sites.

SIGNALLING GATEWAY
Resource used to create a virtual circuit between two sites through which signalling messages pass.

SIGNALLING CHANNEL
A signalling channel is a communication set up between SERGIC servers on two sites: it allows signal exchanges for all the communications and facilities of these sites.

The signalling channel uses a direct X25 link or PLL.

X25 LINK
An X25 link is implemented using CS1 synchronous data transmission cards: it is a direct cable link or a link leased from the operator.

PLL
The PLL (permanent logical link) is an X25 link that uses the available payload on the D channel of an ISDN T0 or ISDN T2.

For static link QSIG T2 or QSIG T0 MULTI-SITES, the PLL in the D channel is used for the signalling channel.

For dynamic-link SWITCHED T0 or T2 MULTI-SITES, the PLL, always in the D channel, is set up via the TRANSPAC network.

DATA CHANNEL
Wired X25 or PLL link between two data transmission sites. This channel is needed where data traffic is high, otherwise the signalling channel is sufficient.

IP TUNNEL LINK
IP link in which the X25 signalling link is encapsulated.

LINK
The notion of link depends on the use of a voice resource. A telephone link connects two voice resources located in two adjacent sites (example: T2 link, IP link, T0 link). This is a point-to-point notion between two sites.

STATIC LINK

A static link is a link set up via a specialised link between two network points and which is permanently available. Static links are supported by static trunk groups.

Medium for communication between 2 sites: these sites are linked by tie-lines, a T2 or T0, providing the circuit TSs.

The link corresponds to the physical construction linking the 2 sites, in our case made up of an IA1, LT2 or LD4 card (the low order site activates the link).

On each site, the link is a trunk group whose number and trunks are independent of the remote site. On the multi-site network, the link is the logical notion common to both ends of the connection.

DYNAMIC LINK

Communication medium between 2 sites connected by T2 or T0 circuit TSs via the switched network (NUMERIS/ISDN network).

A dynamic link is a link set up upon PBX call setup request. Dynamic links are supported by dynamic trunk groups.

INTER-SITE LINKS

Links set up between the sites of the same centre.

INTER-CENTER LINKS

Links between main sites in each centre.

ROUTE

All the links between 2 sites.

ROUTING

A set of routes giving access to a site on the network.

VOIP RESOURCE

Gateway between the TDM world and IP world.

SVL

SVL = Link supervisor. Responsible for creating the various inter-site telephone channels that make up the links. It manages the reservation and distribution of inter-site circuit TS.

For example, on a QSIG T2, it establishes all the TSs one by one and maintains them permanently so that they can be used by the communications.

SERGIC

Intercommunication management server (message exchange via the X25 links). A signalling network is set up by connecting together the SERGIC servers of each site.

These servers use existing data links to communicate with each other.

TCS SERVICE

Table in the iPBX which defines the list of codecs that the call processing module will choose for a specific type of terminal instead of the list of codecs given by the terminal itself.

3 OVERVIEW OF A MULTI-SITE IP NETWORK

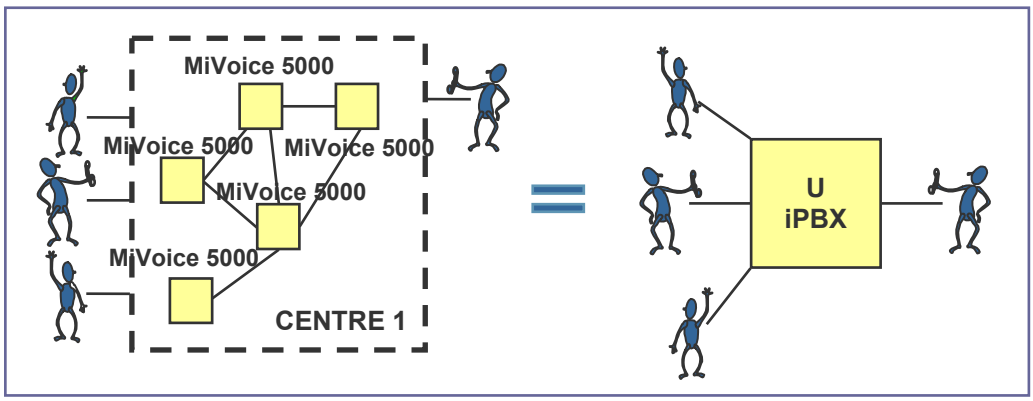
3.1 DESCRIPTION

3.1.1 MULTI-SITE NETWORK

Using MiVoice 5000 iPBXs on a multi-site network allows you to interconnect several PBXs and, thus, offer services similar to those of a single high-capacity PBX.

Multi-site operation is, therefore, used to mask the geographic location of the various establishments that make up a company.

This operation mode is available on every MiVoice 5000 iPBX, without additional software or software key code, but it requires special programming on the part of the installer.



A multi-site configuration brings in a lot of advantages compared to an architecture with n isolated sites:

- A single user view
- The same level of service on all sites
- Increased subscriber mobility
- A network of shared and distributed resources and services (directory, voice mail, operator trunk groups, etc.)
- An optimum bandwidth
- Easy and continuous deployment
- Secure telephone network availability
- Reduced inter-site operation costs.

Finally, the multi-site network is a solution to the problems of connecting together companies (following an acquisition, merger, relocation, etc.) with homogeneous or heterogeneous networks.

3.1.2 MULTI-CENTRE ARCHITECTURE

- A multi-centre architecture consists of several multi-site architectures. It is basically used in the following 3 cases:
- When the number of sites is high
- When the geographic distribution of the sites naturally requires the sites to be grouped together in centres
- When the multi-site network passes through a WAN.

The advantages of a multi-centre configuration are:

- Decrease in the number of links: 1 inter-centre link instead of n inter-site links
- Easy bandwidth management thanks to the use of CAC.

3.2 GENERAL NETWORKING PRINCIPLES

For a multi-site configuration to work, it must be possible to exchange the following between two sites:

- Signalling messages for call setup
- Voice
- Possibly, data such as billing information.

For this, create a certain number of bridges between the sites and centres, in form of:

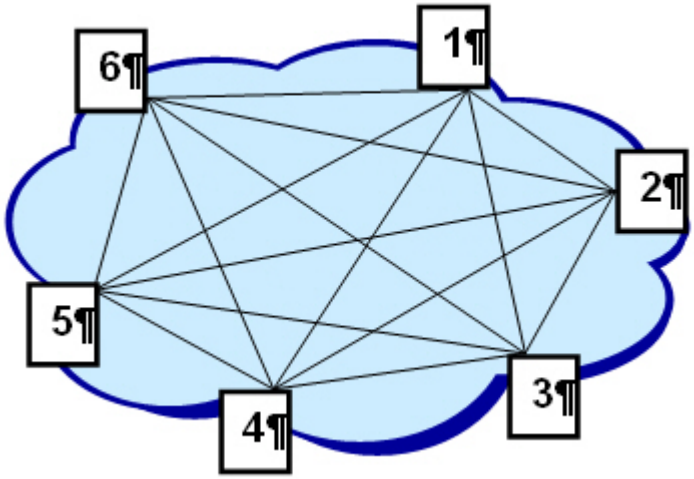
- Signalling gateways for signal transmission
- Voice gateways for voice transmission
- (Optional) data gateways for data transmission.

3.2.1 SIGNALLING GATEWAY

The signalling gateway is the resource used to create a virtual circuit between the network sites through which signalling messages pass. This virtual circuit is also called signalling channel.

On an IP multi-site network this gateway uses an IP tunnel link. It carries MOVACS signals over proprietary TCP. All the messages are transmitted in form of X25 packages in IP links.

Each site must declare a signalling gateway to each site on the network.

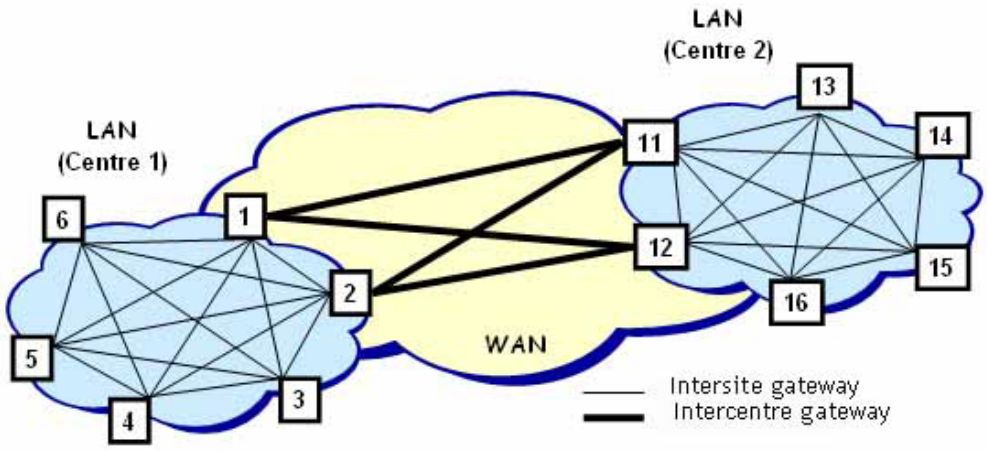


The above diagram illustrates the signalling network meshing between the different sites in the same centre.

There are two types of gateways:

- Inter-site gateways
- Inter-centre gateways

In a multi-site architecture, each site must declare an inter-site signalling gateway to each site in its centre, and know the identity of the site(s) in its centre with inter-centre gateways to other centres on the network.



The above diagram illustrates the signalling network meshing between the different sites in the same centre.

3.2.2 VOICE GATEWAY

The voice gateway is used to set up a voice circuit between two sites.

In an IP multi-site architecture, it is not necessary to declare this gateway which is dynamic (set up on demand) and uses VoIP resources.

3.2.3 DATA GATEWAY

On an IP multi-site network this gateway is not required, given that IP data transmission is used.

3.2.4 IP MULTI-SITE ARCHITECTURE

An IP multi-site architecture is a meshed architecture due to the nature of the IP networks: any site can directly access any other site on the multi-site network.

3.2.5 MULTI-CENTRE ARCHITECTURE

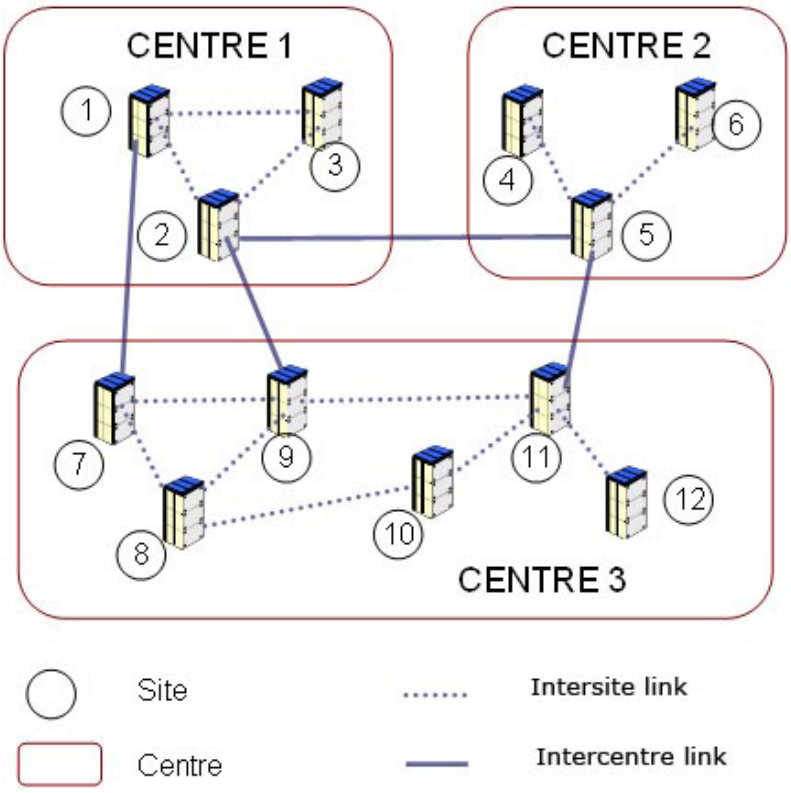


Figure 1: Multi-centre architecture

This network has two architecture levels:

- A multi-site architecture connecting the sites of a centre (sites 1, 2, 3 of Centre 1)
- A multi-centre architecture inter-connecting the centres.

3.3 SETTING UP MULTI-SITE CALLS

When a network subscriber wishes to reach another network subscriber, the number dialled is analysed on its reference site (site on which the subscription is declared). The result of the analysis is used to select a particular site, several sites, a centre, a set of sites and centres, or the number is only recognised as a multi-site network subscriber number.

Based on the analysis performed, the message(s) used to search for a subscriber are transmitted via the signalling network.

The two extreme cases for subscriber search are:

- Number analysis has been used to select a single site (recognition of specific number ranges). In this case, a message is sent to this site only.
- Number analysis results in a global search. In this case, a message is sent to each site of the local centre and to each remote centre. We then talk in terms of general broadcast or "all sites / all centres" broadcast.

The site on which the called subscriber is located also uses a message to indicate to the calling site that the search has been successful.

When the call is set up, voice passes on the IP network via VoIP resources.

Note : VoIP resources are only required for TDM devices.

3.4 RESOURCES AND SERVICES

In a multi-site configuration, some functions and resources are used exclusively in single- site mode, others in multi-site mode.

3.4.1 CENTRALISABLE RESOURCES AND SERVICES

On one or more sites on the network, there are resources which can be shared systematically and occasionally by several sites.

Some resources do not require any specific precautions for use:

- Voice mail
- Paging system
- TTS (Telephone Translation Server)
- SRT server for distributing calls to operators.

Other resources can also be shared by the different sites but require special programming and some precautions for use:

- Access to public network
- Common abbreviated numbers
- Directory service
- Charging (Kitaxe and Mufact servers)
- Alarms sent (Services tickets)

- Answering service
- Operator services
- Voice encryption on the IP network
- CAC (Call Admission Control).

3.4.2 NON-CENTRALISABLE RESOURCES AND SERVICES

Some resources are not associated with multi-site management. They are only used on the site where they are physically present and no other site can have access to them.

The uncentralisable resources are:

- IVB

Note : IVB is available on all Mitel 5000 Gateways systems and in MiVoice 5000 Server (as of R5.3).

- MiVoice 5000 Server Network intercom (external network line supervision in intercom mode)
- Loudspeaker call
- Global forward
- Trunk group reservation for the operator
- Cyclic or fixed subscriber hunt group, or general call hunt group
- Common bell pick-up

3.4.3 CONSTRAINTS CONCERNING RESOURCES

Since the software operation does not check configuration consistency between the different sites, these checks must be carried out by the installer.

The resources involved are as follows:

- Site and centre numbers

  If only one centre is created, its number must be equal to 1.

  Choose the site and centre numbers considering possible upgrades, to avoid having to modify them later.

- Company and department numbers
- Length of the internal dialling plan.

  The choice of this value must take into account the total number of users on the multi-site network, as well as planned and possible network changes.

- Directory numbers

  Two subscribers cannot have the same directory number. This rule also applies to common bell and the remote maintenance MODEM used exclusively by each site.

Note : While a subscription is being created, it is possible to check that the number does not already exist on the multi-site network by ticking the box "With control of multi-site existence" on the subscription creation screen.

- Private direction names
- Operator services
- It is not possible to define an operator service on MiVoice 5000 Server (menu not available).
- DECT management: there must be consistency for the cells and areas defined on each site.

Note : the site copying tool is used to check the consistency of some of these resources. For more information on the copied tables, see Section 4.4.6

3.5 DIRECTORY

In software release R5.1 and later, the MiVoice 5000 device directory is an LDAP directory. Each MiVoice 5000 device can host an LDAP directory database. This database contains:

- Internal records (of subscribers declared on the iPBXs)
- External records (of external contacts)
- Abbreviated numbers.

This directory database also offers an LDAP interface to external applications (charging unit, hotel/motel application, TWP server, CC server, Mitel OMM, i2052 and i2070 terminals, etc.).

Only one directory database is active on the multi-site network. It is on this database that configuration is performed by MiVoice 5000 Manager (if available), through iPBX record creation/modification/deletion interfaces or White Pages menu.

If a MiVoice 5000 Manager is available on the multi-site network, it is then possible to have replicas of the directory database, located on any of the sites on the multi-site network and accessible for consultation only. For more details about replication, refer to Section *3.5.6*.

The White Pages menu, accessible from the MiVoice 5000 Web Admin of each iPBX through the **DIRECTORY SERVICE** button, gives access to all the directory records containing the abbreviated numbers.

The (MiVoice 5000 Manager) Management Centre, if available on the multi-site network, offers an overview of the directory (external records, internal records of all the iPBXs on the multi-site network and abbreviated numbers).

Note : As of R5.2, a new management mode from the directory characteristics is available (refer to document AMT/PTD/PBX/0099/EN).

3.5.1 DATA MODEL

The structure of the data in an LDAP database is a tree defined by a set of branches and nodes. The structure of the data tree in the LDAP database of MiVoice 5000 systems is represented by the following diagram:

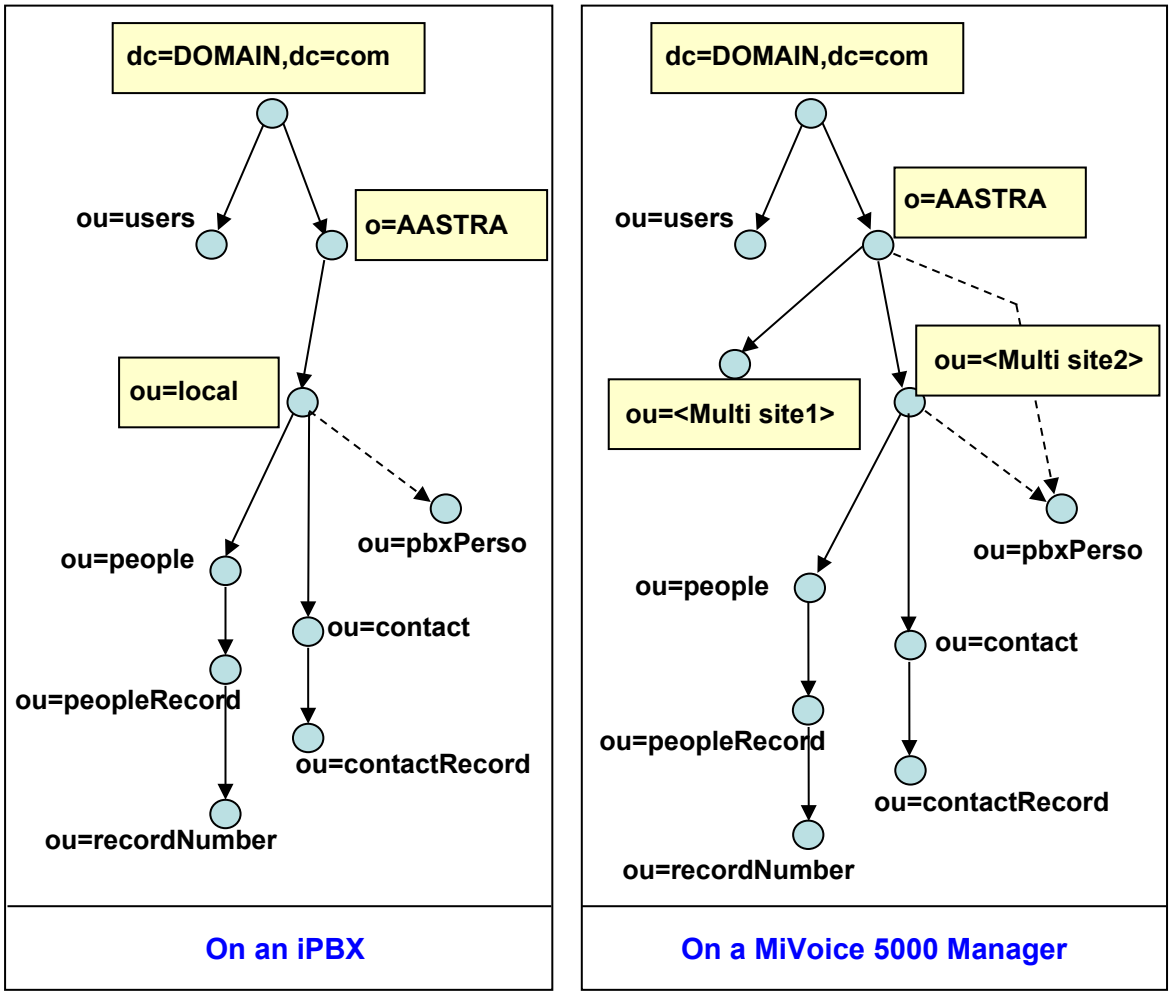


Figure 2: Data tree structure

The **pbxPerso** branch is a proprietary branch used to store in the directory personalised parameters and the description of the record models used.

This makes it possible to personalise the directory records to meet specific needs, and to give to the external applications connecting to the LDAP database a view of the data structure used.

The personalisable parameters are:

- Values which will be proposed while creating directory records in form of an options list, thus facilitating data entry and ensuring a homogeneous input. This is, for instance, the case of the **Title** parameter used to assign to a directory record a value such as Mr, Mrs, etc.
- Additional directory record attributes (10 maximum) which can be used in the directory records in addition to the obligatory parameters.

This branch may be declared globally if its content is shared by all the defined multi-sites, or on the multi-site level if its content concerns only one multi-site network (these two possibilities are illustrated by dotted lines in the structure).

The **users** level contains LDAP accounts enabling external applications to access the database. When each iPBX is installed, an account is created for each external application (billing, TWP, NCP, Mitel OMM, i2070, i2052, hotel/hospital module). The accounts are created with a password which can be modified by the user.

The **people** level consists of the internal records of its branch.

The **contact** level consists of the external records of its branch.

3.5.2 DIRECTORY RECORDS

3.5.2.1 Internal records

An internal record is either of the *person* type or the *alias* type.

An internal record of the person type consists of the personal record and associated number record(s).

An *alias* record corresponds to a person who does not have a subscription but who shares a set with a subscriber. *Alias* records can be used to search for the corresponding persons by name. An *alias* record does not have an associated number record.

The internal records for an iPBX must be created from this iPBX if the multi-site network does not contain any MiVoice 5000 Manager, and from MiVoice 5000 Manager if it is available.

The *personal record* is presented as follows:

ATTRIBUTE	DEFINITION
cleUid	Internal identifier for the record
cleExt	External identifier for the record (used for synchronisation)
type	Subscriber’s title (Mr, room, etc.)
function	Subscriber’s function
mail	Subscriber’s e-mail address
sn	Subscriber’s surname
gn	Subscriber’s first name
displayName	Surname used for display
displayGn	First name used for display
telephoneNumber	Subscriber’s public number(s) (green list)
didNumbers	Subscriber’s DID number(s)

hierarchySV	Administrative hierarchy to which the subscriber belongs
localisationDescr	Subscriber's location (building, floor, office, etc.)
Secretary	Reference to the secretary record
Additional 10 configurable attributes can be added.	

Figure 3: Internal "personal" record

One or more *number records* are associated with this record. There are several *number records* for a multi-line subscription or when the subscriber has several locations and, thus, several numbers.

When a *number record* is created, the number is automatically copied to the "internal "personal" record if this is a public number.

The *number record* is presented as follows:

ATTRIBUTE	DEFINITION
phoneNumber	Main number
label	The label will be displayed instead of the surname and first name.
private	Confidentiality (red list, orange list, green list)
shortNumber	Speed dial number
extendNumbers	List of aliases for this number
didNumbers	Subscriber's DID number(s)

Figure 4: Number record

The format of the *alias* record is the same as that for the *person record*, but without an associated number record. The number fields are automatically completed using the corresponding fields in the subscriber's *person record*.

3.5.2.2 *External records*

The personal record is presented as follows:

ATTRIBUTE	DEFINITION
cleUid	Internal identifier for the record
cleExt	External identifier for the record (used for synchronisation)
type	Subscriber's title (Mr, room, etc.)
mail	Contact e-mail address
sn	Contact's surname
gn	Contact's first name
displayName	Surname used for display
displayGn	First name used for display
phoneNumber	Contact number
hierarchy	Administrative hierarchy with access to the speed dial number
shortNumber	Speed dial number
localisationDescr	Subscriber's location (building, floor, office, etc.)
private	Confidentiality (red list, orange list, green list)
Additional 10 configurable attributes can be added.	

Figure 5: External "personal" record

Note : If an external record is created from MiVoice 5000 Manager, it is possible to give a list of values in the hierarchy parameter. On the other hand, if the external record is created from the iPBX's MiVoice 5000 Web Admin, this parameter accepts only one value. In this case, you have to duplicate the external record as many times as necessary so as to be able to describe all the administrative hierarchies that will have access to the speed-dial number.

3.5.2.3 Number format in the LDAP database

The format for the numbers supported in the LDAP database is as follows:

SUPPORTED FORMATS	
National number	+33 134609000 0134609000
TL number	81400
Internal number	400
International number	+49 12345567 004912345567
Special number	03699

Other formats are not supported (e.g.: +33 (0) 1 34 60 90 00, …).

3.5.2.4 Abbreviated (speed dial) numbers

In release R5.1 and later, abbreviated or speed-dial numbers are directly defined in the directory records.

- An abbreviated number can be assigned to an external number:
  - One or more administrative hierarchies, which give access right for this number, are associated with an external record’s abbreviated number.
  - The same abbreviated number can be re-used on several external records at the same time if the associated hierarchies are unconnected (two hierarchies are said to be unconnected if none of them is daughter to the other).
  - The external number associated with the abbreviated number can be complete or incomplete, with entry of the remaining part of the number by the user.
  - An external incomplete number should not be presented during call by name (the operator assigns it the confidentiality attribute “red list”).
- An abbreviated number can also be assigned to an internal number (in this case, there is no association with a hierarchy: it will be accessible to everybody).

The figure below gives some examples of abbreviated numbers:

Numbering plan

*	3	1	FAC: abbreviated number LG : 3
*	3	2	FAC: abbreviated number LG : 3

External record	External record	External record	External record
Dupond	EADS	Aastra	4567
Peter	Company	Toronto	HOT LINE
+33 1 30456789	+33 1 30456(3)	+45 1 23456()	
100	200	201	104
	/AASTRA/DEV	/AASTRA/DEV	
		/AASTRA/MKG	
....	....	....	....
Green File	Red File	Red File	Green File

Dialing number	*3100	*3200	*3201	*3104
DEV subscriber	OK	OK	OK	OK
MKG DEV subscriber	OK	NOK	OK	OK
Features	Direct call	3 numbers added	The user enters the lock code	Direct call

In this example, the code used to access the “common abbreviated numbers” feature has been set to *3 in the numbering plan (default configuration).

Note : Release R5.1 offers a new abbreviated number management option: it is possible to use several prefixes; each prefix gives access to a given number range (for more details on abbreviated numbers, see the MiVoice 5000 Web Admin Operating Manual [3]).

Here are the call modalities for the four records presented in the example:

- To call Peter Dupond, just dial *3100.
- To call a person at the company “Business”, dial *3200 followed by the 3 numbers of his or her set. But you must belong to the authorised administrative hierarchy (/TCOM/DEV). The name is not displayed.
- To call a person at the "Telecom" company in Montreal, dial *3201 then enter the called party’s extension number. Since the number length is unknown to the iPBX, enter an end code to initialise the call. You MUST belong to one of the authorised administrative hierarchies (/TCOM/DEV or /TCOM/MKG). The name is not displayed.
- To call the Technical Support department, just dial *3104. The call will reach a telephone hunt group.

Note : It is advisable to add to the red list the records whose numbers are incomplete.

3.5.3 WHITE PAGES SERVICE

The White Pages service is a service that is available on any iPBX, and gives an overview of the directory. It used to:

- View, modify, create external records
- View all the internal records of the multi-site network.

This service is accessible from MiVoice 5000 Web Admin, via the **DIRECTORY SERVICE** button:

3.5.4 SOFTWARE ARCHITECTURE

The telephony service of an iPBX uses the MOVACS protocol to:

- Access the Directory Service for search by name (called party name) and for (caller) number resolution
- Access the Abbreviated Number Resolution service for abbreviated number resolution.

These two services are resources that can be shared in a multi-site configuration. Therefore, for each site, indicate the site that will provide the Directory Service and the one that will provide the Abbreviated Number Resolution Service.

Note : Each iPBX that offers the Directory Service must have the required licence.

3.5.4.1 Accessing a directory service from telephony

Telephony can access several directory services located on different iPBXs on the multi-site network and, thus, secure directory consultation and balance the load in terms of number of requests to a directory service.

The configuration of telephony accesses to the directory service must take account of the availability of an active directory.

If the site does not have any active local directory service, you have to configure the location of this service on one or more other sites.

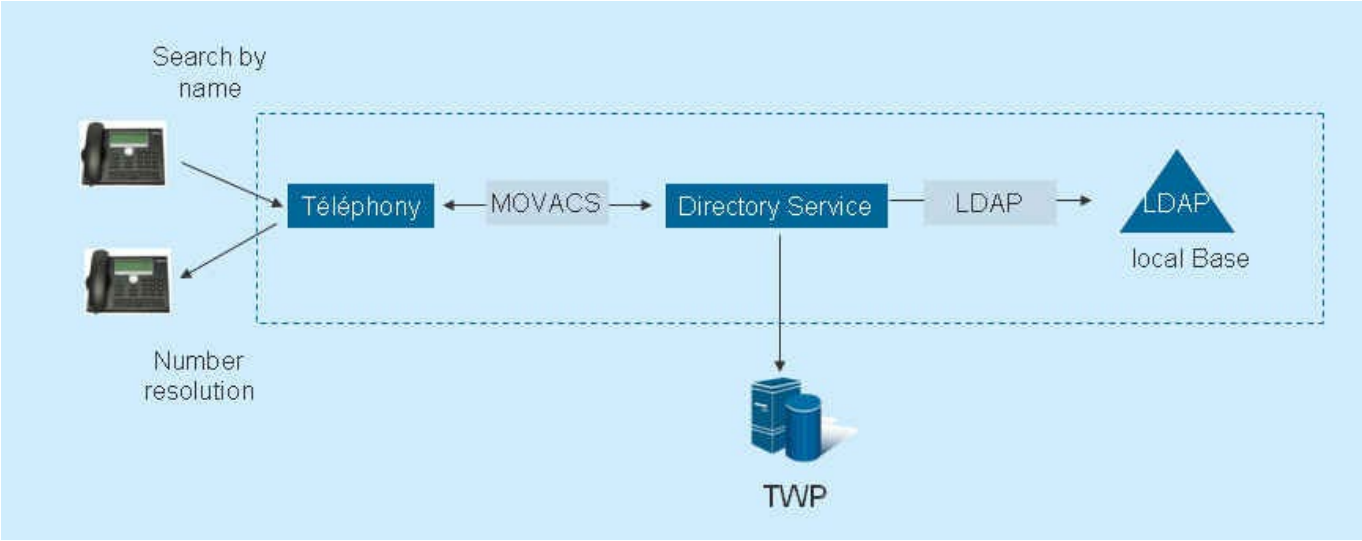
3.5.4.2 Directory service

The directory service may interface with the local LDAP database, a remote LDAP database or the TWP that offers a consolidated view of several external directories with different formats.

For each site on which the directory service is operational, you can define up to three instances of databases which the directory service may access in consultation mode for number resolution, according to the order of priority chosen.

This property offers two advantages:

- Availability of directory access for a given site, thanks to the directory service switchover to a lower-priority directory database instance if the instance it is trying to reach is not accessible
- Request load distribution to the different directory database instances:



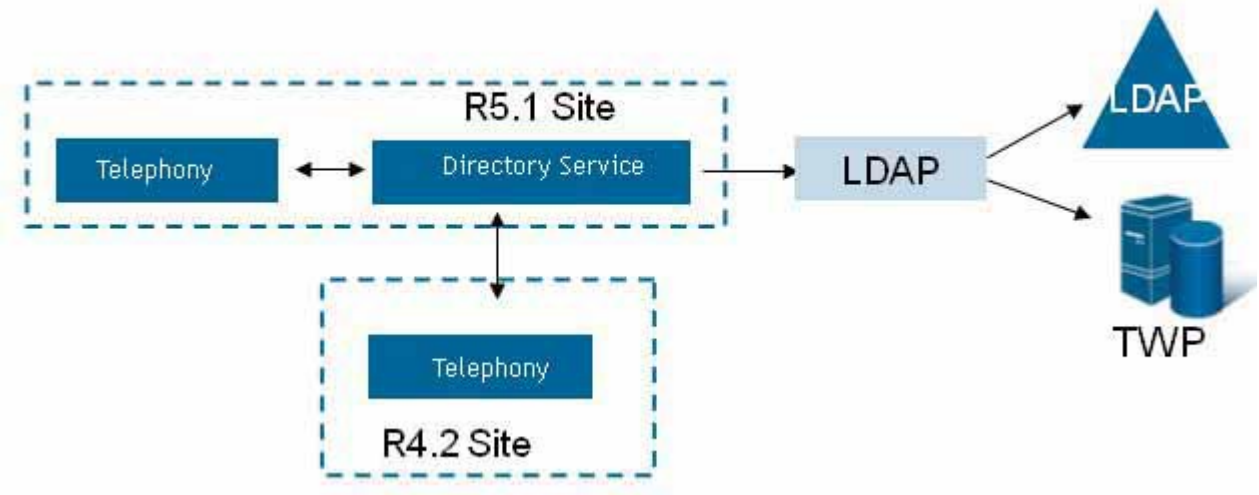
The directory service is subject to locking according to the total number of LADP (internal + external) database records. If the LDAP database contains more directory records than the number authorised on the directory service, this latter is “locked” and stops responding to requests made by telephony. It is "reactivated" when the number of directory records decreases and falls below the authorised threshold. The time required to reactivate the directory services may be up to 30 minutes.

Note : When the directory service points to a TWP instance, there is no check regarding the number of directory records.

A licence is needed in a single-site configuration. In a multi-site configuration, you just need one licence per directory service used. This licence depends on the number of the directory’s physical instances.

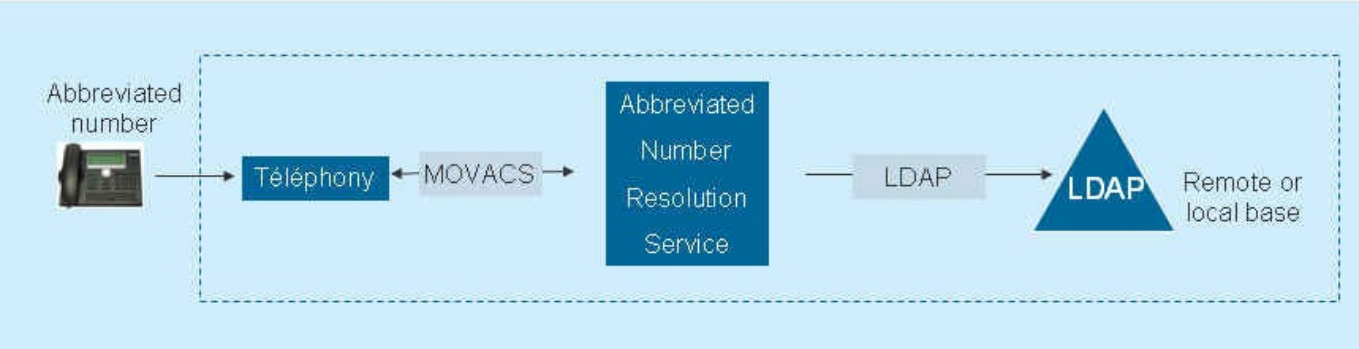
The location of the directory service on a remote site is necessary in case of R5.x – R4.x interoperation.

In fact, the LDAP format of the directory database introduced in R5.1 is not compatible with the directory service of an R4.x site. To access the multi-site database, the R4.x site must use an R5.1 directory service.



3.5.4.3 Abbreviated number resolution service

The abbreviated number resolution service can interface with one database only: the internal LDAP database or a remote LDAP database.

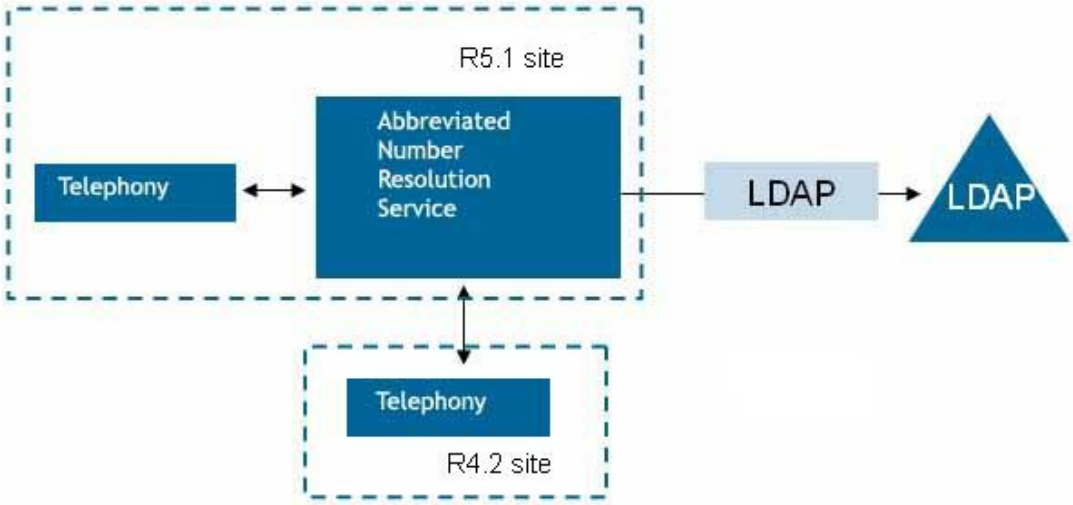


The location of the abbreviated number resolution service on a remote site is necessary in case of R5.x–R4.x interoperation.

In fact, the LDAP format of the directory database introduced in R5.1 is not compatible with the abbreviated number resolution service of an R4.x site. To access the multi-site database, the R4.x site must use an R5.1 abbreviated number resolution service.

Note : Only the abbreviated numbers configured in records not restricted in terms of administrative hierarchy are accessible to R4.x site subscribers.

Telephony may access only one abbreviated number resolution service located on its own site or on a remote site (no protection of this service). In R5.1, it is advisable to locate the abbreviated number resolution service on its own site.



3.5.5 FUNCTIONS PROVIDED BY MIVOICE 5000 WEB ADMIN

MiVoice 5000 Web Admin is used to:

- Configure the directory's administrative hierarchy
- Configure the options list (title, function)
- Create, modify, delete iPBX related internal and external records
- Import/export directory records
- Access any of the different directories distributed over the infrastructure.

3.5.6 FUNCTIONS PROVIDED BY THE MIVOICE 5000 MANAGER MANAGEMENT CENTRE

If available on the multi-site network, the MiVoice 5000 Manager Management Centre hosts the LDAP database. In addition to the services offered by MiVoice 5000 Web Admin, it is used to:

- Give a centralised view of all the managed multi-site records
- Configure the records' optional attributes
- Manage the ACL (Access Control List)
- Synchronise the LDAP database with an external database such as Active Directory
- Manage LDAP database replications on one or more iPBXs on the network.

Note : These last two functions require a software key code.

The choice of the devices that will receive the replicated database instances will be made according to data size.

Replication is a real-time operation. Therefore, the sites may access the replicas, without information loss, to consult the directory. This distributes the directory access load to the different instances and secures the directory access if a directory instance is not accessible.

For more information on these functions, see the *MiVoice 5000 Manager User Guide* [1].

3.5.7 EXTERNAL APPLICATIONS

External applications, billing, TWP, CC, UCP, Mitel OMM, i2052, i2070 applications, etc. connect to the LDAP directory database using a "user account and password" pair which corresponds to an ACL defined in the LDAP database.

An ACL is a rights profile which defines the nodes accessible in the database structure, as well as the associated rights (reading, modification, etc.) for a given user account.

When an iPBX is installed, the LDAP database contains some predefined user accounts for each external application and can be used without any particular changes on a standalone site or on a multi-site without MiVoice 5000 Manager.

On the other hand, when the multi-site contains a MiVoice 5000 Manager, the ACLs must be reconfigured from the MiVoice 5000 Manager to point to the "multi-site" branch rather than the local branch of the tree.

3.6 "DUAL HOMING"

3.6.1 DEFINITION

The "Dual Homing" function enables a set to connect to a backup site when it is unable to connect to its reference site, either because the reference site is out of service or because it cannot be accessed by the network.

3.6.2 R5.1B CHANGES

This function exists from version R4.1 onwards, with the following restrictions:

- It is only available for G2KIP terminals.
- it requires 2 subscriptions on 2 different sites and a specific configuration on the STT server.

With release R5.1B, this function can be extended to other phones by simplifying the configuration required.

Dual Homing is available on all MiVoice 5000 systems.

3.6.2.1 Sets concerned

The Dual Homing function applies to the following sets:

- MiVoice 5300 IP Phones
- Mitel 6700 SIP Phones
- G2KIP
- I2052 CTI connecting to a subscription of any of the previous types.

3.6.2.2 Configuration

In order to configure Dual Homing for a subscription, simply assign a backup site as one of the characteristics of the subscription. There is no need to make a declaration on the backup site or undertake any special configuration of the STT server.

A subscription with an associated backup site is deemed to be "backed up".

Note : To use Dual Homing, you must follow the configuration guidelines described in Section 3.6.7.

3.6.3 R8.2 CHANGES

R8.2 extends this feature to hunt groups within a Call Server configured for Dual Homing.

Dual Homing is available across all systems in the MiVoice 5000 range.

3.6.3.1 Configuration

Configuring Dual Homing for a hunt group involves simply assigning it a backup site as a feature of the subscription. No declaration of the backup site or special configuration of the STT server is required.

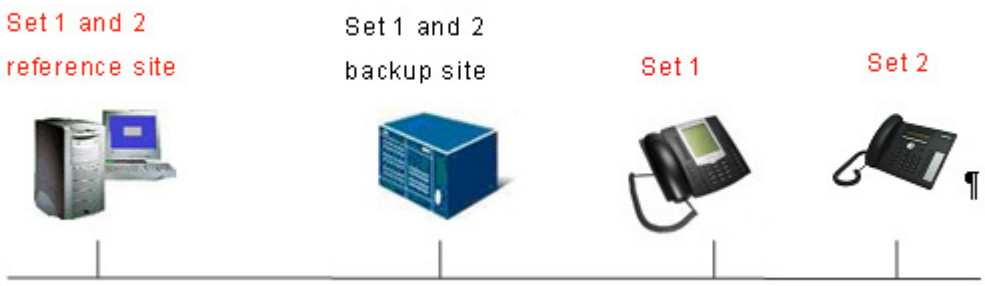
Note: To use Dual Homing, you must follow the configuration guidelines described in Section 3.6.7.

WARNING: The backup site to be assigned must also be running with R8.2.

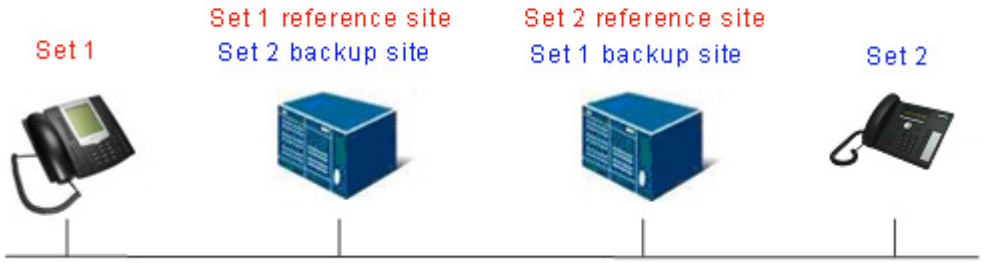
3.6.4 EXAMPLES OF ARCHITECTURE

The figures below show some examples of Dual Homing configuration architecture. The choice of architecture must take into account various factors associated with:

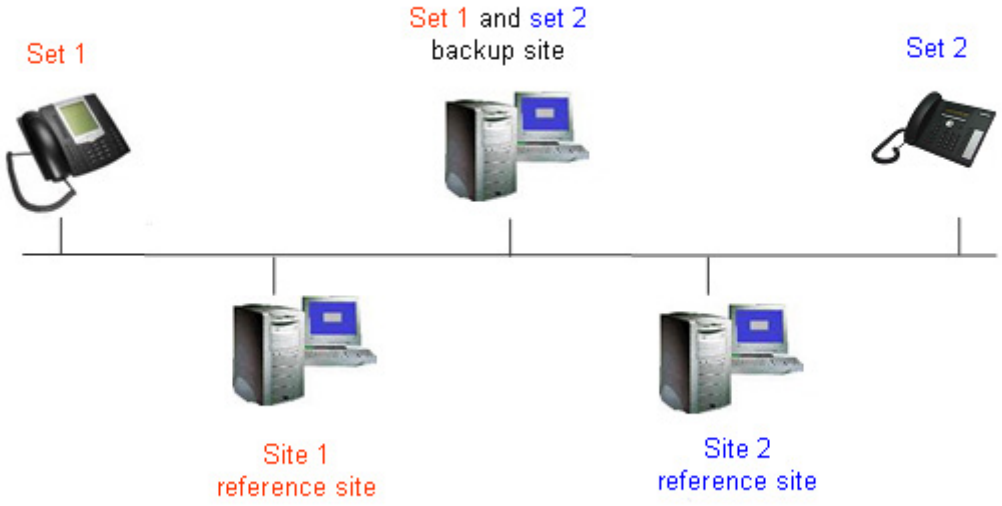
- The network configuration
- The number of sites per multi-site configuration
- The remaining capacity on each of the sites after the local subscriptions have been declared.



This example illustrates the arrangement whereby subscriptions declared on a MiVoice 5000 Server are backed up on a Mitel 5000 Gateways.

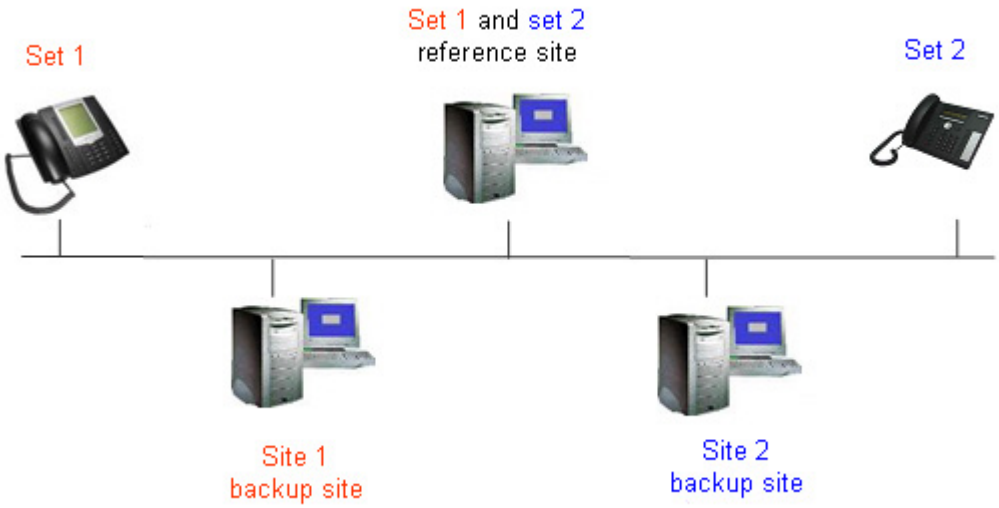


This example illustrates the case in which each site serves as backup for the subscriptions on the other site. This architecture is primarily used in cases where the multi-site configuration involves only 2 sites.



This example illustrates the case whereby one site acts as a backup for the subscribers on the other sites in the multi-site configuration.

This architecture is primarily used when one of the sites in a multi-site configuration has sufficient capacity (in terms of the number of subscriptions available) to accommodate the backup subscriptions on the other sites.



This example illustrates the arrangement whereby the subscribers on one site are backed up as a result of their geographic location.

3.6.5 WORKING PRINCIPLES

When a set cannot access its reference site, it will connect to its backup site as long as a backup site is specified for the corresponding subscription. A backup site can be assigned when the subscription is declared or at any point after this by changing the subscription's characteristics.

During the period that the set is connected to its backup site, the subscriber will have access to reduced telephony functions (see § *3.6.4.5*).

When the terminal's reference site becomes available again, a switchover mechanism is automatically initiated and "normal" function is restored.

3.6.5.1 Subscription declaration

The site on which a subscription is declared is known as its reference site. It is possible to assign any of the sites in a multi-site configuration as the subscription's backup site as long as the configuration rules set out in § *3.6.6* are followed.

- If the multi-site configuration does not contain any MiVoice 5000 Manager application, a backup site can be assigned to a subscription via MiVoice 5000 Web Admin, using the **Backup site** parameter on the subscriber characteristics screen. This can be accessed via the menu **SUBSCRIBERS>Subscriptions>Characteristics>General characteristics**. For a complete description of the settings on this screen, see the *Operating Manual for the MiVoice 5000 Web Admin* [3].

- If the multi-site configuration has a MiVoice 5000 Manager application, it is not possible to create and modify subscriptions from the MiVoice 5000 Web Admin. The backup site is assigned through the MiVoice 5000 Manager application, using the **Backup site** parameter on the subscriber characteristics screen. This can be accessed via the menu **Telephony service >Subscribers**. For a complete description of the settings on this screen, see the *Operating Manual for the Mitel Manager MiVoice 5000 Manager* [1].

3.6.5.2 Data copying

The system automatically creates a copy of each backed up subscription and its telephone environment on the backup site by copying certain tables and data relating to the subscription from the reference site to the backup site.

The presence of these data enables the subscriber to use the majority of the facilities available on the reference site when connected to the backup site.

It is not possible, however, to configure or modify the subscriber's attributes on the backup site.

3.6.5.2.1 List of data copied to the backup site

The following data are copied for each backed up subscription:

- General subscription characteristics
- Terminal characteristics
- Intercom groups
- Authentication data for SIP terminals
- IP addresses of the login site and reference site
- Secondary lines and numbers
- Programmable keys
- Forwarding
- Personal speed dial numbers
- Password
- Company/department.

3.6.5.2.2 Starting the copying process

There are several events that can trigger total or partial copying of data relating to a backed up subscription onto the backup site:

1. The system carries out automatic copying, once per day, from each site to all the sites acting as a backup for at least one subscription:

- The time at which this copying takes place can be configured on the subscriber rights screen. This can be accessed via the menu **SUBSCRIBERS>Rights>General parameters** (see the *Operating Manual for MiVoice 5000 Web Admin [3]*).
- copying is carried out for all subscriptions that are backed up and **in service**,
- All data relating to the subscription (see Section *3.6.4.2.1*) is copied for each backed up subscription.

2. The system carries out automatic copying following the creation of a multi-site configuration (after 5 minutes):

- only subscriptions that are **in service** and for which the backup site is the site for which a link has just been established are copied,

- All data relating to the subscription (see Section *3.6.4.2.1*) is copied for each backed up subscription.

3. The operator can request immediate copying to a backup site or to all sites that serve as backup for at least one subscription. This function can be used to update the data to include any modifications (declaration of new subscribers in Dual Homing mode, for example):

- Site selection can be configured on the subscriber rights screen, accessible via the menu **SUBSCRIBERS>Rights>General parameters** (see *Operating Manual for MiVoice 5000 Web Admin* [3]).

- copying is carried out for all subscriptions that are backed up by the selected site and **in service**,

- All data relating to the subscription (see Section *3.6.4.2.1*) is copied for each backed up subscription.

4. Automatic copying is carried out by the "contact" system of an SIP terminal (IP address and port number required to contact the terminal) each time the contact transmitted in the SIP terminal connection request changes:

- Only this parameter is copied for the corresponding subscription.

In all cases, if a backup site is not available when the copying operation is triggered, the copy request is re-sent to this site every 5 minutes until it is accepted.

3.6.5.3 Activating the backup subscription

When a site (A) notices that it can no longer access another site (B) in a multi-site configuration, site A activates all subscriptions that are backups of site B.

The ICG intercommunication module is responsible for detecting accessibility to other sites.

The delay between detection and confirmation of an inaccessible PBX varies between 55 seconds and 1 minute 40 seconds. At the end of this period, the backup subscription is activated and the terminal can connect to its backup site (until the backup subscription is activated, all requests to register the terminal with its backup site is rejected).

3.6.5.4 Connecting a terminal to the backup site

Different mechanisms are used to connect a terminal to its backup site, depending on whether the terminal supports the login site optimisation function. For more details about login site optimisation, see § *4.5.3*.

3.6.5.4.1 Mitel 6700 SIP Phone

These terminals support the login site optimisation function.

The IP addresses of the reference site and backup site must be configured directly on the terminal (when the terminal is installed using the configuration file "aastra.cfg", or via the terminal's local interface). For more information on how to configure Mitel 6700 SIP phones, see terminal documentation [9], [10], [11], [12].

After four unsuccessful registration (REGISTER) attempts on its reference site, the Mitel 6700 SIP phone sends a registration request to its backup site. For this request to be successful, the backup site must be accessible, and the backup subscription active on this site. If this is not the case, the request is renewed.

In normal operating mode, the delay between two registration request transmissions to the reference site is 1 hour. If the reference site does not receive any piece of information from the terminal beyond this period, it disconnects the subscription.

In backup mode, the delay between registration requests is shortened to 5 minutes, in order to return to normal operating conditions as quickly as possible once the reference site becomes available again.

3.6.5.4.2 MiVoice 5300 IP Phones, G2KIP and i2052 CTI terminals

These terminals support the login site optimisation function.

The IP addresses of the subscription's reference site and backup site are provided automatically when the terminal tries to connect.

MiVoice 5300 IP Phones must be configured with the IP addresses of the login iPBX (via DHCP for example).

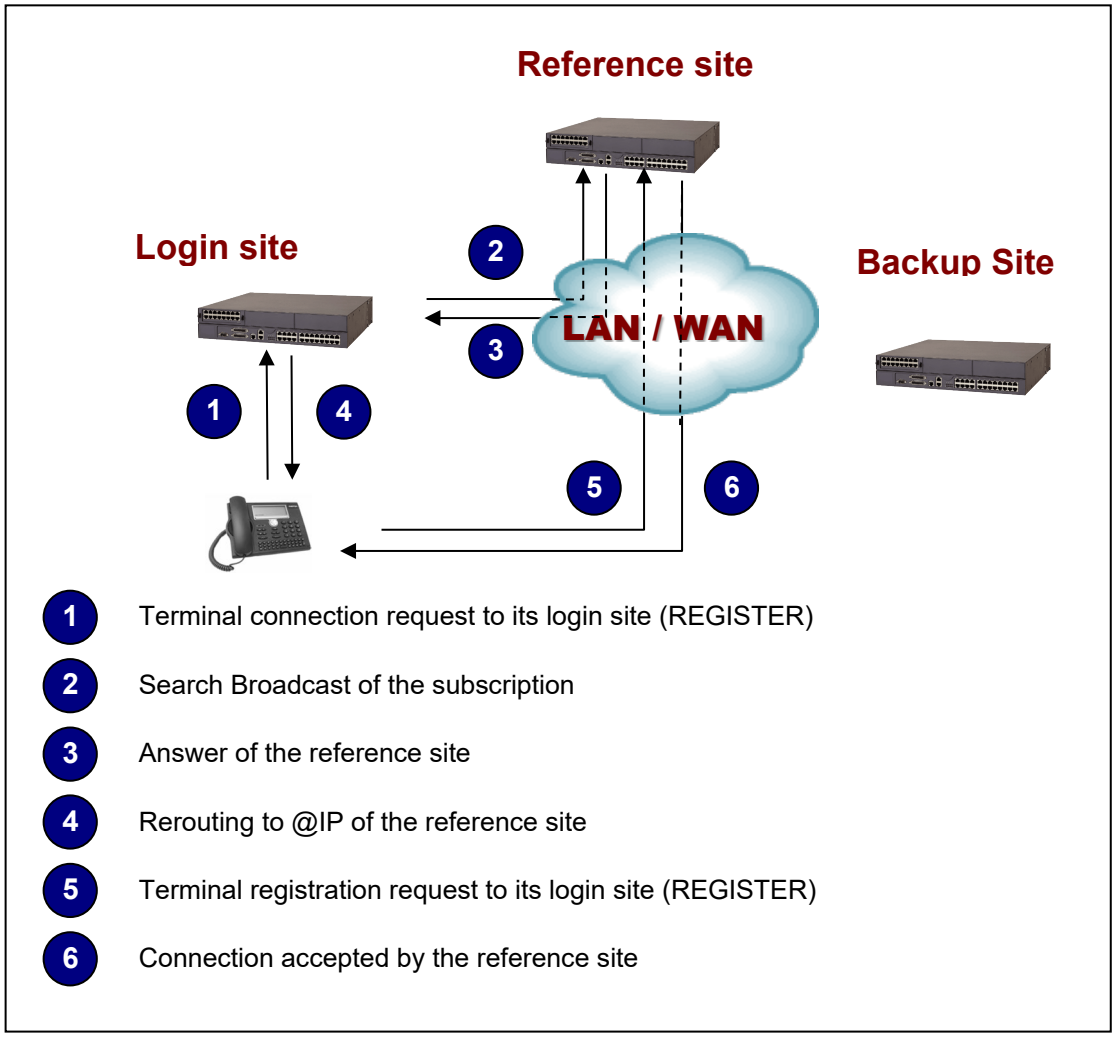


Figure 6: Connecting a set to its reference site (login site optimisation)

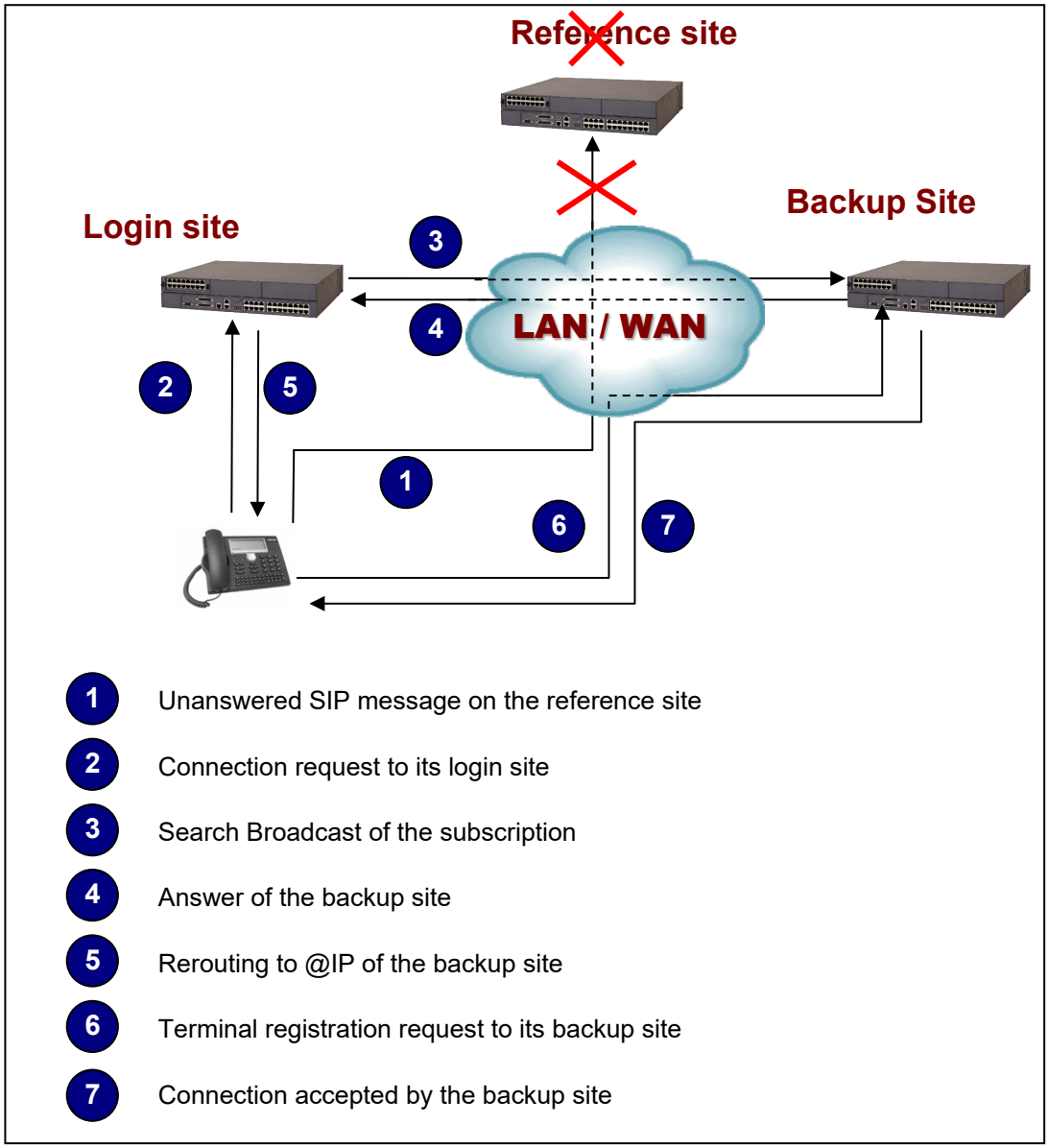


Figure 7: Connecting a set to its backup site (login site optimisation)

If the reference site fails to respond to messages, the MiVoice 5300 IP phone will send a connection request to its login site. The login site optimisation procedure will then result in connection to the backup site as illustrated in the figure below.

3.6.5.5 *Fallback mode on the backup site*

Certain restrictions apply to the subscription rights when the terminal is connected to the backup site.

Furthermore, because the system copies the subscription's telephony data once a day (except where otherwise explicitly required by the operator (see Section *3.6.4.2*)), there may be a discrepancy between the subscription rights on the reference site and those recorded on the backup site.

WARNING : Only MiVoice 5300 IP phones display an icon signalling to the user that the terminal is connected to the backup site and is, therefore, in fallback mode.

The following functions are either unavailable or restricted when connected to the backup site:

- The lists of barred numbers are associated with a site, not a subscription, and will therefore be read from the backup site; as a result, these lists must be consistent between any given site and the sites where the subscriptions are backed up in order to ensure that this function works properly,
- Similarly, the intercom group definitions must be consistent across the different sites.
- The automatic callback function is not available.
- Personal speed dial numbers can be accessed but cannot be configured.
- The list of last incoming/outgoing calls on the reference site is not available on the backup site.
- The voicemail box is not available.
- Forward to voicemail is not available.
- Call forwarding configuration through MiVoice 5000 Web Admin is not authorised; however immediate forwarding can be configured from the terminal (activation, deactivation) but this configuration will be lost on returning to the reference site.
- Manager/assistant forwarding and manager/assistant supervision can be used as long as the keys have been programmed on the main site and the manager and assistant subscriptions are backed up on the same site.
- Terminal unlocking is allowed; however neither locking nor password modification is possible (unlocking is lost on returning to the reference site).
- It is not possible to login/logout via MiVoice 5000 Web Admin.
- It is not possible to logout via the terminal interface, even if the primary subscription has logout rights.
- It is possible to log on (automatically or manually) if no terminal is assigned to the subscription or if the terminal is the same type as that assigned to the subscription.
- The rights associated with the subscription are the same as those on the reference site, but they cannot be modified on the backup site.
- SMS messages received on the reference site cannot be accessed.
- SMS messages received on the backup site are lost upon return to normal operating mode.
- Programmable keys can be used but some associated functions are not allowed (alarm, do not disturb, terminal locking, call forwarding other than immediate forwarding).
- Programmable keys cannot be configured.
- No other configuration can be made from the terminal interface.
- Terminal associations are saved on the backup site but only IP terminals with the Dual Homing function can access the subscription on the backup site (see the list of terminals in Section *3.6.2.1*).

3.6.5.6 Returning to normal operating mode

Once the site supervision function detects that the reference site for the backed up subscriptions is available and operating correctly again, the backup site deactivates all the backup subscriptions for this reference site. From this point onwards (and as long as the reference site remains operational), connection requests to the backup site will be unsuccessful for these subscriptions.

The amount of time required to return to normal operating conditions on the reference site depends on the type of set:

- Mitel 6700 SIP phones: the current session is disconnected by the backup site, The next registration request sent by the terminal is re-routed, and the terminal reconnected to the reference site. As there is a 5 minute delay between two REGISTER requests to the backup site, the set will be out of service during this period.

- MiVoice 5300 IP Phone: in the event of user action, the set receives a registration invitation, triggering a REGISTER request from the set, with no need to wait until the next scheduled REGISTER request (every 5 minutes).

- I2052 CTI and G2KIP: when the backup site connection TCP session is closed, the set immediately opens a new connection session.

3.6.5.7 Call maintenance

The general principles for call maintenance described in § *3.7* apply if the site to which the set is connected becomes inaccessible during a call.

When the terminal has successfully connected to its backup site, the call maintenance procedures are subject to the same rules applicable to a non-backed up terminal for which the connection site has restarted.

3.6.6 UNLOCKING "DUAL HOMING"

The Dual Homing function is unlocked using a licence key on the reference site. The number of subscriptions that can use this function is indicated in the MiVoice 5000 Web Admin menu **SYSTEM> Info>Licences**:

When the authorised number of backed up subscriptions is reached, it will no longer be possible to assign a new subscription to a backup site.

No additional unlocking is required on the backup site. In particular, IP connections to **backup** type subscriptions are not treated as IP connections in terms of the number of connections authorised for the site.

3.6.7 CONFIGURATION RULES

1. the minimum software version required for reference and backup sites is R5.1B, or R8.2 for hunt group configuration.

2. the same software version must be installed on both the reference site and the backup site in order to ensure that the Dual Homing function works correctly,

3. the licence key on the reference site must authorise Dual Homing configuration for the number of subscriptions to be backed up,

4. To create backup type subscriptions, the subscriber table on the backup site must have empty entries available; this can be checked by viewing the filling status of the tables via the menu **SYSTEM>Supervision>Filling status of tables**:

5. in order to assign a backup site to a subscription, the subscription must be of the LOCAL type.

Note : A set does not need to be assigned to the subscription when Dual Homing is configured for the subscription. You then just need to assign it an MiVoice 5300 IP phone, Mitel 6700 SIP Phone or G2KIP set later.
Subscription/i2052 CTI association is not done through terminal assignment but via its connection to a subscription declared in the i2052 application.

WARNING : Once a backup site is assigned to a subscription, a licence is automatically used up, even if the terminal associated with the subscription does not support the Dual Homing function.
The menu SUBSCRIBERS>Display>Other displays>Backed up subscriptions is used to identify these cases (see Operating manual for MiVoice 5000 Web Admin [3]).

3.7 MIVOICE 5000 WEB ADMIN CALL MAINTENANCE

In an IP environment, voice calls are no longer pass through the iPBX. Once a call is set up, it can continue without interaction with the iPBX, as long as no other operations are performed on the terminal. It is therefore possible, under certain conditions, to maintain a voice over IP call if the iPBX through which the call was made is no longer accessible.

Software version R5.1B offers this functionality for calls that involve at least one MiVoice 5300 IP Phone or one Mitel 6700 SIP Phone.

Note : No configuration operations are required for call maintenance.

Once a call is connected, it can be maintained if the call is between:

- Two MiVoice 5300 IP Phones or one Mitel 6700 SIP Phones connected to the same site with software release ≥ R5.1B that is no longer accessible (internal call)
- One MiVoice 5300 IP Phone or one Mitel 6700 SIP Phone connected to a site with software release ≥ R5.1B that is no longer accessible and a terminal connected to another site (inter-site call)
- One MiVoice 5300 IP Phone or one Mitel 6700 SIP Phone connected to a site with software release ≥ R5.1B that is no longer accessible, and an operator whose access is located on another site with software release ≥ R5.1B (network call).

The various configurations are explained in detail in § 3 to 3.7.5.

3.7.1 PREREQUISITES

The iPBXs that offer the call maintenance function are the MiVoice 5000 range (Server or 5000 Gateways) with software version R5.1B or above.

Sets that support the call maintenance function are:

- MiVoice 5300 IP Phone with software version V2.12.xx,
- Mitel 6700 SIP Phone with software version V2.3.xx,

3.7.2 SITE INACCESSIBILITY

A terminal may be unable to access a site for the following reasons:

1. The site has been stopped.
2. The site is being restarted.
3. The link between the iPBX and the terminal has been cut.

3.7.3 CALLS INVOLVING A SINGLE SITE WITH SOFTWARE VERSION ≥ R5.1BOR ABOVE

	MIVOICE 5300 IP PHONE	MITEL 6700 SIP PHONE	OTHER SET	TDM ACCESS	IP ACCESS
MIVOICE 5300 IP PHONE	1	1			2
MITEL 6700 SIP PHONE	1	1			2
OTHER SET					
TDM ACCESS					
IP ACCESS	2	2			

Local calls

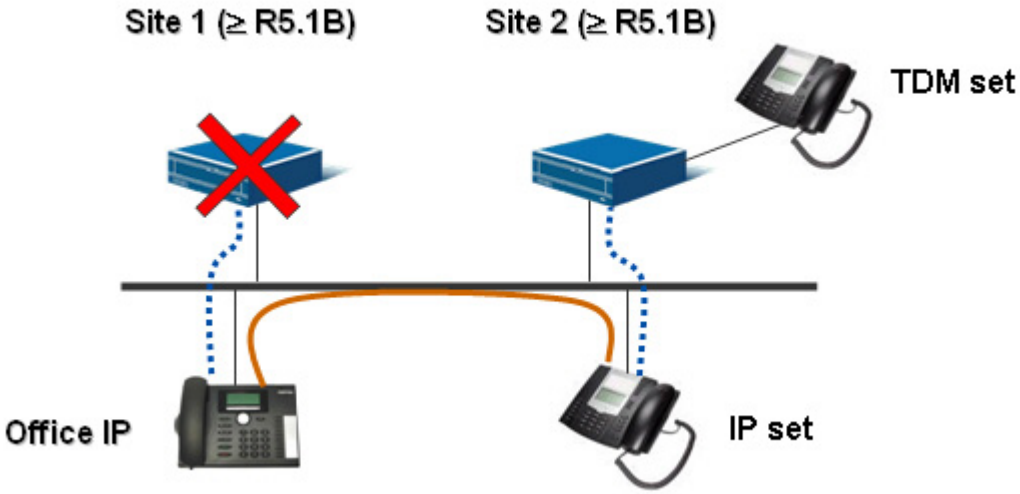
Network calls

Transit calls

1. Call maintained
2. Call maintained until it is cut-off by the operator on no answer by the SIP or H.323 audit access point.

All other calls are terminated.

3.7.4 CALLS INVOLVING TWO SITES WITH SOFTWARE VERSION ≥ R5.1B OR ABOVE



SITE 1 / SITE 2	MIVOICE 5300 IP PHONE	MITEL 6700 SIP PHONE	OTHER SET	ACCESS TDM	IP ACCESS
MIVOICE 5300 IP PHONE	1	1			2
MITEL 6700 SIP PHONE	1	1			2
OTHER SET	1	1			2
TDM ACCESS	3	3			
IP ACCESS	3	3			

Local calls (inter-site)

Network calls

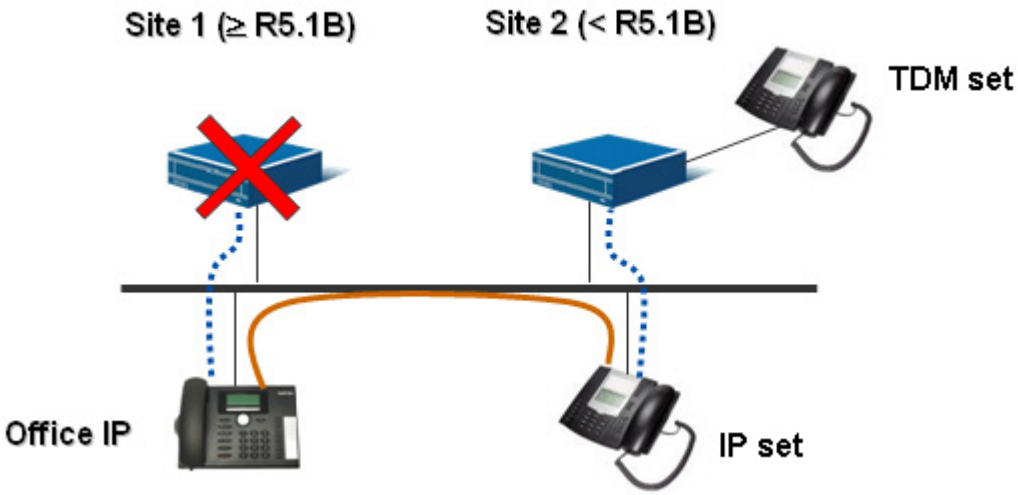
Transit calls

1. Call maintained
2. Call maintained until it is cut-off by the operator on no answer by the SIP or H.323 audit access point.
3. Call maintained for a period specified in configuration data 489 (default value of DCF 489: 1 hour)

All other calls are terminated.

3.7.5 CALLS INVOLVING TWO SITES IN INTEROPERATION

3.7.5.1 Where the site with version ≥ R5.1B or above is inaccessible



SITE 1 / SITE 2	MIVOICE 5300 IP PHONE	MITEL 6700 SIP PHONE	OTHER SET	ACCESS TDM	IP ACCESS
MIVOICE 5300 IP PHONE	1	1			2
MITEL 6700 SIP PHONE	1	1			2
OTHER SET	1	1			2
TDM ACCESS					
IP ACCESS					

Local calls (inter-site)

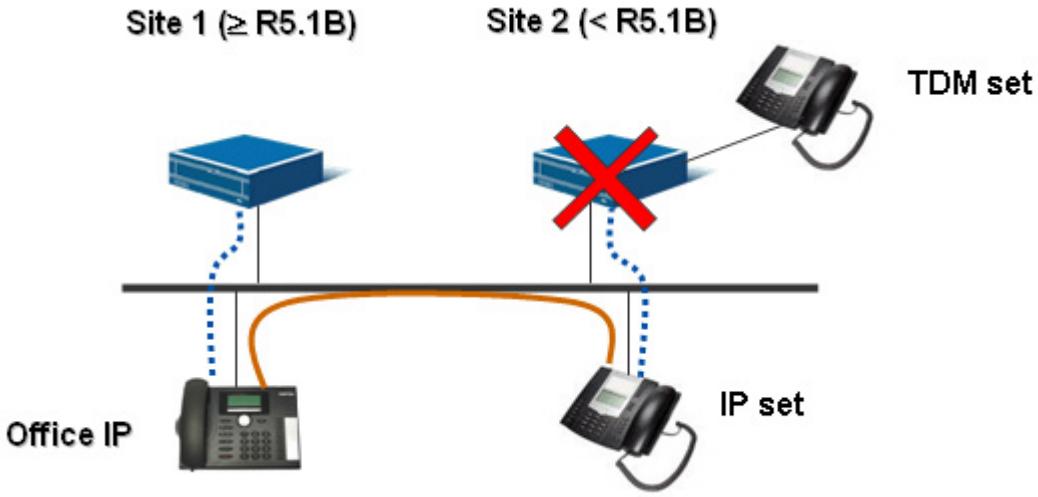
Network calls

Transit calls

1. Call maintained
2. Call maintained until it is cut-off by the operator on no answer by the SIP or H.323 audit access point.

All other calls are terminated.

3.7.5.2 Where the site with version R5.1A (or R4.2) is inaccessible



In this case, there is no guarantee that calls will be maintained.

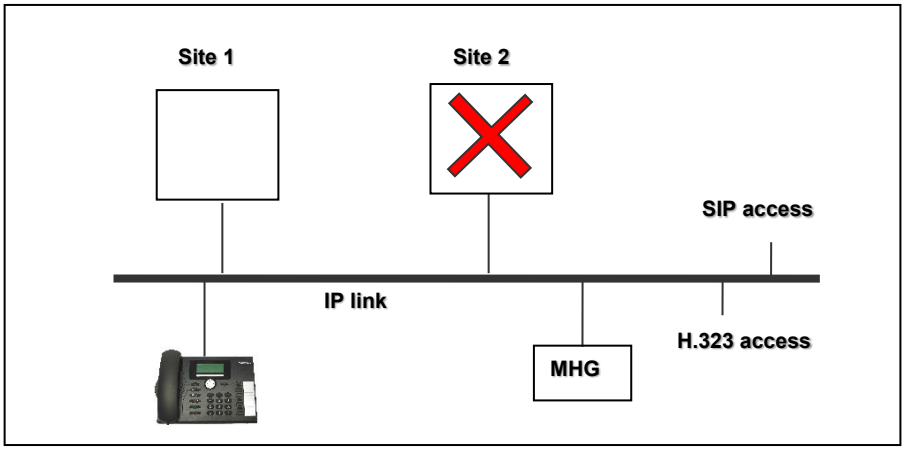
3.7.6 NETWORK CALL MAINTENANCE PRINCIPLE

Network calls with IP access on the site that is no longer accessible (site 2 in the figure below) are maintained but are audited by:

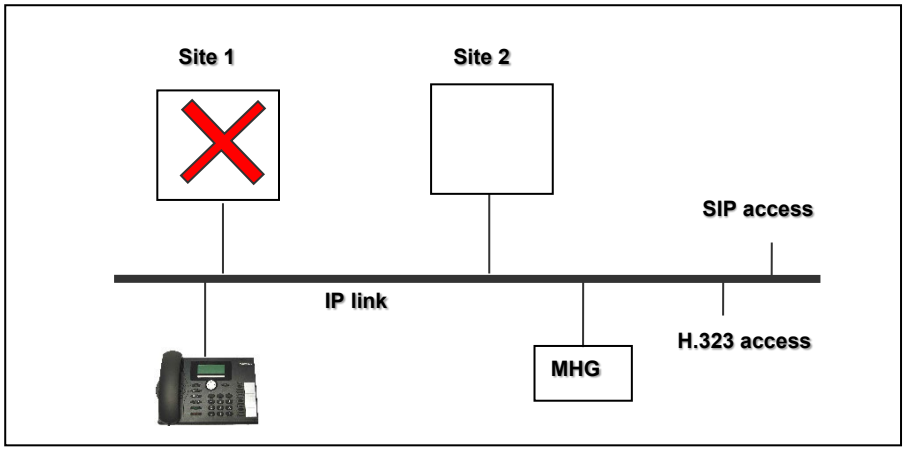
- The operator, for an SIP access
- The MHG, for a H323 access.

For an SIP access, since the site can no longer be detected through audit, the operator releases the call.

For a H323 access, when the MHG audit can no longer detect the site, the MHG releases the call.



Network calls with IP access on another site (site 2 in the figure below) are maintained by a timeout mechanism (via site 2) as long as the terminal's connection site remains inaccessible.



The timeout value is given in DCF 489 (default value 1 hour).

At the end of the timeout, the subscriber half-call is released and the network half-call is redirected to the attendant console.

The inaccessibility of the terminal's connection site is detected by:

- The ICG intercommunication management module for sites located in the same centre
- A supervision task for sites located in two different centres; this task is automatically launched between the two sites when a subscription on one of the sites is declared as backed up on the other.

WARNING : If the two sites are located in different centres and site 2 does not serve as backup site for any of the subscriptions on site 1, the call is maintained but not released at the end of the timeout period.

3.7.7 BEHAVIOUR ACCORDING TO SET TYPE

The tables below summarise the set/user/call interactions for MIVOICE 5300 IP Phones or one MITEL 6700 SIP Phones during the call maintenance phase. For more details about sets, see set documentation [6] to [12].

SET IN A CALL AND IPBX INACCESSIBLE			
	NO RESPONSE TO A REGISTER REQUEST	**USER HANGS UP (OR PRESSES THE RELEASE KEY)**	**OTHER OPERATION ON THE TERMINAL**
MIVOICE 5300 IP PHONES OR ONE MITEL 6700 SIP PHONES	The call is maintained. The two LEDs are activated on the terminal. The REGISTER transmission rate changes from 1 hour to 5 minutes, or remains on 5 minutes	The call is released. The two LEDs are activated on the terminal. The terminal sends a REGISTER request. The REGISTER transmission rate changes from 1 hour to 5 minutes, or remains on 5 minutes	The call is maintained. The terminal beeps indicating that the action is forbidden. The two LEDs are activated on the terminal. The terminal sends a REGISTER request. The REGISTER transmission rate changes from 1 hour to 5 minutes, or remains on 5 minutes
MITEL 6700 SIP PHONES	The call is maintained. An LED is activated on the terminal. The terminal sends a REGISTER request.	The call is released.	The call is maintained and placed on hold The action associated with the operation fails. The call placed on hold can be resumed.

TERMINAL ENGAGED IN A CALL AND IPBX ACCESSIBLE AGAIN				
	TRANSMISSION OF A REGISTER REQUEST	**USER HANGS UP (OR PRESSES THE RELEASE KEY)**	**OTHER OPERATION ON THE TERMINAL**	**NEW INCOMING CALL**
MIVOICE 5300 IP PHONE	The call is maintained. The two LEDs are deactivated on the terminal. The REGISTER request is accepted.	The call is released. The terminal is re-synchronised by the iPBX. The two LEDs are deactivated on the terminal.	The ongoing call is released. The terminal is re-synchronised by the iPBX. The two LEDs are deactivated on the terminal.	The ongoing call is released. The terminal is re-synchronised by the iPBX. The two LEDs are deactivated on the terminal. the new call is presented to the set
MITEL 6700 SIP PHONES	The call is maintained. The LED is deactivated on the terminal. The REGISTER request is accepted.	The call is released.	The action associated with the operation is successful. The ongoing call is released (the iPBX refuses to place it on hold).	The call is presented to the terminal via another line and the ongoing call is maintained, whereas the new call is not answered. If the new call is answered, the ongoing call is released (the iPBX refuses to place it on hold).

3.8 MANAGING SPECIAL NUMBERS

Special numbers are speed dial numbers that give access to internal emergency services (medical room, for example) or external emergency services (ambulance service, fire service, etc.) as well as different departments within the company (general services, information servers, etc.).

When a subscriber dials a special speed dial number this may need to be converted into a different number, depending on the caller's location (contact number for an on-call doctor for example), and/or routed to the subscriber (ambulance service, fire service, etc.).

This need is apparent in multi-site configurations where the call transmission site may differ from the subscriber's reference site because of the potential for mobility: Dect, login to a terminal on another site, IP terminals. A single-site configuration also exists, covering different geographic locations for emergency services, for example.

In order to meet these needs, software version R5.1B offers a terminal geographic location service when a call is transmitted. Location information is used to perform number translations and relevant routing operations.

3.8.1 WORKING PRINCIPLES

From software version 5.1B and above, the CAC server offers a geographical location service. For a description of the various services offered by the CAC server, see the *Operating Manual for the MiVoice 5000 Web Admin* [3].

When a call is transmitted, the geographic location function assigns each set (IP or TDM):

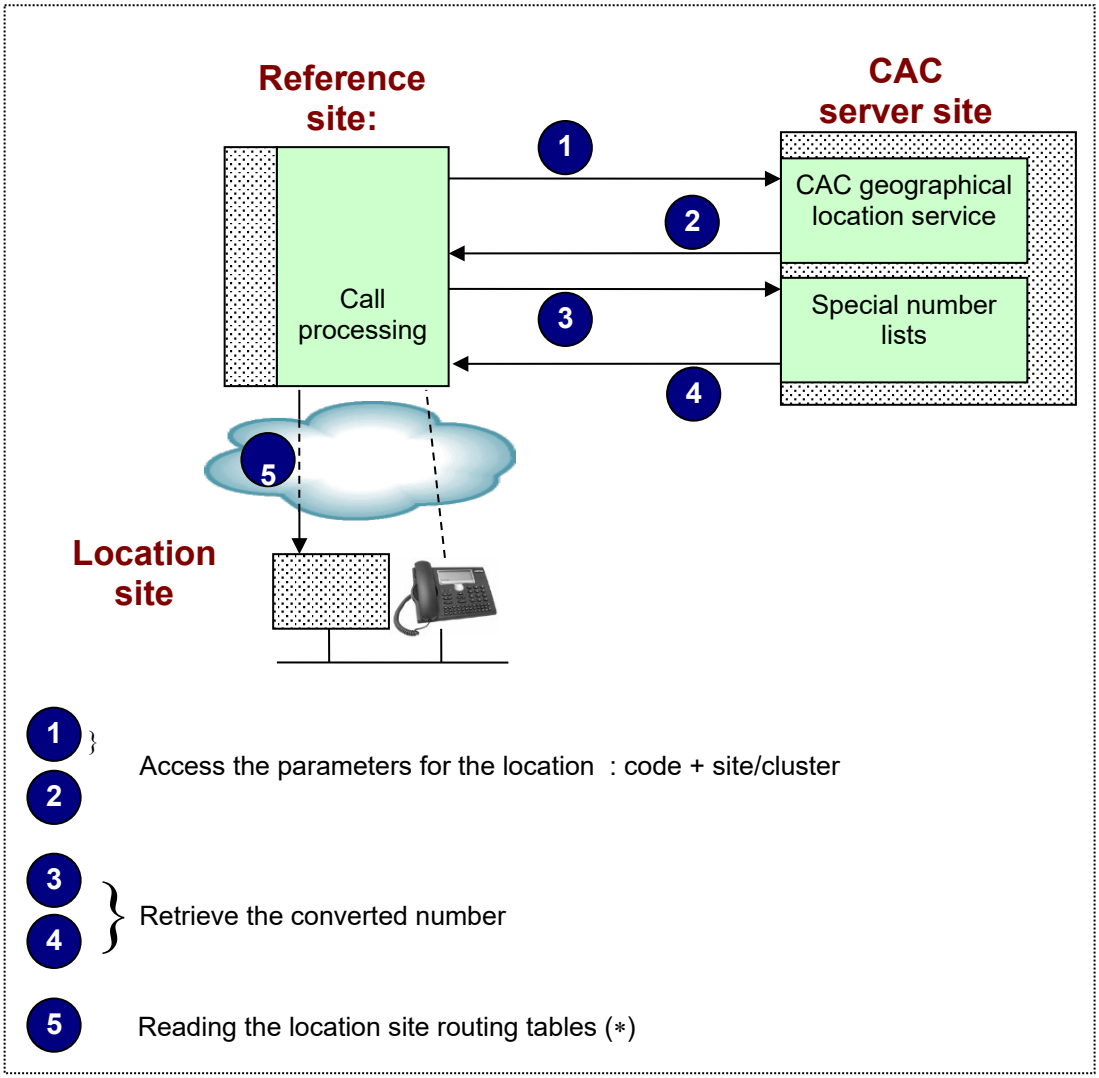
- A location site and cluster pair, depending on its IP address for an IP terminal, or the IP address of the connection site for a TDM terminal; this site/cluster pair will be used to route the call.
- a special number code which will be used to convert the number dialled.

In order to do this, the network must first be divided into IP subnets, and each of these IP subnets assigned:

- A site and cluster pair (this site and cluster pair will naturally correspond to the iPBX located on the subnet if it exists)
- A special number code (corresponding to a set of special number lists).

When a subscriber dials a special number, the call processing function, located on the subscription's reference site, queries the CAC server, which provides the caller's location parameters. The special number code is used to point to the caller's location on the special number list and to send the correctly translated number. The lists used are those available on the CAC server site.

The following diagram illustrates the interactions between the various sites involved when a subscriber dials a special number.



*: if the location site is not accessible, the call will be routed as per the reference site tables.

In order to access the parameters for the location (stages 1 and 2 in the diagram below) and the converted number (stages 3 and 4), special configuration of the CAC server is required. This configuration process is described in paragraph *3.8.3*. Details of each stage are provided in the description of the corresponding menus in the *Operating Manual for the MiVoice 5000 Web Admin* [3].

3.8.2 DEFENCE MECHANISM

When a terminal cannot be located (CAC server site inaccessible or IP address not assigned to a subnet), the number translation is performed using local lists (associated with CODE 0), and the call is routed according to the subscription's reference site tables.

In order to avoid this situation, configuration of a backup CAC server is strongly recommended (for more details, see the *Operating Manual for the MiVoice 5000 Web Admin* [3] and the *CAC Programming Guide* [4]).

3.8.3 CONFIGURATION

In order to make use of the location function for processing special numbers, the following are required:

On the CAC server site:

- Create access prefixes for the special number lists.
  “**NUMBERING PLAN>Plan for users>Access to features**”

- Declare the names of special number codes.
  “NUMBERING PLAN>Special numbers>Special number code names”

- Create lists of special numbers for each code
  “NUMBERING PLAN>Special numbers>Special number definition”

- Activate the CAC service (Server = PRIMARY)
  “NETWORK AND LINKS>Quality of service>CAC services>CAC server parameters”

- Activate the geographic location service on the CAC server site.
  “NETWORK AND LINKS>Quality of service>CAC services>CAC server parameters”

- Declare the names of the different locations.
  “NETWORK AND LINKS>Quality of service>CAC services>Locations>Names”

- Assign a special number code to each location.
  “NETWORK AND LINKS>Quality of service>CAC services>Locations>Characteristics”

- Divide the network into IP subnets.
  “NETWORK AND LINKS>Quality of service>CAC services>IP subnets”

- Assign a location name and site and cluster pair to each IP subnet.
  “**NETWORK AND LINKS>Quality of service>CAC services>IP subnets**”

On each site:

- Create access prefixes for the special number lists.
  “**NUMBERING PLAN>Plan for users>Access to features**”

Note : The access prefixes for the special number lists must be defined for each site. They can be copied from a reference site using the command "NETWORK AND LINKS>Multi-sites>Copy site", which enables you to copy the numbering plan tables (see Section 4.4.6).

- Copy the special number lists that correspond to the code for this site.
  “**NETWORK AND LINKS>Multi-sites>Copy of site**” (see *Sections 3.8.4* and *4.4.6* of this document).

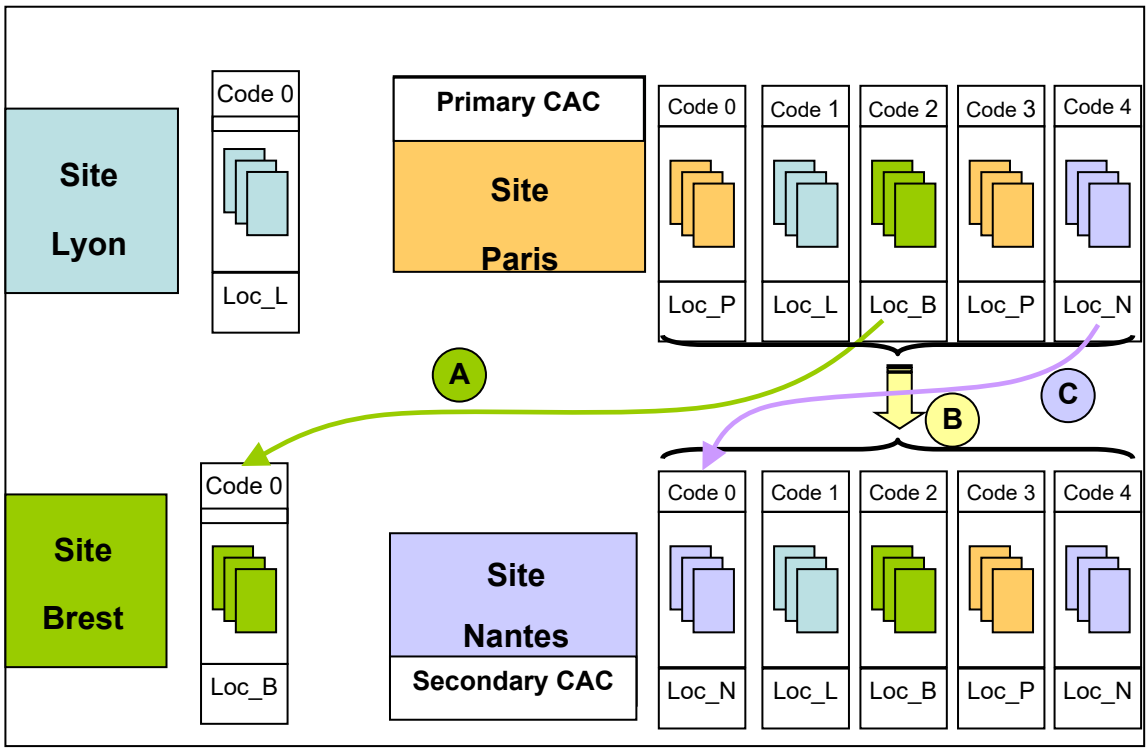
On the backup CAC server site, if declared:

- Copy all the special number lists.
  "**NETWORK AND LINKS>Multi-sites>Copy of site**" (see *Sections 3.8.4* and *4.4.6* of this document).

- Copy the special number lists that correspond to the code for this site.
  "**NETWORK AND LINKS>Multi-sites>Copy of site**" (see *Sections 3.8.4* and *4.4.6* of this document).

3.8.4 DISTRIBUTION OF SPECIAL NUMBER LISTS

The figure below illustrates how the special number lists are distributed on the different sites, ensuring optimal management of special number calls.



In the example above:

- the **Lyon** site is in an IP subnet associated with location **Loc_L**, for which the special number code is **Code 1**

- the **Brest** site is in an IP subnet associated with location **Loc_B**, for which the special number code is **Code 2**

- the **Nantes** site is in an IP subnet associated with location **Loc_N**, for which the special number code is **Code 4**

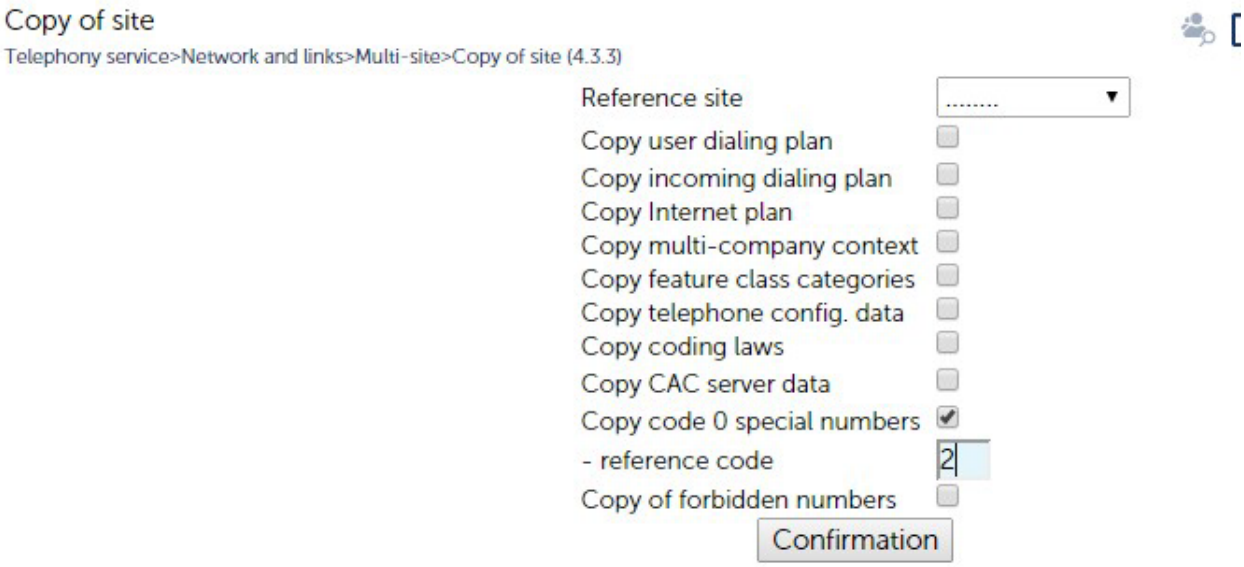
The 3 operations A , B and C indicated in the figure above are table copying operations which can be performed using the menu “**NETWORK AND LINKS>Multi-sites>Copy of site**”, provided the sites to which the copies are made are of the same type and are using the same software release as the source site.

In normal operating conditions, the special number lists used are those found on the CAC server site.

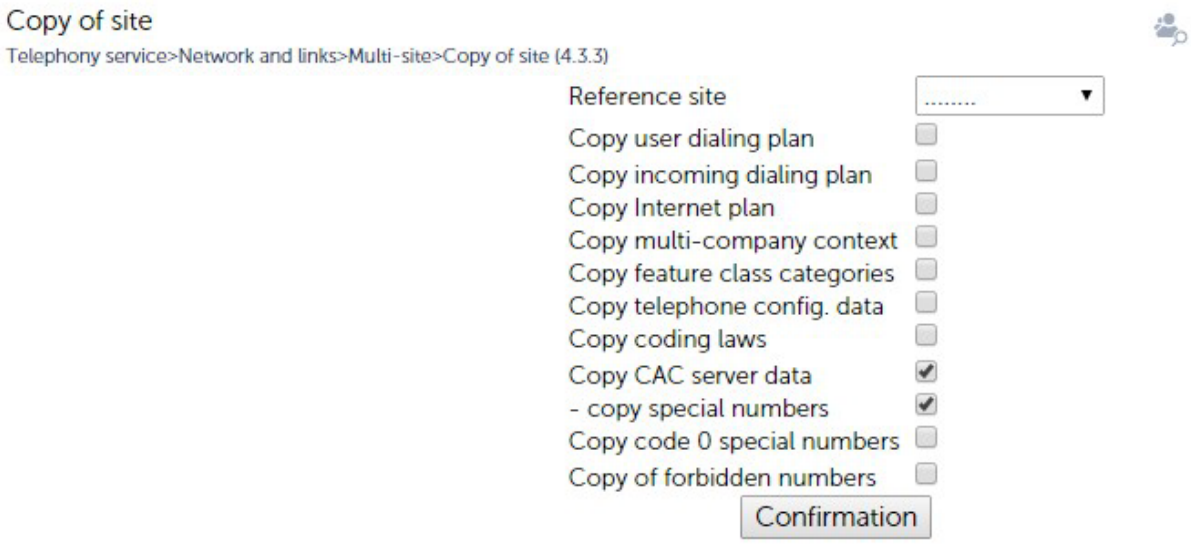
In backup mode, the special number lists used are those found on the backup CAC server site.

In fallback mode, when a terminal cannot be located, the lists used are those found on the subscription reference site, corresponding to special number "CODE 0".

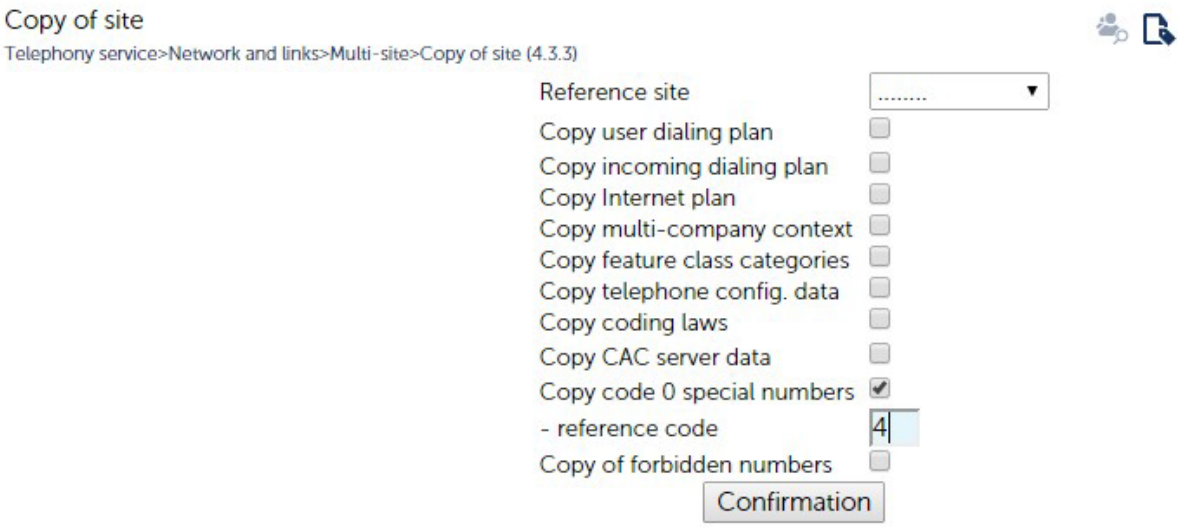
A : this operation is performed for the Brest site. The special number lists corresponding to the code "Code 2" are copied from the Paris site, which houses the primary CAC server, to the Brest site. They are copied to the local Code 0 table. The copying parameters are as follows:



B : this operation is performed for the Nantes site. The special number lists corresponding to all codes are copied from the Paris site, which houses the primary CAC server, to the Nantes site, which houses the secondary CAC server. The copying parameters are as follows:



C : this operation is performed for the Nantes site. The special number lists corresponding to the code "Code 4" are copied from the Paris site, which houses the primary CAC server, to the Nantes site. They are copied to the local Code 0 table. The copying parameters are as follows:



Note : It is advisable to carry out operation B then operation C, rather than combining the two operations in the same request.

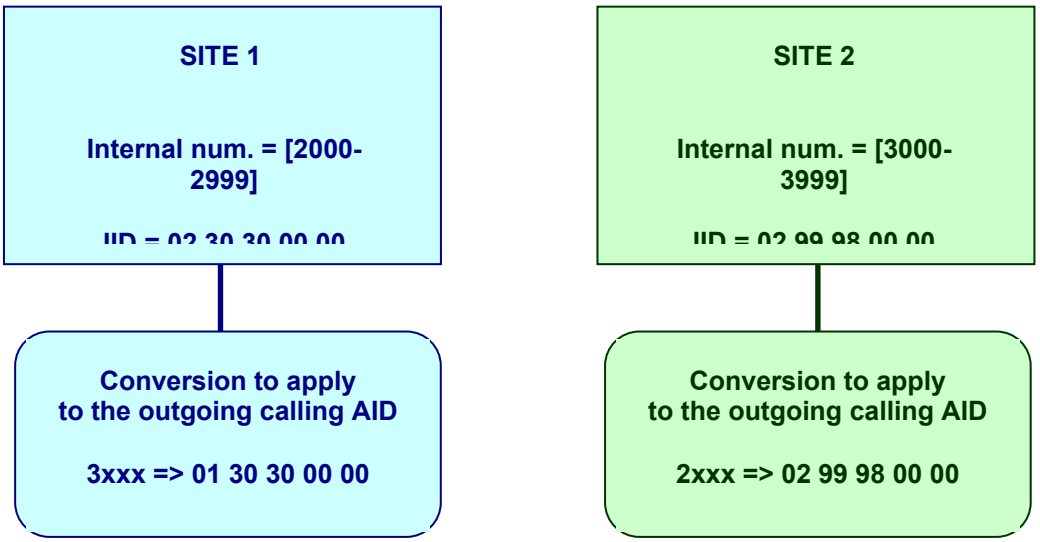
CAUTION : It is advisable to present the special number lists for a given site in the local code 0 table, including for sites housing CAC servers: After a site is restarted, the CAC server is not available immediately, and there are therefore (short) periods during which no CAC server is available to provide location information for terminals located on its site.

3.8.5 IID/AID PROCESSING

When a call is routed via a different location site from the subscription declaration site, the caller number transmitted is inconsistent unless a translator is applied to the IID/AID. The number transmitted will start with the IID of the location site and end with the AID of the subscription.

In this case, it is advisable to transmit only the IID of the location site, requiring a translator to be applied to all AIDs that are not local site numbers. This operation must be carried out on each of the sites in the multi-site configuration.

Example:



When subscriber 2222 declared on site 1 makes a call, the number transmitted is:

- 01 30 30 22 22 if the subscriber is located on site 1
- 02 99 98 00 00 if the subscriber is located on site 2. Without a translator, the number transmitted will be 02 99 98 22 22, which does not correspond to any existing number in the multi-site configuration.

CAUTION : In order to configure the translators as simply as possible, it is important to apply a block-oriented local number policy for all sites in the multi-site configuration. If the number of translators is not enough, refer to the document Managing DID numbers as of R5.2 AMT/PTD/PBX/0099/EN.

3.9 ROUTING EXTERNAL CALLS

External calls are routed, if available and unless otherwise configured, using the geographic location service provided by the CAC server. Calls are routed externally using a mechanism similar to the one used for special number management (see Section *3.8*), which uses the routing tables on the caller's location site rather than those on the subscription declaration site. Routing therefore takes place as closely as possible to the subscriber.

This default function can be deactivated using configuration data DCF 427.

3.10 LINK SERVER

The link server is used to set up voice links between two sites.

For an inter-site link via a PCM type trunk group, it creates a static link on which all the TS's are continuously transmitted to set up calls.

For an ISDN type inter-site link via a dynamic T2 trunk group, it creates a dynamic link on which all the TSs are transmitted on demand to set up calls. To optimise the call setup time, some TSs are provided “in advance”.

The terminals’ ability to take on a double IP/TDM appearance, developed to meet the needs to migrate to voice transmission technology IP, makes this operation moduss and less necessary. Nevertheless, it is retained and has been developed to use VoIPs instead of TSs.

On an IP multi-site network, the link server mechanism is necessary when S0, S2 or H323 sets are available because these sets do not have the IP/TDM double appearance.

It is also used to ensure a quality of service for the calls set up, by limiting the number of calls to the LAN according to its bandwidth.

3.11 CALL ADMISSION CONTROL (CAC)

On an IP network, messages and voice circuits are exchanged via IP. If the IP network to which the equipment used for telephony over IP is connected contains sections where the bandwidth is limited (for example, WAN access via routers), it is not possible to guarantee that the system will work correctly. This is because, if too many calls are set up, the available bandwidth will not be adequate for the required throughput and all communications will be disrupted by the overload.

Call admission control is a bandwidth control mechanism used to disallow the setting up of new IP calls so as to guarantee the quality of calls in progress on links with a limited bandwidth, especially on a WAN. Rejected calls can then be rerouted to the public network, thanks to the associated resources and an adequate configuration.

Note : The CAC mechanism does not take into account calls set up via voice gateways (SVL).

The implementation of CAC is optional.

Call admission control is based on the notions of centre, CAC centre and CAC classes. CAC manages inter-centre link throughputs, but for global call management (including active communications within the same centre) we have the notion of CAC class. For more information about CAC programming, refer to the *CAC programming guide* [4]).

3.12 FAX CALLS

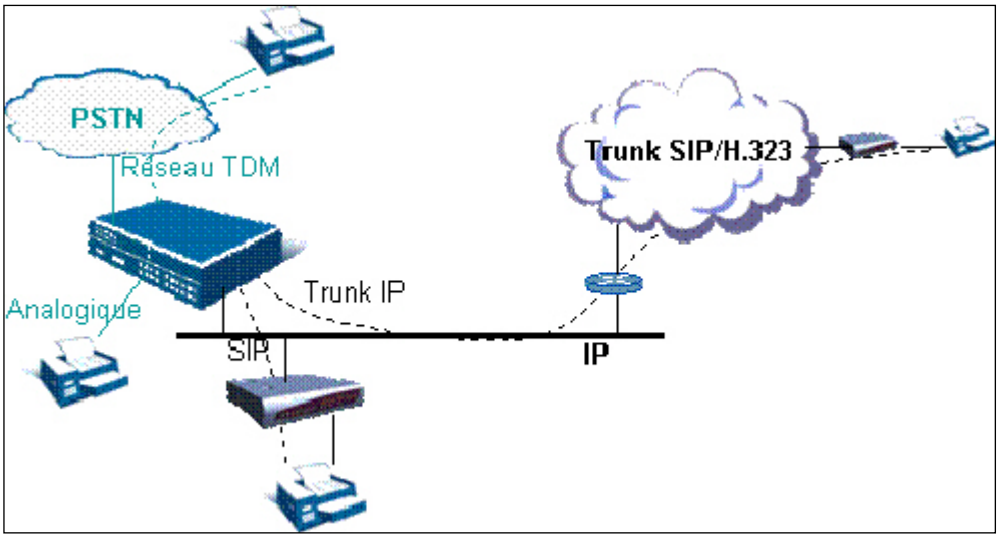
EIP type VoIP resources available since version R5000.1 support the T.38 protocol for Fax type calls on the IP network. This function is available for software versions ≥ R5000.1 R5.1B.

The T.38 protocol uses less bandwidth and is more reliable than the G.711 protocol and will therefore be preferred by the system when EIP type VoIP resources are available. The choice of the T.38 protocol is subject to a DCF in R5.2, and as of R5.3 it can be activated from the menu **SUBSCRIBERS>Rights>General parameters**.

In a multi-site configuration in which interoperation is activated, this protocol will be implemented as of release R5.2 SP2.

3.12.1 TYPES OF FAX SUPPORTED

The different Fax configurations that are possible are shown in the diagram below:



The following Fax types are supported:

- Analogue Fax connected directly to the iPBX
- Fax connected to an Audiocode box connected to the iPBX as SIP terminal (these boxes can also be connected to the iPBX in H.323, but we recommend connecting them as SIP subscriber)
- Fax located behind the network (analogue, SIP or H.323 type).

The table below summarises the cases where the T.38 protocol is implemented.

	TDM FAX	SIP FAX	H.323 FAX	TRUNK TDM	TRUNK SIP	TRUNK H.323
TDM FAX	YES (*)	YES (*)	NO	YES (*)	YES (*)	NO
SIP FAX	YES (*)	YES	NO	YES (*)	YES	NO
H.323 FAX	NO	NO	NO	NO	NO	NO
TRUNK TDM	YES (*)	YES (*)	NO	YES (*)	YES (*)	NO
TRUNK SIP	YES (*)	YES	NO	YES (*)	YES	NO
TRUNK H.323	NO	NO	NO	NO	NO	NO

* : the T.38 protocol is only re-negotiated if the VoIP resources used are EIP type resources.

3.12.2 IPBX CONFIGURATION

The Fax subscribers must be "DATA" type in the case of a combination of VoIP resources (presence of PT2 and EIP) and interoperation.

If the only multi-site VoIP resources are EIP type (no PT2 card), it is possible not to type the Fax subscriptions "DATA" so that a combination of answering machine/Fax equipment can be used for example.

This typing is configured using the parameter **SERVICE BEARER** in the menu **Telephony service>Subscribers>Subscriptions>Characteristics**.

3.13 ROLE OF THE (MIVOICE 5000 MANAGER) MANAGEMENT CENTRE

When a MiVoice 5000 Manager is present on a multi-site network:

- It hosts the LDAP database.
- It will no longer be possible to configure subscribers from the Web Admin of the different sites.
- It centralises subscriber configuration.
- It synchronises the LDAP database with an external database such as Active Directory.
- It offers a database replication function.

Therefore, MiVoice 5000 Manager manages the entire directory database.

On the other hand, the multi-site network configuration must be performed on each iPBX on the multi-site configuration.

4 CONFIGURING A SINGLE-CENTRE IP MULTI-SITE NETWORK

This chapter describes how to implement a single-centre IP multi-site network.

The IP multi-site configuration is characterised by the fact that each of the multi-site iPBXs is connected to the others via an IP network. The IP network serves as support both for signalling and data transport (X25 communications).

The iPBX management interface offers automatic configuration possibilities which considerably facilitate the implementation of an IP multi-site:

- Automatic local routing update on each site
- Automatic creation of inter-site signalling gateways (including IP tunnel connection, tunnel link, etc.)
- Copying of tables between similar systems.

Each of these points is described in detail in the description of networking procedure (see Section *4.4*).

A certain number of conditions must be met before the networking operation. This point is described in detail in Section *4.2*.

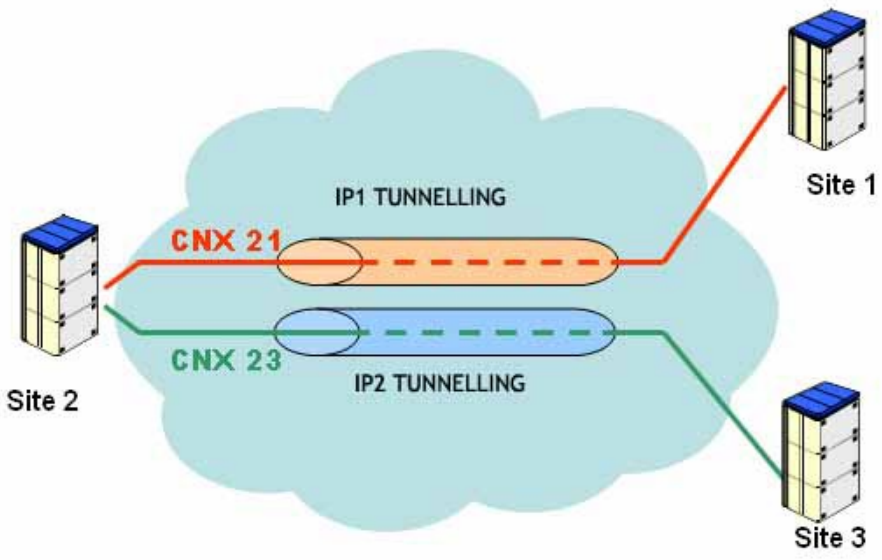
4.1 IP MULTI-SITE SPECIFIC PRINCIPLES

The procedure for IP networking of several iPBXs involves encapsulating a traditional network in IP links. To perform this operation, the system uses an “IP tunnelling” link that emulates X25 links for transporting signals and data.

The proprietary MOVACS signalling protocol is used to create inter-site communication channels and exchange the UDP port identity for conveying compressed audio information.

The signalling gateway and data gateway use the IP tunnel.

It is not advisable to configure a voice gateway (SVL).



4.2 NETWORKING PRELIMINARIES

The following conditions must be fulfilled in order for the multi-site network to properly:

- The internal numbering plan must have the same length on all the sites that make up the multi-site configuration.
  It is advisable to use an internal number length that will allow future extensions (addition of sites, addition of subscribers on a site).

- The same subscriber number should not appear on two different sites.
  It is advisable to use number ranges (without overlap) and to have free ranges for future extensions. The number ranges will also simplify the use of internal sub-directions to transmit messages selectively.

- If the multi-site configuration must contain a MiVoice 5000 Manager (Management Centre), you must use feature classes for subscriber management.

Recommendation: limit to 12 the number of sites in a centre.

4.3 MAJOR MULTI-SITE CONFIGURATION STEPS

This procedure uses all the configuration automation possibilities. It is always possible to perform the operations manually, but it is advisable to use automatic configuration.

Table copying is only possible between the same site types (from MiVoice 5000 Server to MiVoice 5000 Server, or from XS/XL/XD to XS/XL/XD) and the same software release.

If the multi-site configuration contains several MiVoice 5000 Servers and several XS/XL/XD PBXs, two reference sites are defined, one for each type, for copying the table.

The iPBX installation phase uses a configuration file, *install.conf*, to personalise the system installation. This file contains, among others, the following information:

- The internal number length

- The internal number range

- The automatic subscriber creation request on available trunks (on Mitel 5000 Gateways and Mitel 500/A50 PBXs)

- The special subscriber numbers (general-purpose subscriber (on Mitel 5000 Gateways and MiVoice 5000 Server systems (as of R5.3), PSRN subscriber (on Mitel 5000 Gateways system))

- Automatic IVB assignment to each subscriber (on Mitel 5000 Gateways and MiVoice 5000 Server PBXs (as of R5.3)).

Note : in the current release R5.1, the file install.conf is factory-configured using the client's order specifications.
It is possible to change the parameter values during installation (see the Installation and Maintenance Manual for MiVoice 5000 range products [5]).

The table below indicates the different multi-site installation phases, for installations "without MiVoice 5000 Manager" and "with MiVoice 5000 Manager".

The procedure for adding a MiVoice 5000 Manager in an existing multi-site configuration is described in Section *4.9*.

The procedure for creating a multi-site configuration with already installed systems consists in applying to each site the procedure for adding an already configured site in a multi-site (see Section *4.8*).

A certain number of steps are obligatory for multi-site configuration, others are optional. In the table below, the optional steps are indicated on a grey background.

	MULTI-SITE WITHOUT MIVOICE 5000 MANAGER	MULTI-SITE WITH MIVOICE 5000 MANAGER
ON MIVOICE 5000 MANAGER		Install MiVoice 5000 Manager.
		Declare the LDAP database connection. Declare the multi-site.
ON EACH IPBX	Install the iPBX with the right file *install.conf* (∗).	Install the iPBX with the right file *install.conf* (∗).
	Activate multi-site operation mode.	Activate multi-site operation mode.
	Declare the local site with automatic internal routing update. Check the created items.	Declare the local site with automatic internal routing update. Check the created items.
	Restart the iPBX.	Restart the iPBX.
	Declare the remote sites and activate automatic creation of IP tunnel connection to each of the remote sites. Check the created items.	Declare the remote sites and activate automatic creation of IP tunnel connection to each of the remote sites. Check the created items.
	Locate the MiVoice 5000 Server resources.	Locate the MiVoice 5000 Server resources.
	Locate the routes for the directions.	Locate the routes for the directions.
ON THE REFERENCE SITE	Configure the iPBX.	Configure the iPBX.
	Create local sub-directions.	Create local sub-directions.
ON A SITE OTHER THAN THE REFERENCE SITE	Import tables from the corresponding reference site.	Import tables from the corresponding reference site.
ON EACH SITE	Define the directory connection parameters: location of databases	Define the directory connection parameters: location of databases
	Locate the directory service and abbreviated number resolution service.	Locate the directory service and abbreviated number resolution service.
	Create in the active database the site's internal subscriber records (∗).	Create in the active database the site's internal subscriber records (∗).
	Update the directory records.	Update the directory records.
MIVOICE 5000 MANAGER		Download the iPBX data through a generation operation.
		Reconfigure the ACLs for connecting external applications.
EACH SITE	Configure the distribution of internal calls.	Configure the distribution of internal calls.
	Configure overflow call on network.	Configure overflow call on network.
	Locate other services to share.	Locate other services to share.
	Activate login site optimisation.	Activate login site optimisation.
	Test inter-site links to other sites.	Test inter-site links to other sites.

(∗): if the configuration of the file *install.conf* did not take into account the future architecture of the multi-site to be installed, additional operations may become necessary such as subscriber redialling. These procedures are described in detail in Section 4.6.

(∗): do not perform this operation on the site hosting the active database.

4.4 OBLIGATORY NETWORKING PHASES

4.4.1 ACTIVATING MULTI-SITE OPERATION MODE

The part concerning MiVoice 5000 Manager is handled in Section *4.6.2*.

ON EACH OF THE SITES:

In the menu **SYSTEM>Configuration>Services**, tick the **Multi-site management checkbox**.

This operation is used to activate all the multi-site operation menus and commands in the iPBX user interface, especially the **Multi-sites** menu in **NETWORK AND LINKS**.

4.4.2 DECLARING THE LOCAL SITE

Each multi-site must have its own identity and must know the identity of all the remote sites in the network, and the centre to which they belong.

A site is identified through a number between 1 and 99.

A centre is identified by a number between 1 and 62.

In the configuration described here, there is only one centre to which all the sites are attached, and the centre number is 1.

ON EACH OF THE SITES:

To declare the local site, select the menu **NETWORK AND LINKS>Multi-sites>Site and centre definition>Local site and centre**.

Figure 8: Declaring local site 1

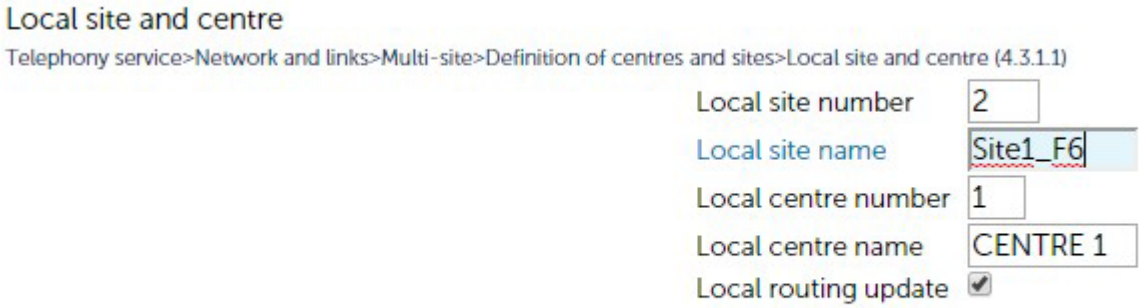


Figure 9: Declaring local site 2

Note : In the configuration under study (single-centre), the local centre number must be equal to 1, and the name of the local centre identical on all the multi-site iPBXs.

LOCAL SITE NUMBER

Between 1 and 99

The local site number must be different for each of the sites on the multisite network.

LOCAL SITE NAME

Character string (8 characters maximum).

LOCAL CENTRE NUMBER

Between 1 and 62

The local centre number must be the same for each of the sites on the multi-site network (single-centre configuration).

LOCAL CENTRE NAME

Character string (8 characters maximum).

The local centre name must be the same for each of the sites on the multi-site network (single-centre configuration).

LOCAL ROUTING UPDATE

Tick this box:

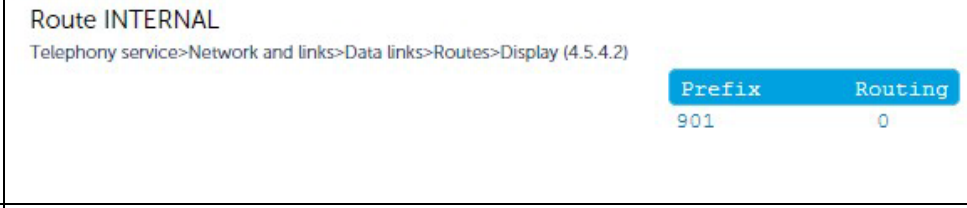
- The local routes and associated prefixes are deleted and the new route 9xx is defined, where xx is the local site number.
- The correspondences between TCP port ⇔ X25 address are also updated.

WARNING : In case of interoperation with an R4.2 site, you have to either add local route 95x on the R5.x site, or modify the number dialled on the R4.2 site to reach the signalling gateway of the R5.x site.

CHECKING THE DIFFERENT ITEMS CREATED BY THE SYSTEM:

To check the local route update, select the menu **NETWORK AND LINKS>Data links>Routes>Display** then select **LOCAL**.

SINGLE SITE



MULTI-SITE

Figure 10: Internal routing update

To check the TCP PORTS ⇔ X25 Addresses translation update, click NETWORK AND LINKS>Data links / Tcp/ip – x25 gateway>Display TCP port transl. - X25 address.

SINGLE SITE

Port	X25 number	Mode
3204	901012	NOT DEFINED
3206	901013	TPKT
3208	90101191	TPKT
3209	90101190	TPKT
3211	901011600	NOT DEFINED
3217	90101410030	TPKT
3218	901013	TPKT
3219	901013	NOT DEFINED
3288	901014130	TPKT
3291	901014100	TPKT
3301	901011600	TPKT
3302	90101000	TPKT
3303	90101000	NOT DEFINED
3304	901014000	NOT DEFINED

MULTI-SITE

Port	X25 number	Mode
3204	9012	NOT DEFINED
3206	9013	TPKT
3208	901191	TPKT
3209	901190	TPKT
3211	9011600	NOT DEFINED
3217	901410030	TPKT
3218	9013	TPKT
3219	9013	NOT DEFINED
3288	9014130	TPKT
3291	9014100	TPKT
3301	9011600	TPKT
3302	901000	TPKT
3303	901000	NOT DEFINED
3304	9014000	NOT DEFINED

Figure 11: TCP port – X25 address transl.

After declaring the local site, restart the site so the updates are really taken into account.

4.4.3 DECLARING REMOTE SITES

To enable the sites to communicate with each other, each site must know all the other sites (remote sites), and have an IP tunnel connection with each of the remote sites that allow the transmission of signalling messages between the sites.

ON EACH OF THE SITES:

Note : the remote site declaration described below must be repeated for each of the remote sites.

To declare a remote site, select the menu **NETWORK AND LINKS>Multi-sites>Site and centre definition>Remote sites**.

BY NAME

List of already declared remote sites

OR BY ITS NUMBER

Number of the remote site to be declared

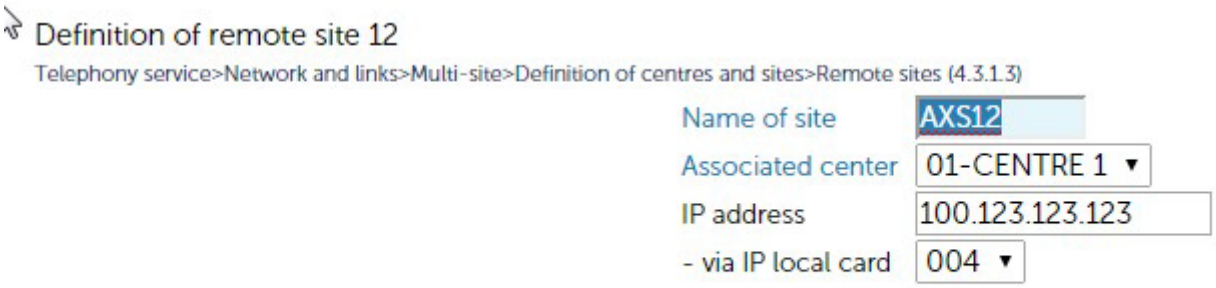
AUTOMATIC IP GATEWAY CREATION

NO **YES**

Select YES to automatically create:

- The tunnel connection
- The signalling gateway
- The path for the tunnel connection.

Click "**Select item**". The site definition screen appears:



SITE NAME

Name of the site to be declared (8 characters maximum)

ASSOCIATED CENTRE

Centre to which the site is attached.

In a multi-centre configuration, the list contains the names of declared centres (the names displayed by the user interface are names which have been declared, preceded by the centre number).

In a single-centre configuration, the list contains centre 1 only.

IP ADDRESS

IP address of the site to be declared

Note : this field is only available if automatic IP gateway creation has been requested for in the previous screen.

VIA THE CARD

Location of the IP card on which the IP tunnel will be created.

Note : this field is only available if automatic IP gateway creation has been requested for in the previous screen.

After entering these parameters, click **Confirm gateway creation**.

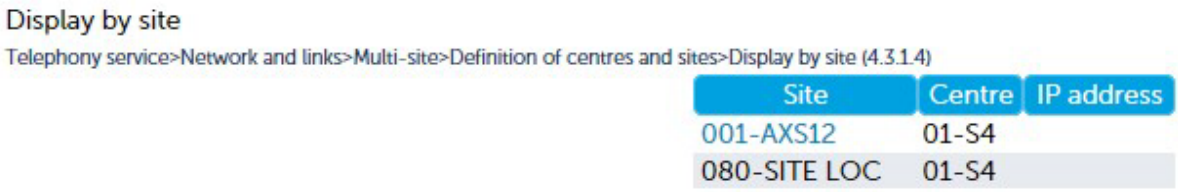
The following operations are performed:

- The remote site is detected by the local site.
- The IP tunnel link, "I-tun.xx", is created (xx = remote site number).
- The TCP tunnel link, "Cxtun.xx", is created (xx = remote site number).
- The signalling gateway is created.
- The remote route is created.

CHECKING THE DIFFERENT ITEMS CREATED BY THE SYSTEM:

1. Remote sites

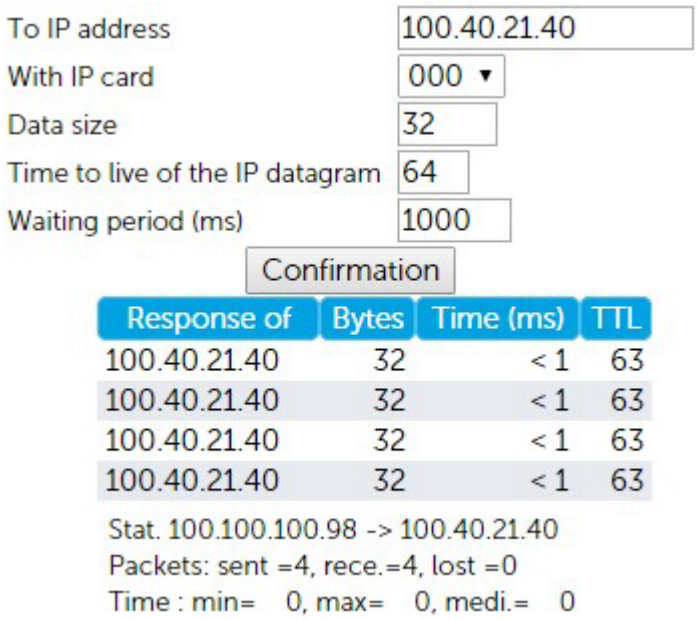
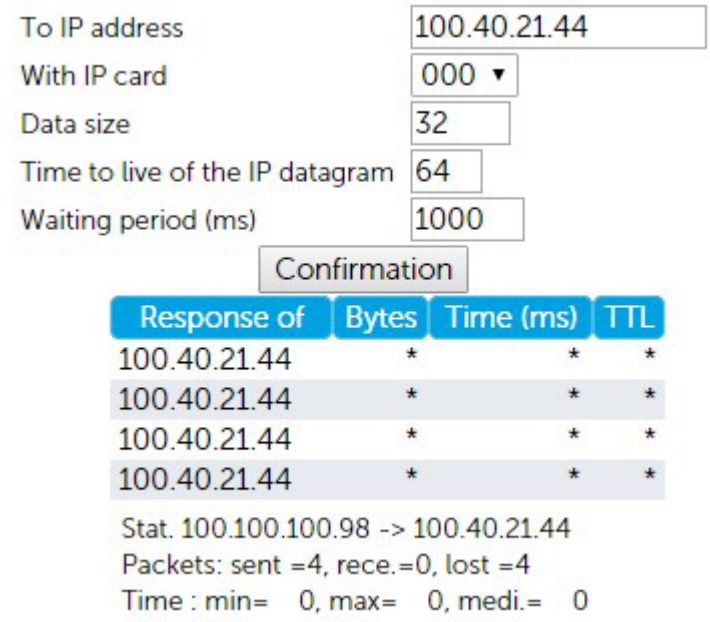
- To view the list of sites created in the multi-site configuration, select the menu **NETWORK AND LINKS>Multi-sites>Centre and site definition>Display by site**.



Remote sites 1 and 3 are available on the list of sites for site 2.

- To check the accessibility of the remote sites, send a ping request from the management interface to each declared remote site, from the menu **SYSTEM>Expert>Processor access>Debug tools>Send ping request**.

Fill in the fields **TO IP ADDRESS** and **WITH IP CARD**, then click **Confirm**.

IF THE RESULT IS:	... THEN
	The remote site is accessible.
	The remote site is not accessible: • Check the IP address of the remote site. • Check that the remote iPBX has been started. • Check the IP card network parameters.

2. IP tunnel links

Select the menu **SYSTEM>Supervision>Display status>Data links**.

The IP tunnel links created towards sites 1 and 3 appear on the list of site 2 data links. The directory numbers automatically assigned by the system to the tunnel links have the values 1000 + the remote site number.

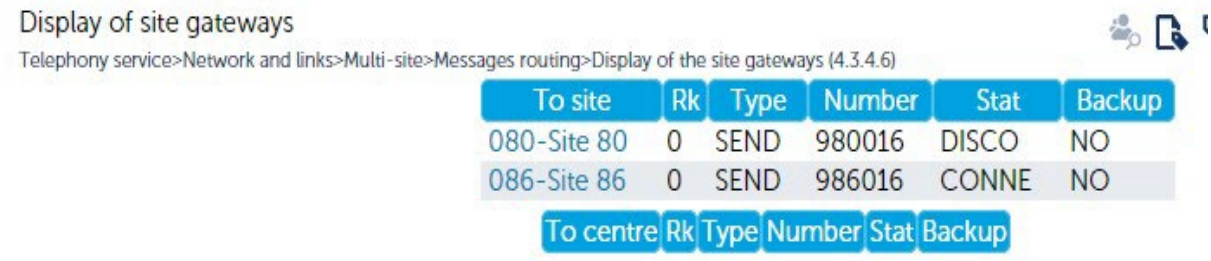
3. TCP tunnel connections

Select the menu **SYSTEM>Supervision>Display status>Connections of TCP tunnel**.

The TCP connections implemented in the corresponding IP tunnels are displayed.

4. Signalling gateways

Select the menu **NETWORK AND LINKS>Multi-sites>Message routing>Display of the site gateways**.



The signalling gateways created between local site 2 and each of the remote sites 1 and 3 are displayed. The table shows for each signalling gateway created:

- The name of the site towards which the gateway is created
- Its rank: in automatic creation mode, only one gateway is created and its rank is rank 0 (in manual creation mode, you can create two signalling gateways between two sites, with rank 0 and 1).
- Its type (transmission and reception): this property shows the site that took the gateway creation initiative (for more information, see Section 4.1).
- The SERGIC server call number of the remote site used to create the gateway (only for gateways for which the local site is the sender).
- Its status (connected, disconnected, out of service).
- If the gateway is an backup gateway (automatic creation by the signalling gateway system does not create any backup gateway).

5. Remote routing by tunnel

Select the menu **NETWORK AND LINKS>data links>Routes>Display**.

Select the **IP TUNNEL** route type then click **Select item**.

The list of routes created towards the IP tunnels is displayed.

4.4.4 CONFIGURING THE RESOURCES

A VoIP resource offers an IP interface to a TDM set and a TDM interface to an IP set, on a Mitel 5000 Gateways or Mitel 500/A50 system.

As of R5.3 SP1, MiVoice 5000 offers via MEDIA SERVER service the same voice services as Mitel 5000 Gateways:

- Messages and announcements
- IVR
- IVB
- 3-way conference

MEDIA SERVER is natively IP and does not require any voice over IP resource to be accessible via IP terminals or via an IP network.

The MEDIA SERVER 3-way conference service on MiVoice 5000 Server is a single-site service. An IP terminal or virtual conference master TDM terminal declared on MiVoice 5000 Server automatically requires the MEDIA SERVER 3-way conference service.

The MEDIA SERVER announcement service on MiVoice 5000 Server is a single-site service. An IP terminal declared on MiVoice 5000 Server automatically requires the MEDIA SERVER announcement service. An IP trunk uses the MEDIA SERVER announcement service if the SIP trunk is declared on the MiVoice 5000 Server on which the MEDIA SERVER announcement service has been activated.

Note : Voice prompts are not managed by terminals Mitel 6700 SIP Phone.
A Virtual TDM uses the announcement service of the Mitel 5000 Gateways system to which it is physically connected.

However, it is possible to configure on MiVoice 5000 Server the Conference/Announcement resources on a Mitel 5000 Gateways system in the following cases:

- If the MEDIA SERVER service has been disabled
- If the MEDIA conference service has been disabled
- If the MEDIA announcement service has been disabled
- MEDIA SERVER no longer has any available resources for the conference function (the MEDIA SERVER licence is exceeded if the number of authorised RTP flows).

Note : Fallback is not possible for the Messages and Announcement function if MEDIA SERVER no longer has any available resources.

4.4.4.1 "TDM conferences/announcements" resource

If you wish to configure on MiVoice 5000 Server the conference/announcement resources on an Mitel 5000 Gateways system, select menu **NETWORK AND LINKS>Multi-sites>Localisation of the services>Other services**.

BY NAME

Service name

Select **TDM CONFERENCES AND ANNOUNCEMENTS** from the drop-down list.

AND IF INTERCOM GROUP, ITS NUMBER

This parameter is not applicable to the TDM CONFERENCES AND ANNOUNCEMENTS service.

Click **Select item**.

It is possible to define 8 different locations for potential VoIP resources used to create conference circuits and broadcast voice prompts.

BROADCAST PRIORITY X

[redacted]	Search locally for MEDIA SERVER Conferences and announcements resources.
[redacted]	Search locally for MEDIA SERVER Conferences and announcements resources.
[redacted]	Search for Announcements and Conference resources on a remote Mitel 5000 Gateways system that has some VOIP resources.

Note : This field is empty in a new MiVoice 5000 Server installation. MEDIA SERVER Conferences and announcements resources are automatically used if activated.

On an XS, XL or XD iPBX, the location of the TDM CONFERENCES AND ANNOUNCEMENTS service is set by default to the value LOCAL SITE. This configuration phase is not necessary unless the Mitel 5000 Gateways system does not have any VOIP resources.

These fields are also used to calculate the attachment cluster/site of IP terminals in a configuration with SVL.

If you select the value SITE BASIS, the following two fields appear:

SITE NAME

Name of the Mitel 5000 Gateways site on which are located the VoIP resources to be used for conference circuits and voice prompt broadcast.

The drop-down list contains all the multi-site site names.

CLUSTER NUMBER

Number of the cluster on the Mitel 5000 Gateways site that has the VoIP resources to be used for conference circuits and voice prompt broadcast.

4.4.4.2 "TDM MULTI-SITE access point" resource

The TDM MULTISITE access point defines the cluster/site containing the dual TDM→VOIP access point when the IP terminal takes a TDM appearance in order to access a TDM type Mitel network (for example access to a TDM tower).

The TDM MULTISTE access point resource may contain 4 clusters on the same tower entry point. It is not advisable to program several sites.

To locate the TDM MULTISITE access point select the menu **NETWORK AND LINKS>>Multi-sites>>Localisation of the services>>Other services**.

BY NAME

Service name

Select **TDM MULTI-SITE ACCESS POINT** from the drop-down list.

AND IF INTERCOM GROUP, ITS NUMBER

This parameter is not applicable to the TDM MULTI-SITE ACCESS POINT service.

Click **"Select item"**.

It is possible to define 8 different locations for potential VoIP resources used to broadcast IP network announcements (IP trunk).

BROADCAST PRIORITY X

.....	No VoIP resource location for this priority level
LOCAL SITE	Search for VoIP resources locally.
SITE BASIS	Search for VoIP resources on a remote site.

If you select the value SITE BASIS, the following two fields appear.

SITE NAME

Name of the site on which are located the VoIP resources to use.

The drop-down list contains all the multi-site site names.

CLUSTER NUMBER

Cluster number of the site with the VoIP resources to use.

4.4.4.3 Checking the location of VoIP resources

To check the location of previously defined VoIP resources, select the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Display the services of a site/centre**.

OF SITE

Name of the site to be displayed.

Select the site for which a VoIP resources location was previously defined.

OR CENTRE

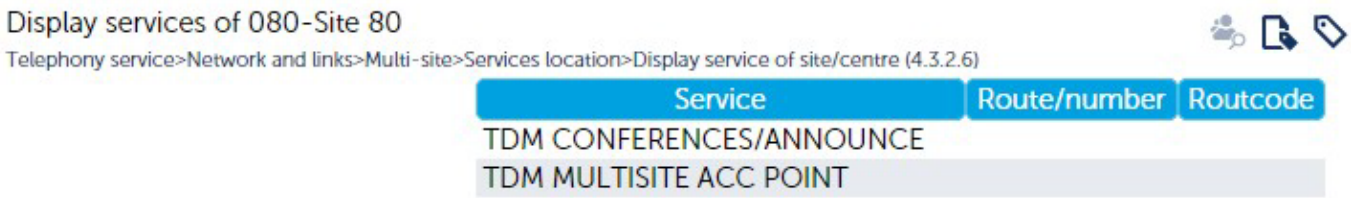
Not applicable to VoIP resources.

OR BROADCAST LIST

Not applicable to VoIP resources.

After selecting the site, click **"Select item"**.

In the configuration performed here, the display of services on sites 1 and 3 will be shown as follows:



4.4.5 CONFIGURING REFERENCE SITES

The multi-site has now been networked and the next phase consists in configuring each site on the multi-site network.

The table copying tool integrated into the user interface minimises the configuration operation for each site, by configuring only one reference site for each type (one MiVoice 5000 Server and one XS or XL or XD) and copying the reference site tables to other similar sites.

WARNING : Site copying is only possible between two iPBXs with the same software release. The call re-routing table can only be copied between two similar iPBXs with the same software release.

To configure the reference MiVoice 5000MiVoice 5000 Server iPBX and the reference XS or XL or XD iPBX, refer to the *MiVoice 5000 Web Admin Operating Manual* [3].

WARNING : The numbering plan must be indicated on all the multi-site network sites. Therefore, define the same numbering plan on both reference sites.

4.4.6 COPYING REFERENCE SITE TABLES

You can use the "Copy site" command to copy to the site a certain number of tables and parameters from a previously configured reference site. It is accessible from the menu “**NETWORK AND LINKS>Multi-sites**”.

REFERENCE SITE

Name of the site whose tables and parameters will be copied.

The drop-down list contains all the multi-site site names.

Select the same type of site (MiVoice 5000 Server if the current site is a MiVoice 5000 Server, otherwise, XS or XL or XD) configured previously.

Tick all the boxes corresponding to the different data, except the box for COPY CAC SERVER DATA (copy CAC server data only from the site hosting the CAC server to the site hosting the backup CAC server).

After selecting the parameters, click "Confirmation” to confirm the copying operation. This operation may take a few minutes.

At the end of the copying operation, a message informs the user that the operation has been completed successfully.

The table can be copied in two different ways:

- By replacing the table completely, no matter its initial content, on the target site (this behaviour is identified by (*) in the descriptions that follow)
- By updating the table (this behaviour concerns tables that contain lists of names and is identified by (+) in the descriptions that follow):
    - Keeping the value if the entry exists in the local table but not in the imported table
    - Updating the value if the entry exists in both tables
    - Adding the value if the entry does not exist in the local table but exists in the imported table.

The tables and/or parameters concerned by each copy screen column are listed below.

COPY USER NUMBERING PLAN

If this box is ticked, the following tables or parameters will be copied:

- Access to extensions (*)
- Access to features (*)
- Access to public network (*)
- Access to directions (*)
- Suffix definition (*)
- Direction names (+)
- Names of internal sub-directions (+)

COPY CALL RE-ROUTING

Note : This line only appears if the copying of user numbering plan is required.

If this box is ticked, the following tables or parameters will be copied:

- Rerouting update (*)
- Handling rerouting operations (*). Mitel 5000 Gateways

WARNING : It is not possible to copy the call re-routing tables between different iPBX types (MiVoice 5000 Server and Mitel 5000 Gateways).

COPY “INCOMING” NUMBERING PLAN

If this box is ticked, the following tables or parameters will be copied:

- Internal dialling (*)
- Access to public network (*)
- Access to directions (*)

COPY MULTICOMPANY CONTEXT

If this box is ticked, the following tables or parameters will be copied:

- The parameter "Multi-company management" is set to YES.
- Communication between companies: telephone (*)
- Communication between companies: data (*)
- Company names (+)
- Department names (+)
- Routing code names (+)
- Names of broadcast codes (+)
- Company profile names (+)
- Company/department parameters (+)
- Call distribution names (+)
- Call distribution definition (*)
- Calendar names (+)
- Calendar range definition (*).

COPY FEATURE CLASS CATEGORIES

- Category names (+)
- Category definition (*)
- Feature class names (+)
- Feature class definition (*)
- TL class names (+)
- TL class definition (*)

COPY TELEPHONE CONFIGURATION DATA

- Telephone configuration data (*)

COPY ENCODING LAWS

This line appears in release R5.3 and later so, during a copying process, the management of new laws and increase in the number of laws managed by the iPBX (from 4 to 7 laws maximum) can be taken into account.

This copying operation concerns the following tables:

- Tables which define the list of codecs that the call processing module will choose for a specific type of terminal instead of the list of codecs given by the terminal itself (SERVICE_TCS)
- Tables of specific law names
- Tables defining the law flow rate (laws declared and associated flow rate).

Note : See Operating Manual for MiVoice 5000 Web Admin [3] for information on how to manage encoding laws.

In a multi-site configuration, the list of laws and parameters used must be the same on all the sites.

When the checkbox is ticked, two lines are displayed for configuring "voice over IP encoding laws" (except private directions), as well as for configuring "specific encoding laws" and associated flow rates:

- The first line (ticked) is used to copy the table of specific law names.
- For laws associated with private directions, a second line appears when the first one is ticked leaving the option to copy or not to copy these laws.

Note : is possible to copy encoding laws between different iPBX types (MiVoice 5000 Server and Mitel 5000 Gateways), provided these sites have the same software release.

-

WARNING : Texte attention texte attention texte attention texte attention texte attention texte attention texte attention texte attention texte attention texte attention.

COPY CAC SERVER DATA

- CAC server parameters (*)
- Location names (+)
- Location definitions (*)
- CAC class definition (*)
- IP subnet definition (*)
- Defining the flows to the centres (*)

In release R5.3 and later, the characteristics of encoding laws are also taken into account when CAC server data is copied.

If the centre to which the target site (to which you wish to copy the data) belongs is on the list of centres managed by the CAC server, all the CAC server tables are copied, as well as the tables of specific law names.

Otherwise only the following tables are copied:

- Declared laws
- Throughputs
- The one which indicates whether the law is a high throughput law
- Names of specific laws.

Note : It is possible to copy CAC server data between different iPBX types (MiVoice 5000 Server and Mitel 5000 Gateways), provided these sites have the same software release.

Note : Copying CAC server data deletes the previous configuration.

Copy special numbers

- Special number code names (+)
- Define special number lists for each code (*)

Copy code 0 special numbers

- Define special number lists associated with the code indicated in the REFERENCE CODE parameter (*): once copied, these lists will be associated with code 0

Copying barred numbers

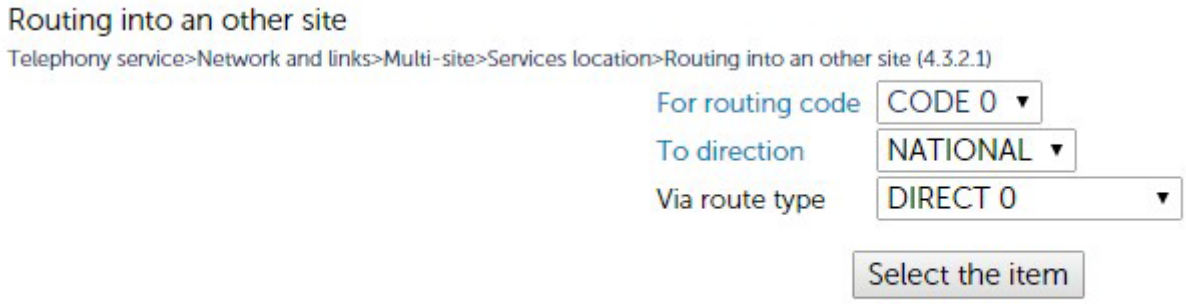
- Barred number list names (+)
- Barred number list definition (*).

4.4.7 ROUTE LOCATION

For all the sites that do not have accesses to the directions defined in the numbering plan, you have to define the site(s) to which the corresponding calls will be routed so as to be able to access the directions.

This phase is mandatory for MiVoice 5000 Server iPBXs and may be necessary on XS, XL or XD iPBXs if you wish to give priority to certain iPBXs for an exterior access type.

To route calls to other sites, select the menu NETWORK AND LINKS>Multi-sites>Location of the services>Routing in another site.



FOR ROUTE CODE

Routing code Names

The drop-down list contains the routing code names defined in the menu SUBSCRIBERS>Hunt groups and companies>Multi-company management>Routing code names.

Note : This field is only available in multi-company configuration.

TO DIRECTION

Direction name for the routing in question.

The drop-down list contains the names of directions defined in the numbering plan.

VIA ROUTE

DIRECT 0	DIRECT 1	PROXIMITY 0	PROXIMITY 1
REROUTING 0	REROUTING 1	REROUTING 2	REROUTING 3
REROUTING 4	REROUTING 5	REROUTING 6	REROUTING 7
OTHER NETWRK 0	OTHER NETWRK 1	OTHER NETWRK 2	OTHER NETWRK 3

Select the values corresponding to the routing to transfer to another site then click “**Select item**”.

FOR ROUTE CODE

Information field indicating the routing code concerned.

Note : This field is only available in multi-company configuration.

HANDLED BY

Information field indicating whether routing is handled by the local site.

The following 7 fields, REMOTE SITE 1 to REMOTE SITE 7, are used to define the sites to which the routing in question will be transferred, in order of priority.

REMOTE SITE NO. X

Name of the remote site to which the routing is transferred.

CLUSTER

Number of the remote site cluster to which the routing is transferred.

4.5 OPTIONAL NETWORKING PHASES

The purpose of the configuration operations described here is to optimise the setting up of calls by minimising the traffic generated by the exchanges of signalling messages on the network.

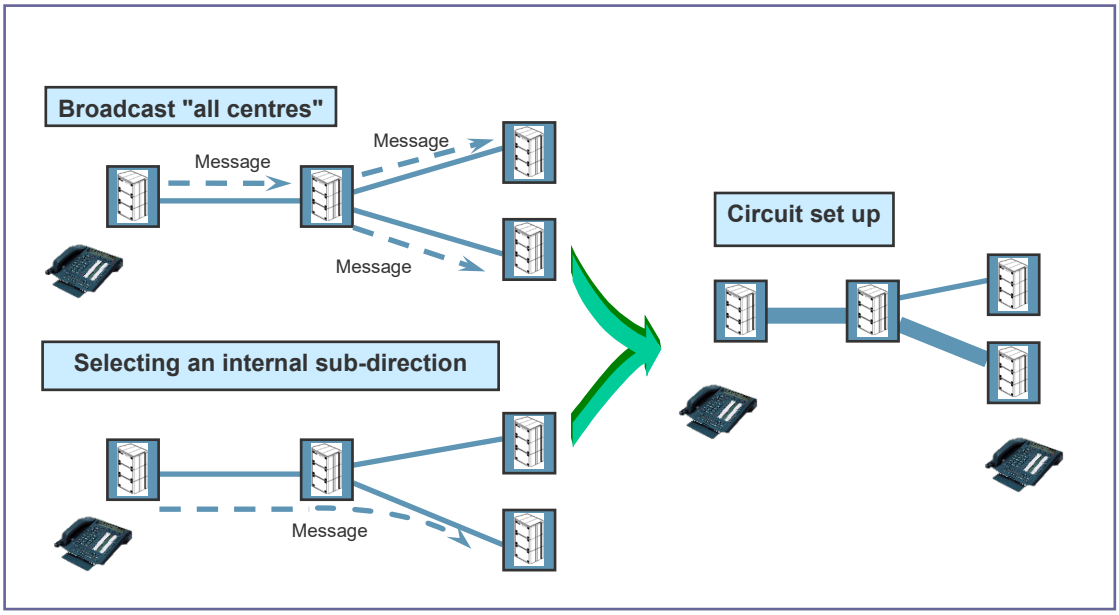
Three types of optimisation are offered:

- Targeted message broadcast on the network, using sub-directions
- Sharing of other resources and services
- Optimisation of the login site for IP sets.

4.5.1 MANAGING INTERNAL CALLS ON THE MULTI-SITE

The use of internal sub-directions allows selective broadcasting, over the network, of the signalling messages generated through subscriber search on the multi-site.

The use of this function is reserved for large configurations.



WARNING : Internal sub-directions, as well as the associated accesses, are numbering plan elements. Therefore, it is advisable to define these elements on the reference site(s) before carrying out the site copying operation described in Section 4.4.6.

This option is used as follows:

On each reference site:

1. Define the names of the internal sub-directions to each site on the multi-site.
2. Define the corresponding access in the numbering plan.

On each site:

3. Define the broadcast priorities for each internal sub-direction.

4.5.1.1 Creating internal sub-directions

On each reference site:

To define the names of internal subdirectories, select the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Names of internal subdirectories**.

Define an internal sub-direction name for each site on the multi-site.

To define accesses to internal subdirectories, select the menu **NUMBERING PLAN>User numbering plan>Access to extensions**.

Select the internal direction INTERNAL and delete the access to this direction by leaving the RANGE X field blank.

For each of the internal sub-directions, select the sub-direction and indicate the number ranges corresponding to the site targeted by this sub-direction.

4.5.1.2 *Internal call distribution*

On each site:

To define the transmission priorities for internal subdirectories, select the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Allocation of local calls**.

Select the sub-direction corresponding to the local site and assign the value LOCAL SITE to the parameter BROADCAST PRIORITY 1.

For each of the other internal sub-directions, assign the value SITE BASIS to the parameter BROADCAST PRIORITY 1, and select the site for which the internal sub-directory has been defined.

WARNING : Do not modify the value ALL CENTRES assigned to the parameter BROADCAST PRIORITY 1 of the sub-direction INTERNAL.

4.5.1.3 *Overflow call on network*

This option makes it possible to have a backup for internal calls (on the multi-site) in case the IP fails. It consists in defining a trunk group on which calls will be re-established in case of inaccessibility, for the selected internal sub-directions.

WARNING : As overflow is equivalent to a change of network, it is subject to the "network shift" right granted to the calling party in his or her general characteristics.

For the switchover to take place if necessary, you need to have defined the translator used to translate the called internal number call to external number. Translators are defined in the menu **NETWORK AND LINKS>Network>Translators>Outgoing: called party number**.

To activate the network overflow option, select the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Overflow call on network**.

Select the internal sub-directions for which overflow call on network must be activated. The names of the internal sub-directions appear on this screen which corresponds to the internal sub-directions created via the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Names of internal sub-directions**.

Select the trunk group which will be used to re-establish calls in case of inaccessibility, then click "**Advanced characteristics**…".

TONE TYPE

BY FREQUENCY **BY PULSE** **DTMP/DP**

DP THEN DTMF **BY IMP THEN IMP**

This parameter is used to define the network tones detection mode.

- BY FREQUENCY: PSTN on TRK
- BY PULSE: TL or PCM in signalling code L0
- DTMP/DP: both types of tone are accepted
- DP THEN DTMF: tone type reserved for export
- BY IMP THEN IMP: two consecutive impulses.

Select the value that corresponds to the trunk used.

TRANSMIT TYPE

DTMF **DECADIC** **SOCOTEL R1**

This parameter defines the dialling signal transmission mode on the network line, in accordance with the central exchange characteristics.

Select the value that corresponds to the trunk used.

DIAL TONE

YES **NO**

Select "NO".

OUTGOING DIGIT TRANSLATOR NUMBER

Translator number (defined for this) used to translate the internal number into external number.

Note : overflow call on network can only succeed if the requested internal number is DID.

4.5.2 OTHER SERVICES AND RESOURCES

The menu **NETWORK AND LINKS>Multi-sites>Localisation of the services>Other services** allows you to use on one site the services of another site on the multi-site network.

TDM CONFERENCES/ANNOUNCEMENTS and TDM MULTISITE ACCEESS POINT resources are described in *4.4.4.1* and *4.4.4.1* respectively.

The DIRECTORY SERVER and COMMON ABBREVIATED DIALLING resources are described in 4.6.1.3 and *4.6.1.4* respectively.

Other resources that can be shared on the network are:

- VOICE MAIL
- BARRED NUMBERS
- PAGING SERVICE
- INTERCOM GROUP
- TEST DEVICE
- PACKET CIRCUIT COUPLER
- MULTI CONFERENCE SERVER
- STT SERVER
- OP DISTRIDUTION SERVER
- L.C.R SERVER STATUS
- L.C.R SERVER AREA
- VOICE ENCRYPTION
- DOMAIN H323 GATEWAY
- OP GP1 to OP GP15
- OPERATORS

A resource is located via the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Other services**. On the list of services, select the resource you want and configure the broadcast by order of priority of this resource.

4.5.3 LOGIN SITE OPTIMISATION

Login:

Association between a set and a subscription.

Reference site:

A subscriber's reference site is the site on which the subscription is declared. This site contains all the subscription related data, and calls to and from this subscriber will be processed on this site.

Login site:

The login site of an IP set is the site that contains the IP card on which the set makes its TCP/IP connection.

When this login site is different from the reference site, exchanges between the IP set and its reference site pass through the login site. The inter-site traffic generated by the message exchanges may be high in the presence of a large number of IP sets.

To minimise the inter-site traffic, it is advisable for an IP set to connect directly to the subscription's reference site. This is the purpose of the login site optimisation function used to provide an IP set with its reference site IP card addresses on which it can open a session.

4.5.3.1 Activating / deactivating the optimisation function

A site offers the login site optimisation function if it has at least one IP address (CPU card or PT2 card) declared eligible for the sets' login.

By default, the CPU card IP address and all the IP cards are eligible.

To deactivate the eligibility of a PT2 card (terminals i7xx only) so it is not overloaded:

- Modify the parameter AUTHORISED SETS LOGIN, in the menu **SYSTEM>Configuration>Cards>IP board parameters.**
- Click on the location of the IP card to declare it eligible for terminal login.
- Set the parameter **AUTHORISED SETS LOGIN** to YES.

4.5.3.2 Choosing the operating mode

When an IP set is logging on, if the login site is not the reference site, the IP addresses used to connect to the reference site are sent to the set that can thus open its session directly on its reference site.

Two operating modes are offered:

- Automatic mode in which the iPBX retrieves, upon start-up, two IP addresses of activated IP cards, connected to the network and declared eligible for set login
- Manual mode in which the operator defines one or two IP addresses to use on the iPBX for set login

To configure the operating mode, select the menu NETWORK AND LINKS>Multi-sites>Login site optimisation.

Login site optimisation

AUTOMATIC **MANUAL**

In AUTOMATIC mode, the login IP addresses for the site are provided by the system.

In MANUAL mode, they are entered by the user:

- IP address 1
- IP address 2

The login site optimisation mode is indicated for information purpose in the menu **System>Configuration>Cards>IP board parameters**:

4.6 CONFIGURING DIRECTORY PARAMETERS

Directory parameters are pre-configured when each iPBX is being installed.

The different Ctrl + i screens displayed during a first installation are used for system pre-configuration. For the directory part, this file contains the following information:

- The internal number length
- The internal number range
- Automatic subscriber creation requests
- Automatic IVB assignment to each subscriber.

At the end of the installation of an iPBX, directory records may or may not be created in the internal LDAP database according to pre-configuration through Ctrl +i.

Note : The servers that access the directory set up cache mechanisms to optimize processing (name search, forbidden numbers, speed dials, SDN).

4.6.1 A MULTISITE WITHOUT MIVOICE 5000 MANAGER

On a multi-site network without management centre, there is only one active LDAP database and it is hosted by one of the sites: So, there is no LDAP database replica.

The following steps are necessary on each of the sites for configuring the directory parameters on a multi-site network without management centre:

- Installation>pre-configuration
- Configure directory service broadcast.
- Locate the databases.
- Locate the directory service.
- Locate the abbreviated number resolution service.
- Creation of internal directory records in the active database (if the active database is not the internal database)
- Perform massive directory update (optional).

4.6.1.1 Site pre-configuration

To avoid future configuration operations, it is advisable, for each site, to perform a pre-configuration of the following parameters using Ctrl + i:

- The site number
- The numbering plan length (the same value for all the sites)
- The internal number range (separate ranges for all the sites)

- Automatic subscriber creation requests.

4.6.1.2 Configuring directory service broadcast

The directory service is responsible for search by name and number resolution. It is available on each iPBX, but is only unlocked if the software licence is unlocked. If it is unlocked on the iPBX, it can be used locally by the site, but also by other sites if its availability is configured. This availability is activated on the site(s) on which it is active, via the menu **SUBSCRIBERS>Directory>Parameters> Connections**.

The directory service is activated for the iPBX in question from the **Directory in use** parameter in the **Name resolution** tab.

The directory service is active if the box is ticked. If the box is not ticked, another service must be defined in the menu **NETWORK AND LINKS>Multi-sites>Location of the services**.

4.6.1.3 Location of databases

The location of the following two databases can be configured:

- The "Basic directory exp."
- The directory database used by the directory service.

The configuration of the "basic directory exp." is decorrelated from the directory database used by the directory service.

4.6.1.3.1 Location of the "Basic directory exp."

Configuration tab of the menu **SUBSCRIBERS>Directory>Parameters>Connections**

The "basic directory exp" database is an internal or remote LDAP database.

The following services are connected to this database:

- White Page service: directory display / modification
- Abbreviated number resolution service
- XML server: call by name on terminals Mitel 6700 SIP Phone,
- Web Admin telephony service: directory configuration.

The location of this database must be configured on each of the multi-site network sites via the **Configuration** tab, in the menu **SUBSCRIBERS>Directory>Parameters> Connections**.

The location of the “user database directory” is configured from the following fields:

CONFIGURATION tab

SERVER TYPE

INTERNAL **EXTERNAL**

This parameter indicates the location of the database:

- On the site on which the database is located, the value for this parameter must be **INTERNAL**.
- If the database is not inside the iPBX, the value of this parameter must be **EXTERNAL**.

SERVER NAME OR IP ADDRESS

Name or IP address of the server hosting the "basic directory exp." database.

PORT

LDAP connection port (389 is the default value for the LDAP protocol).

DATABASE OR URL

Connection point on the LDAP tree.

The default value for this parameter (ou=local,o=AASTRA,dc=DOMAIN,dc=com) corresponds to a configuration without MiVoice 5000 Manager.

LOGIN

LDAP database access login.

The default login (cn=Manager, dc=DOMAIN,dc=com) corresponds to an account created in the LDAP database during installation.

PASSWORD

Database access password. Leave the default password proposed: it corresponds to the pre-configured iPBX user account in the LDAP database.

For a remote database (TYPE OF SERVER = EXTERNAL), configure the access parameters:

PERSONALIZATION

MULTISITE BASIS **GLOBAL**

This parameter defines where the directory record personalisation **pbxPerso** branch is declared.

WARNING : In R5.2 and R5.3, this parameter should never be set to GLOBAL.

REGENERATE INTERNAL RECORDS

Ticking this checkbox regenerates internal records in the LDAP server which may be internal or external.

Click **Validation** to confirm this option.

4.6.1.3.2 Directory database used by the directory service

Name resolution tab of the menu **SUBSCRIBERS>Directory>Parameters>Connections**.

The different sites on which the directory service is working (**Directory in use** checkbox ticked) must be configured to connect to the directory database in question.

This location is configured on the remote databases via the **Configuration** tab of the menu **SUBSCRIBERS>Directory>Parameters>Connections**.

The location of the database used by the directory service is configured from the following fields:

THRESHOLD BEFORE ALARM (IN %)

This field is used to configure a threshold before alarm and the display of alarm messages when the number of directory records is exceeded on MiVoice 5000 Server and Mitel 5000 Gateways MiVoice 5000 devices.

When the threshold is reached, a message is displayed in the logbook to alert the user.

Note : When this limit is exceeded, the functions call by name and name search -> number and name -> name are blocked (they stop working).

SEARCH BASE DIRECTORY PRIORITY 0 / 1 / 2

These parameters indicate the location of the databases to be used by the directory service in order of priority (0 to 2).

DATABASE FALLBACK EXP	The database used by the directory service is the management database (defined in the **Configuration** tab).
LDAP	The database used by the directory service is the LDAP database defined using the following parameters.
TWP	The directory service communicates with the TWP.

The description of the parameters used to define an access to a directory database replica is the same as the one given above for **Configuration**. Replicating an LDAP directory requires the use of a MiVoice 5000 Manager management centre.

If a TWP exists on the network to give access to external directories, it can be used by the directory service. The basic connection parameters to enter are as follows:

DATABASE OR URL

Link for the TWP R31 server: http://localhost/tws2/TWS_PbxDirectoryWebSvc/.

Link for the TWP R32 server: http://localhost/tws3/TWS_PbxDirectoryWebSvc/

NO. MAX ANSWERS FOR REQUEST

Field used to define the maximum number of names proposed during an LDAP request on the terminals when users are searching for internal or external names.

4.6.1.3.3 Numbering service

Menu SUBSCRIBERS>Directory>Parameters>Connections, Numbering service tab.

When ticked, the **Service in use** checkbox allows the use of a numbering server (SDN) to process abbreviated and barred numbers. This service gives access, in read mode, to an LDAP database possibly secured by a second LDAP database.

By default, the checkbox is ticked (Service in use).

The **Broadcast** field contains the following values:

- **Internal**; the SDN server can only be used for the iPBX in question.
- **Multisite**; the server can be used by all the sites in the multi-site configuration.

If the service cannot be rendered (SDN server is not working or failure upon request):

- Abbreviated number translation fails, and the call is rejected.
- The list of barred numbers cannot be returned; in this case, the external number is authorised by administration.

Note : For specific use of this service, see DID number management documentation - AMT/PTD/PBX/0099/EN.

-

Note : If several sites on the multi-site network have an active directory service, you can enter several locations in the BROADCAST PRIORITY X field; this secures the directory service access by offering fallback possibilities. In this configuration, the system alternates requests between the two databases located (PRIO 0 and PRIO 1).

4.6.1.4 Location of abbreviated number service

The abbreviated number resolution service is available on all the iPBXs and is not subject to a key code. It can, therefore, be used locally on each site.

You can perform this configuration from the menu **NETWORK AND LINKS>Multi-sites>Location of the services>Other services**. On the list of services, select **COMMON ABBREVIATED DIALLING**:

BROADCAST PRIORITY 1

.....	No service location.
LOCAL SITE	The abbreviated number resolution resource used will be that of the local site.
SITE BASIS	The site will use the abbreviated number resolution resource of another site.

If you select the value SITE BASIS, the following fields appear:

SITE NAME

Name of the site on which to look for the abbreviated number resolution service.

The drop-down list contains all the multi-site network site names.

CLUSTER NUMBER

Cluster number of the site with the abbreviated number resolution resource. The cluster number is 2 for Mitel 5000 Gateways systems.

4.6.1.5 *Creating directory records in the active database*

Note : Carry out this operation only if the active database is not internal.

The directory records available in the internal database were created in the pre-configuration phase (using the settings of the file *install.conf*) and/or on the site before configuring the active database access.

The purpose of this phase is to create in the multi-site network's single database the directory records corresponding to each iPBX on the multi-site network.

WARNING : This is not a copying operation, but creating records with default values like during a TOTAL. The records must then be configured later on the multi-site database.

Before sending these records to the active database, you can re-number the subscribers if necessary.

The internal subscriber re-numbering procedure is described in Section *4.8.3*.

To create the site directory records in the multi-site database:

1. Check that the iPBX actually points to the multi-site network directory database as defined in Section *4.6.1.3*.

2. From the **Directory** tab, accessible from the menu **SUBSCRIBERS>Subscriptions>Characteristics>Directory information**, click the listing icon.

The site's internal subscriber directory records that do not exist in the multi-site database are created in this database.

Repeat this operation on each of the sites, except on the site hosting the directory database.

4.6.1.6 *UPDATING DIRECTORY RECORDS*

This operation is optional. It consists in carrying out a massive update of the directory data. It is performed from each iPBX thanks to the export/import function:

1. From the **Directory** tab, accessible from the menu **SUBSCRIBERS>Subscriptions>Characteristics>Directory information**, click the export icon:

The directory record data is exported into a .csv file.

	A	B	C	D	E	F	G	H	I	J	K	L	
1	Référence	AnnuAbo	Genre	NomAbo	Prenom	Fonction	hierarchy	BranchHierar	Confidential	NumSDA	Email	Localisation	Labi
2	4921	4921-29046-0	4922-29052-0	4922-29047-0	4922-29048-0	4922-29049-0	4922-29054-0	4922-29087-0	4922-29053-0	4922-29088-0	4922-29081-0	4922-29084-0	4922
3	1	200	.....	Dupont	Patrick	.....	STE 0/SERV 0		Liste verte				
4	2	201	.....	ABO 201		.....	STE 0/SERV 0		Liste verte				
5	3	202	.....	TITI		.....	STE 0/SERV 0		Liste verte				
6	4	203	.....	ABO 203		.....	STE 0/SERV 0		Liste verte				
7	5	204	.....	ABO 204		.....	STE 0/SERV 0		Liste verte				
8	6	205	.....	ABO 205		.....	STE 0/SERV 0		Liste verte				
9	7	206	.....	ABO 206		.....	STE 0/SERV 0		Liste verte				
10	8	207	.....	ABO 207		.....	STE 0/SERV 0		Liste verte				
11	9	208	.....	ABO 208		.....	STE 0/SERV 0		Liste verte				
12	10	209	.....	ABO 209		.....	STE 0/SERV 0		Liste verte				
13	11	210	.....	ABO 210		.....	STE 0/SERV 0		Liste verte				
14	12	211	.....	ABO 211		.....	STE 0/SERV 0		Liste verte				
15	13	212	.....	ABO 212		.....	STE 0/SERV 0		Liste verte				
16	14	213	.....	ABO 213		.....	STE 0/SERV 0		Liste verte				

exportRHM

2. Modify the values as you wish.

3. Import the file with the new values, from the menu **SYSTEM> Software maintenance>Massive import**.

For more details on the export/import functions, see the *MiVoice 5000 Web Admin Operating Manual* [3].

4.6.2 A MULTISITE WITH MIVOICE 5000 MANAGER

This section describes the different directory installation and configuration phases if you wish to implement a multi-site network with Management Centre from scratch.

On a multi-site network with a management centre, the active LDAP database is hosted by the management centre.

Proceed as follows:

1. Install the MiVoice 5000 Manager application.
2. On MiVoice 5000 Manager:

- Declare the LDAP database connection.
- Declare the multi-site.

3. For each iPBX:

- Install the iPBX with the right file *install.conf*.
- Configure directory service broadcast.
- Locate the databases.
- Locate the directory service.
- Locate the abbreviated number resolution service.
- Create internal directory records in the active database.
- Perform massive directory update (optional).

4. On MiVoice 5000 Manager:

- Retrieve the iPBX data through a **generation** operation.
- Reconfigure the ACLs for connecting external applications.

4.6.2.1 Installing and configuring Mivoice 5000 Manager

For this phase, refer to the documents MiVoice 5000 Manager Installation and Configuration Guide [2] and MiVoice 5000 Manager User Guide [1].

- Declare the LDAP database connection.

At the end of the Management Centre installation operation, the LDAP database is installed and initialised. Just indicate on the management centre the LDAP database IP address to use (in this case, the IP address of the PC on which MiVoice 5000 Manager is installed). This parameter can be defined in the **Directory** tab of the menu **Administration>Configuration**.

- Declare the multi-site.

You can declare the multi-site configuration in the menu **Administration>Configuration>Network topology**.

4.6.2.2 Site pre-configuration

To avoid future configuration operations, it is advisable to install the iPBX with configuration records containing:

- The numbering plan length (the same value for all the sites)
- The internal number range (separate ranges for all the sites)
- Automatic subscriber creation requests.

4.6.2.3 Configuring directory service broadcast

The directory service broadcast for each site is configured using the same procedure as described in Section *4.6.1.2* if the network does not have any management centre.

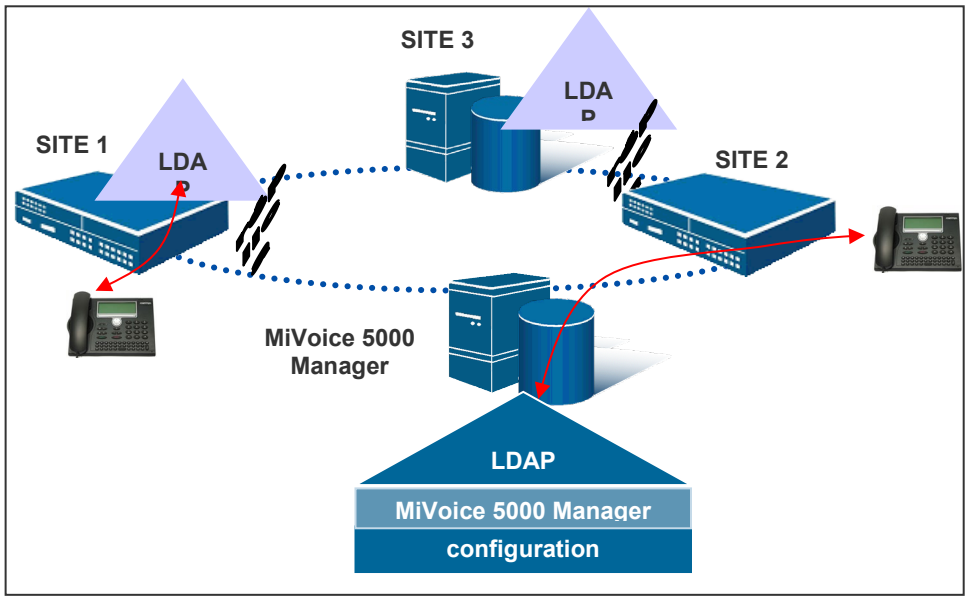
4.6.2.4 Location of databases

The location of the following two databases can be configured:

- The "Basic directory exp."
- The directory database used by the directory service.

The configuration of the "basic directory exp." is decorrelated from the directory database used by the directory service.

The following example illustrates a database location possibility in a configuration with a management centre.



	SITE 1	SITE 2	SITE 3
Directory in use	YES	YES	YES
CONFIGURATION Server address	INTERNAL	EXTERNAL MiVoice 5000 Manager address	INTERNAL
SEARCH FOR DIRECTORY DATABASE PRIORITY 0	DATABASE FALLBACK EXP	DATABASE FALLBACK EXP	DATABASE FALLBACK EXP
SEARCH FOR DIRECTORY DATABASE PRIORITY 1	LDAP: MiVoice 5000 Manager address	LDAP: Site 3 address	LDAP: MiVoice 5000 Manager address
SEARCH FOR DIRECTORY DATABASE PRIORITY 2	DATABASE FALLBACK EXP	LDAP: Site 1 address	DATABASE FALLBACK EXP

4.6.2.4.1 Location of the "Basic directory exp."

The "basic directory exp" database is an internal or remote LDAP database.

The following services are connected to the "basic directory exp." database:

- White Page service *: directory display / modification
- Abbreviated number resolution service
- XML server: call by name on terminals Mitel 6700 SIP Phone,
- Web Admin telephony service: directory display.

(*) Directory modification is only possible on sites with a "basic directory exp. located outside on MiVoice 5000 Manager.

The location of this database must be configured on each of the multi-site network sites via the **Configuration** tab, accessible via the menu **SUBSCRIBERS>Directory>Parameters> Connections**.

The location of the “user database directory” is configured from the following fields:

CONFIGURATION TAB:

SERVER TYPE

INTERNAL **EXTERNAL**

This parameter indicates the location of the database:

- On the site hosting a replica LDAP database, the value of this parameter may be **INTERNAL or EXTERNAL** to allow modifications on the directory database with the white pages service.
- On any other site of the multi-site network, the value for this parameter must be **EXTERNAL.** In that case, the database is either located on an external replica LDAP database or on the MiVoice 5000 Manager LDAP database.

PASSWORD

Database access password.

SERVER NAME OR IP ADDRESS

Name or IP address of the MiVoice 5000 Manager management centre.

PORT

LDAP connection port (389 is the default value for the LDAP protocol).

DATABASE OR URL

Connection point on the LDAP tree.

The default value for this parameter (ou=local,o=AASTRA,dc=DOMAIN,dc=com) corresponds to a configuration without MiVoice 5000 Manager. In the present case, replace **local** with the multi-site name as declared on the management centre.

LOGIN

LDAP database access login.

The default login (cn=Manager, dc=DOMAIN,dc=com) corresponds to an account created in the LDAP database during installation.

PERSONALIZATION

MULTISITE BASIS **GLOBAL**

This parameter defines the location in which the directory record personalisation **pbxPerso** branch is declared (see *Figure 2*).

4.6.2.4.2 Directory database used by the directory service

The different sites of the multi-site network on which the directory service is in use (checkbox ticked for the parameter **Directory in use**) must be configured to either access the active database on MiVoice 5000 Manager, or a replica if available on the network, or a TWP server.

Databases are located on the sites concerned via the **Name resolution** tab, accessible via the menu **SUBSCRIBERS>Directory>Parameters>Connections**.

The location of the database used by the directory service is configured from the following fields:

THRESHOLD BEFORE ALARM (IN %)

This field is used to configure a threshold before alarm and the display of alarm messages when the number of directory records is exceeded on MiVoice 5000 Server and 5000 Gateways MiVoice 5000 devices.

When the threshold is reached, a message is displayed in the logbook to alert the user.

Note : When this limit is exceeded, the functions call by name and name search -> number and name -> name are blocked (they stop working).

SEARCH BASE DIRECTORY PRIORITY 0 / 1 / 2

These parameters indicate the location of the databases to be used by the directory service in order of priority.

SERVER TYPE

DATABASE FALLBACK EXP	The database used by the directory service is the management database (defined in the **Configuration** parameter group).
LDAP	The database used by the directory service is the LDAP database instance defined by the following parameters.
TWP	The directory service communicates with the TWP.

MiVoice 5000 Manager can create one or more LDAP database replicas on the network which can be used by the directory services.

The description of the parameters used to define an access to a directory database replica is the same as the one given above for **Configuration**.

If a TWP exists on the network to give access to external directories, it can be used by the directory service. The basic connection parameters to enter are as follows:

DATABASE OR URL

TWP server URL.

NO. MAX ANSWERS FOR REQUEST

Field used to define the maximum number of names proposed during an LDAP request on the terminals when users are searching for internal or external names.

4.6.2.4.3 Numbering service

Numbering service tab of the menu **SUBSCRIBERS>Directory>Parameters>Connections**.

When ticked, the **Service in use** checkbox allows the use of a numbering server (SDN) to process abbreviated and barred numbers. This service gives access, in read mode, to an LDAP database possibly secured by a second LDAP database.

By default, the checkbox is ticked (Service in use).

The **Broadcast** field contains the following values:

- **Internal**; the SDN server can only be used for the iPBX in question.
- **Multisite**; the server can be used by all the sites in the multi-site configuration.

If the service cannot be rendered (SDN server is not working or failure upon request):

- Abbreviated number translation fails, and the call is rejected.
- The list of barred numbers cannot be returned; in this case, the external number **is authorised by administration**.

Note : For specific use of this service, see DID number management documentation - AMT/PTD/PBX/0099/EN.

Note : If several sites on the multi-site network have an active directory service, you can enter several locations in the BROADCAST PRIORITY X field; this secures the directory service access by offering fallback possibilities.

4.6.2.5 Examples

Some examples of the use of the numbering service in a multi-site configuration with MiVoice 5000 Manager are given in the appendix A.5.

4.6.2.6 Location of abbreviated number resolution service

The abbreviated number resolution service location for each site is the same as the one described in Section *4.6.1.4* if the network does not have any management centre.

4.6.2.7 Creating directory records in the MiVoice 5000 Manager LDAP database

This operation is described in Section 4.6.1.5.

It has to be performed on each site.

4.6.2.8 UPDATING DIRECTORY RECORDS

This operation is described in Section *4.6.1.6*.

It is optional and can be performed on each site for which you wish to modify the directory information.

4.6.2.9 Generating data on MiVoice 5000 Manager

Generation operation on MiVoice 5000 Manager enables you to transfer data from all the multi-site iPBXs and centralise it on the management centre; it also enables you to lock the corresponding configuration functions on each iPBX.

Before this operation can be performed, the multi-site must be declared on MiVoice 5000 Manager and each site must also be declared on the multi-site network. If the sites were not declared while MiVoice 5000 Manager was being installed and configured (see *4.6.2.1*), they must be declared at this level.

To start a generation:

- Select the menu Administration>Network topology.
- Select the region and multi-site.
- Click Configuration.
- Click the **Generate** button in the **Multi-site configuration** window.

Data can be downloaded in two phases:

1. Importing directory data from the active database
2. Importing the configuration of each iPBX

MiVoice 5000 Manager opens the regeneration window:

- Click the **Import** button to import the directory data.

CAUTION : For the subscribers of a site to be downloaded, the LDAP database must contain the corresponding directory records. Therefore, the directory data import phase is important for hitch-free deployment of the multi-site network.

At the end of this phase, iPBX configuration download is triggered automatically.

At the end of the operation, it remains to reconfigure the ACLs (Access Control Lists).

4.6.2.10 Reconfiguring ACLs

It is necessary to reconfigure the ACLs so the external applications' accesses to LDAP database tree nodes are located in the multi-site branch concerned and not in the local branch.

In MiVoice 5000 Manager, from the menu Administration>Network topology:

- Select the region and multi-site.
- Click Configuration.
- Click the **Directory** button in the **Multi-site configuration** window.

To configure the ACL for an external application:

1. Click **Add**.
2. Select the application in the drop-down list of the **Login** field.
3. Select the rights associated with this application in the drop-down list of the **Operation** field.

Note : LISTAGE_ANNUAIRE gives the right to consult internal and external directory records. LISTAGE_GLOBAL gives the right to consult all the directory parameters.

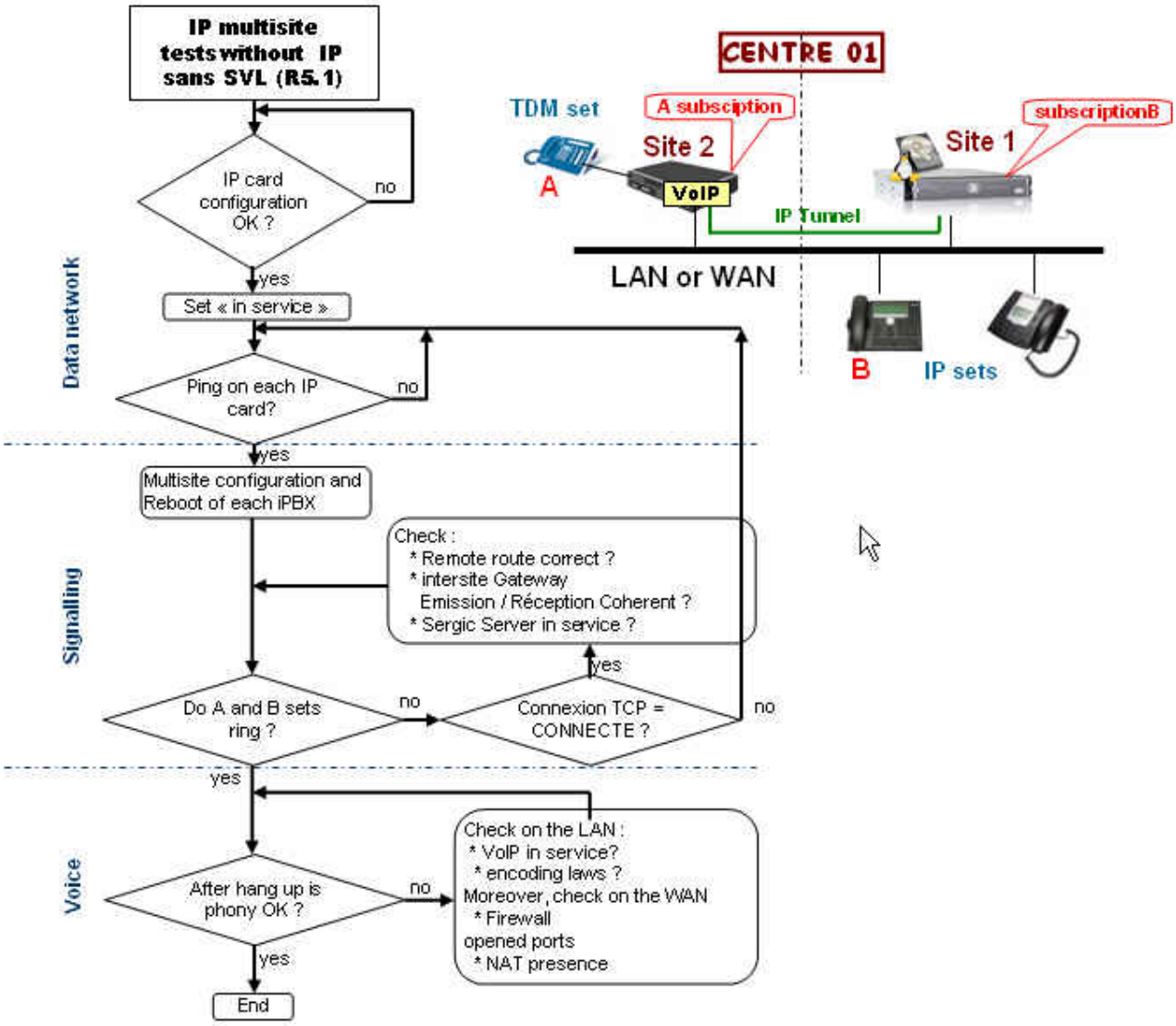
4. Select the branch of the directory to which the application will have access.
5. Click **Apply**.

Note : If you select PEOPLE_ET_CONTACT, the rights will automatically be assigned as well to PEOPLE and CONTACT.

4.7 TESTING INTER-SITE LINKS

Since all the items that enable the sites to communicate with each other are in place, it remains to test the actual link by setting up communication from one site to the other.

The procedure below indicates the different checks to make if the communication fails.



To check that the VoIP resources are in service, check the status of voice resources from the menu **SYSTEM>Supervision>Display status>Voice resources**.

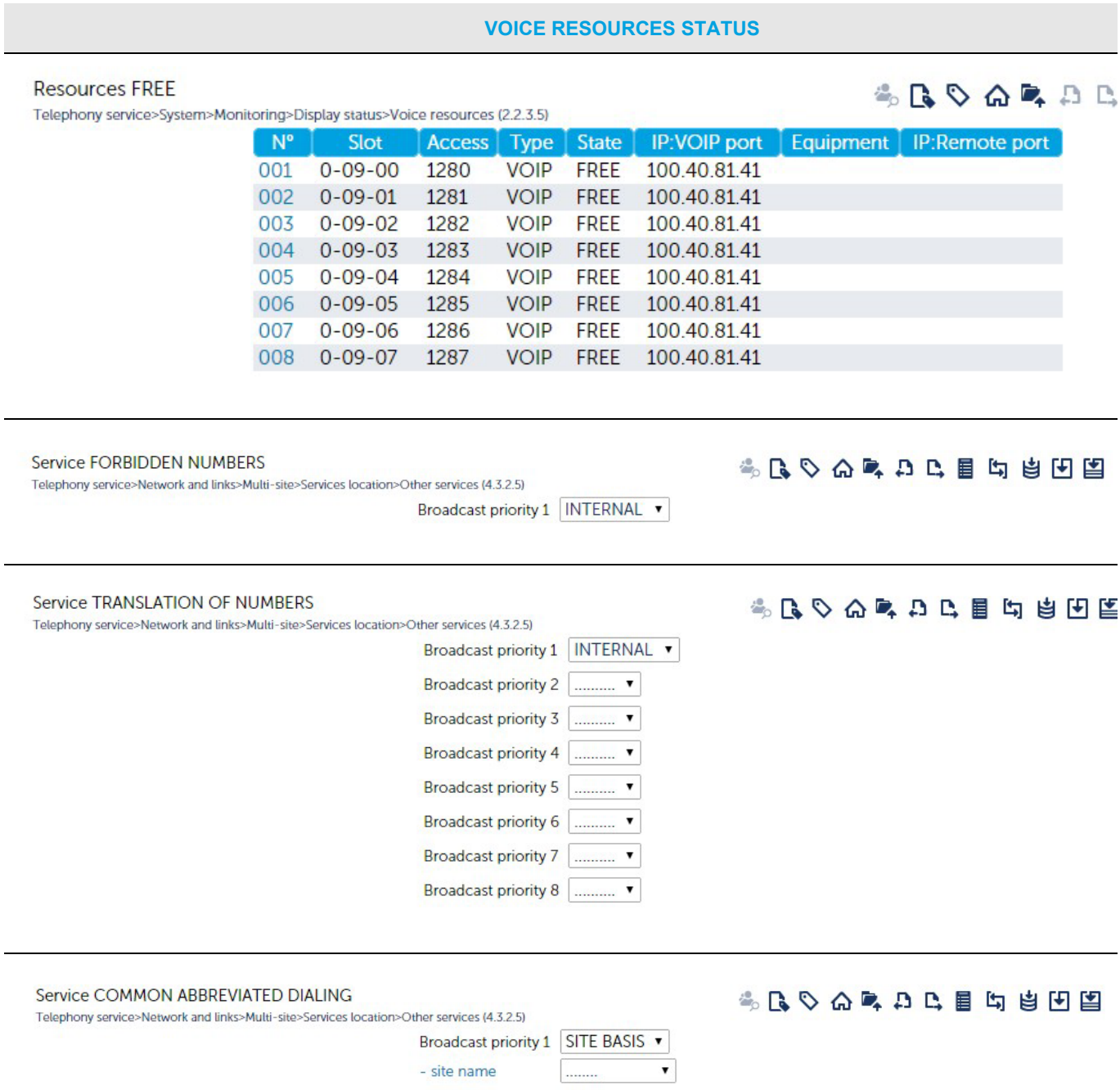


Figure 12: Displaying VoIP resources

4.8 ADDING A SITE IN AN IP MULTI-SITE

A site can be added to an existing IP multi-site in two ways:

- By adding a new site (installing a new device)
- By integrating an already configure standalone in the multi-site.

If it is a new site, you have to first carry out the installation phase to enable you pre-configure a certain number of parameters.

The operations to perform depend on the type of set being integrated into the multi-site network (new or already configured site) and also on the availability of a management centre on the existing multi-site network.

The table below summarises the operations to perform in each case.

The operations are described in the later part of this section.

	NEW SITE	ALREADY CONFIGURED SITE
MULTI-SITE WITHOUT MIVOICE 5000 MANAGER	• Install the site. • Configure the network parameters on all the sites. • Configure the directory parameters. • Create some of the site's internal subscriber records in the active database. • Update the records through export/import.	• Configure the network parameters on all the sites. • Re-create the internal numbers if necessary. • Re-configure the directory parameters. • Create some of the site's internal subscriber records in the active database. • Update the records through export/import.
MULTI-SITE WITH MIVOICE 5000 MANAGER	• Install the site. • Configure the network parameters on all the sites. • Declare the new site on MiVoice 5000 Manager. • Configure the site's directory parameters. • Create some of the site's internal subscriber records in the active database. • Update the records through export/import (on the site). • Download to MiVoice 5000 Manager the data for the new site through import.	• Configure the network parameters on all the sites. • Re-create the internal numbers if necessary. • Declare the site on MiVoice 5000 Manager. • Reconfigure the site's directory parameters. • Create some of the site's internal subscriber records in the active database. • Update the records through export/import (on the site). • Download to MiVoice 5000 Manager the data for the new site through import.

4.8.1 INSTALLATION

This phase is only applicable if you are adding a new site to the multi-site network.

The parameters to add in the file *install.conf* are:

- The internal number length
- The internal number range separated from the ranges used already on the other sites
- Automatic creation of internal extensions: YES

At the end of the installation phase, the directory records corresponding to the internal numbers of the new site are created in the site's internal LDAP database.

4.8.2 NETWORKING

The following steps must be taken to integrate the added site into the multi-site network architecture:

ON THE ADDED SITE:

- Declare the local site (see *4.4.2*) and update the local path.

Note : If the added site is a new site that has just been installed, its internal number was created during installation if the site number had been entered in the file install.conf.

- Restart the iPBX.
- Declare the remote sites (see *4.4.3*), with automatic creation of IP gateway to each of the other sites.
- Locate the resources (conference circuits, TDM access point) if necessary (see *4.4.4*).
- Copy tables from another site if possible (see *4.4.6*), otherwise configure the site completely.
- Locate some paths if the new site does not have access to the directions defined in the numbering plan (see *4.4.7*).

ON EACH OF THE OTHER SITES:

- Declare the new remote site (see *4.4.3*), with automatic creation of the IP gateway to the new site.

4.8.3 RE-ASSIGNING NUMBERS TO THE SITE SUBSCRIBERS

If the site you are integrating into the multi-site network is a new site, choosing a new "free" number range in the file *install.conf* helps you avoid this phase.

If the site being integrated into the multi-site network is already configured, check that the internal subscriber numbers of the site to integrate do not already exist in the LDAP database of the multi-site network. In case of overlap, you have to re-assign numbers on the site to be integrated into the multi-site network.

You can modify the numbers from the iPBX's MiVoice 5000 Web Admin via the **REDIAL** column, accessible via the menu **SUBSCRIBERS>Subscriptions> Redial**.

This screen is used to re-assign a number range.

Using the parameters **FIRST DIRECTORY NUMBER** and **LAST DIRECTORY NUMBER**, select the internal number range to modify.

Using the **NEW VALUES** parameter, select an available number range in the multi-site LDAP database.

In this case, the numbers of range 200-288 are re-assigned from 500 (to 588).

4.8.4 DECLARING THE SITE ON MIVOICE 5000 MANAGER

This operation is only to be performed if the multi-site contains a MiVoice 5000 Manager.

See the MiVoice 5000 Manager User Guide [1].

4.8.5 CONFIGURING THE DIRECTORY (WITHOUT MIVOICE 5000 MANAGER)

4.8.5.1 Directory parameters

Configuration tab

Server type: EXTERNAL

Server name or IP address: IP address of the site hosting the multi-site database.

The other sites on the network are not affected by this operation. Refer to the examples described in the Appendix in Section *A.4.1* and Section *A.4.2*.

Note : If the site to integrate into the multi-site network must host the multi-site directory database, the directory parameters must be configured accordingly on all the sites existing already.

4.8.5.2 Locating the directory service and abbreviated number resolution

The procedure for locating the new site's directory service is the same as the one described in 4.6.1.3.

The procedure for locating the new site's abbreviated number resolution service is the same as the one described in *4.6.1.4*.

4.8.5.3 Creating directory records in the active database

This operation is described in Section 4.6.1.5.

It must be performed from the new site if the new site is not hosting the multi-site database, or from each of the other sites on the multi-site network if the new site must host the directory database.

4.8.5.4 UPDATING DIRECTORY RECORDS

This operation is described in Section *4.6.1.6*.

It must be performed from the new site if the new site is not hosting the multi-site database, or from each of the other sites on the multi-site network if the new site must host the directory database.

4.8.6 CONFIGURING THE DIRECTORY (WITH MIVOICE 5000 MANAGER)

4.8.6.1 Directory parameters

Configuration tab

Server type: EXTERNAL

Server name or IP address: MiVoice 5000 Manager IP address

However, replicas of the directory database do exist on the network and if you wish to use these replicas as main database for the directory service or as fallback database, you have to configure the database location accordingly (see Section 0 for a full description of the database location).

The other sites on the network are not affected by this operation. Refer to the examples described in the Appendix in Section ***Erreur ! Source du renvoi introuvable.*** and Section *0*.

4.8.6.2 Locating the directory service and abbreviated number resolution

The procedure for locating the new site's directory service is the same as the one described in *4.6.1.3.*

The procedure for locating the new site's abbreviated number resolution service is the same as the one described in *4.6.1.4*.

4.8.6.3 Creating directory records in the active database

This operation is described in Section 4.6.1.5.

4.8.6.4 UPDATING DIRECTORY RECORDS

This operation is described in Section *4.6.1.6*.

4.8.6.5 Importing the new site into MiVoice 5000 Manager

This operation is performed on the management centre. From the menu **Administration>Network topology**:

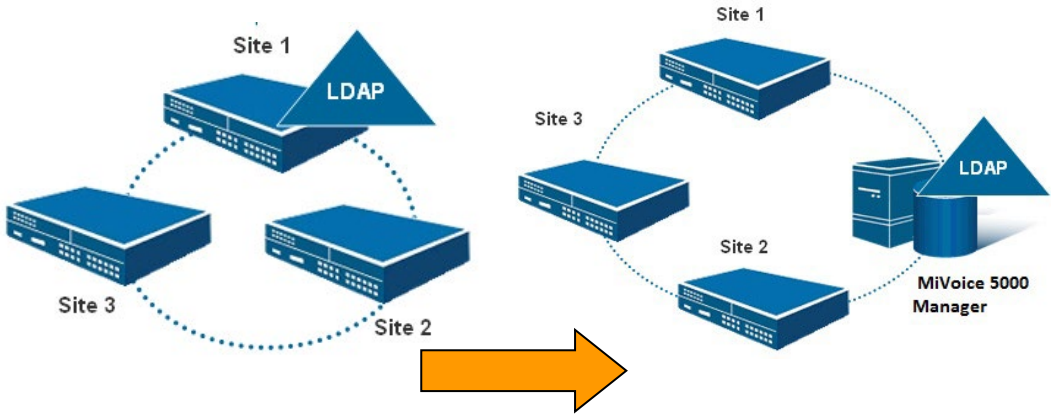
Select the region then the multi-site into which the site must be imported:

- Click Configure.
- In the area “Import a new site into multi-site”, select the name of the site to be imported into the multi-site. The drop-down list contains the names of the sites declared on MiVoice 5000 Manager for this multi-site network.
- Click the “Import” button. The site import screen is displayed.
- For the directory database to be imported into the multi-site database on MiVoice 5000 Manager, tick the box “Import internal directory data into the site?”, then click the “Start” button.

The entire site configuration is imported into the multi-site. At the end of this operation, the site user interface is locked for the downloaded data and MiVoice 5000 Manager takes over the management of this data.

4.9 ADDING A MIVOICE 5000 MANAGER IN AN IP MULTI-SITE

The figure below illustrates the required architectural change:



To add a MiVoice 5000 Manager management centre to an existing multi-site configuration, proceed as follows:

1. Install the MiVoice 5000 Manager application.
2. On MiVoice 5000 Manager:

- Declare the LDAP database connection.
- Declare the multi-site.

3. On each site:

- Reconfigure the database location parameters.
- Create directory records for each iPBX in the MiVoice 5000 Manager LDAP database.
- Update the directory records.

4. On MiVoice 5000 Manager:

- Download data from the various sites to MiVoice 5000 Manager (**GENERATION** with **DIRECTORY DATA IMPORT**).
- Reconfigure the ACLs for connecting external applications.

4.9.1 INSTALLING AND CONFIGURING MIVOICE 5000 MANAGER

This operation is described in Section 4.6.2.1.

4.9.2 LOCATING THE DATABASES ON EACH OF THE SITES

It is necessary to reconfigure the directory server on each iPBX on the network.

On MiVoice 5000 Web Admin, from the **Configuration** and **Name resolution** tabs, in the menu **SUBSCRIBERS>Directory>Parameters>Connections**, replace the initial address of the site (site 1 in the example) with the directory resource before adding the management centre via the MiVoice 5000 Manager address.

Previous configuration of sites 2 and 3:

Directory in use: YES

Basic directory exp: EXTERNAL

Server name or IP address: iPBX IP address

Previous configuration of site 1:

Directory in use: YES

Basic directory exp: EXTERNAL

Server name or IP address: DATABASE FALLBACK EXP

New configuration of all the sites:

Directory in use: YES

Basic directory exp: EXTERNAL

Server name or IP address: MiVoice 5000 Manager IP address

4.9.3 CREATING DIRECTORY RECORDS IN THE MIVOICE 5000 MANAGER LDAP DATABASE

This operation is described in Section 4.6.1.5.

4.9.4 UPDATING DIRECTORY RECORDS

This operation is described in Section *4.6.1.6*.

4.9.5 GENERATING DATA ON MIVOICE 5000 MANAGER

This operation is described in Section 4.6.2.8.

At this stage, MiVoice 5000 Manager can create replicas on the network to better distribute the directory resource and ensure security.

4.9.6 RECONFIGURING ACLS ON MIVOICE 5000 MANAGER

This operation is described in Section 4.6.2.10.

4.10 DELETING A SITE FROM AN IP MULTI-SITE

The operations to be performed before being able to delete a site from the multi-site network depend on whether or not the site is hosting the directory database on a multi-site network without MiVoice 5000 Manager, or a replica of the database for a multi-site network with a MiVoice 5000 Manager.

4.10.1 TRANSFERRING THE DIRECTORY DATABASE

If the site to delete does not host the directory database, this phase is not applicable.

If the site to delete is hosting the directory database, move it to another site by making an LDIF export, from an import to the site chosen to host the database.

4.10.2 MODIFYING DIRECTORY REFERENCES

On a multi-site network without MiVoice 5000 Manager:

- If the site to delete does not host the directory database, this phase is not applicable.
- If the site to delete is hosting a directory database, change all the directory references of other sites to locate the directory database on the site now containing the resource.

On a multi-site network with a MiVoice 5000 Manager:

- If the site to delete does not host any directory database replica, this phase is not applicable.
- If the site to delete is hosting a directory database replica, modify all the directory references of other sites with this replica.

On the site to delete, all the directory database reference must be set to INTERNAL.

4.10.3 LOCATING SERVICES

If some resources or services are located on the site to be deleted, redefine their location for all the sites concerned.

4.10.4 DELETING OBSOLETE DIRECTORY RECORDS

The directory records of subscribers on the site to be deleted must be deleted from the multi-site directory database.

The directory records of subscribers on the site to be deleted must be available on the standalone site:

- If the site to be deleted is hosting the directory database or a replica, just delete the records corresponding to the other sites.
- If the site to be deleted is not hosting any directory database or replica, import the multi-site database then delete from it the directory records for the other sites.

4.10.5 DELETING THE MULTI-SITE NETWORK LINK ITEMS

To delete site 2 from the multi-site network, delete the network links which each of the other sites on the multi-site network has to this site. Below is a description of how to delete the links to site 2 from site 1. Repeat these operations on each of the other sites.

1. Set the inter-site gateway status to **NOT EQUIP.** in the menu **NETWORK AND LINKS>Multi-sites>Message routing>Inter-site gateways** select the gateway to site 2.

Select **NOT EQUIP.** in the **STATUS** field of gateway 0.

2. Delete the IP tunnel routing prefix: in the menu **NETWORK AND LINKS>Data links>Routes**, select the IP tunnel route corresponding to the tunnel link to site 2.

In the **PREFIX** field, indicate the routing prefix number then select **DELETE** in the **ACTION** field.

3. Delete the directory number / TCP connection association: in the menu **NETWORK AND LINKS>Multi-sites>TCP tunnel connections**, select the tunnel connection to site 2.

Select **DELETE** in the **ACTION** field.

4. Disable the tunnel link then delete its name and number: in the menu **NETWORK AND LINKS>Data links>Link management**, select the tunnel link to site 2.

Select **DISABLE** in the **ACTION** field then delete the name and directory number of the link.

4.10.6 DELETING THE SITE

To delete the site from the multi-site network, now it remains to:

- Delete on each of the other site its reference as remote site.
- Delete the site and references to remote sites
- Deactivate the multi-site on the deleted site.

APPENDIX

This appendix gives the different items concerning the architectures of non “full IP” multi-site networks.

A.1 MULTI-SITE ARCHITECTURE

Several architecture types exist for a multi-site network. Each architecture has its advantages and disadvantages, and the customer must find the right compromise between security and the cost of running his multi-site network.

A.1.1 LINEAR ARCHITECTURE

This solution attaches more importance to operating cost (only three specialised lines are used to link four sites together) than to security. In fact, cutting any of the specialised lines can render communication between two or more sites impossible.

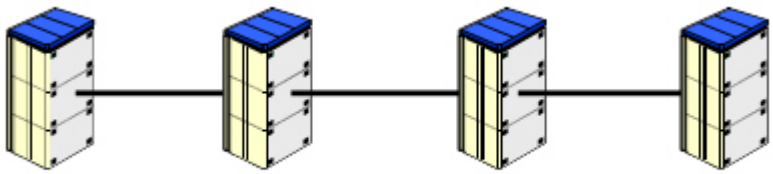


Figure 13: Linear architecture

A.1.2 STAR ARCHITECTURE

This solution can be used if one of the sites on the network has a greater capacity than the others. This site, which could be called the "central site", then allows interconnection between the other sites referred to as "satellite sites". In this configuration, all the resources are often concentrated on the central site in order to make access to the resources more direct and more evenly distributed for the other sites.

So, this solution optimises the operating cost by limiting the number of subscriptions for private and public lines.

Unfortunately, there is the risk of the satellite sites being isolated in case of failure on the central site.

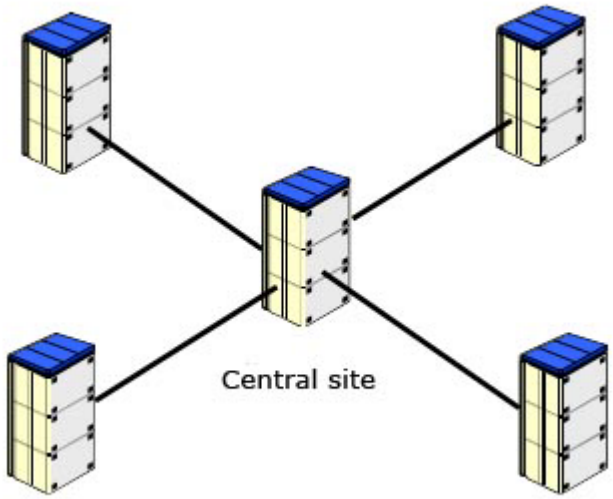


Figure 14: Star architecture

A.1.3 MESHED ARCHITECTURE

This is the most reliable solution because there are several ways of accessing a remote subscriber or, more generally, the network resources. Therefore, in case of fault on a site, the other sites may not be isolated.

The operating cost is, of course, higher due to the number of private lines.

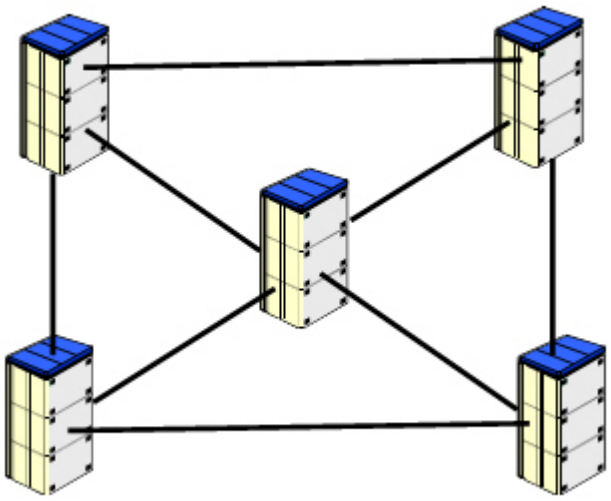


Figure 15: Meshed architecture

A.1.4 MULTI-CENTRE ARCHITECTURE

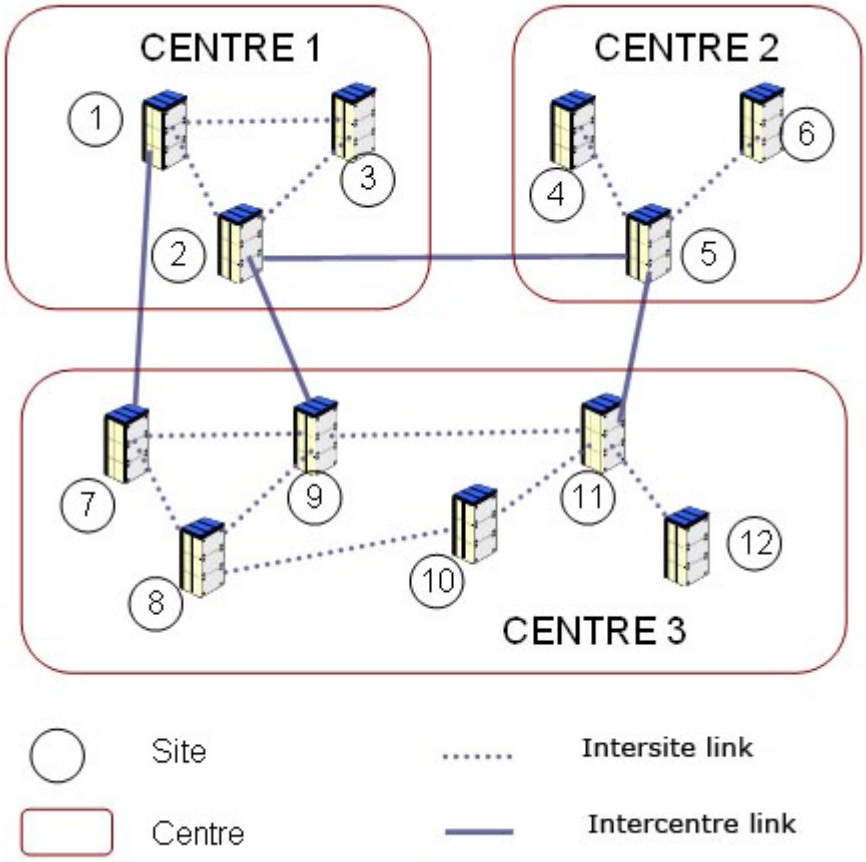


Figure 16: Multi-centre architecture

This network has two architecture levels:

- A multi-site architecture connecting the sites of a centre (sites 1, 2, 3 of Centre 1)
- A multi-centre architecture inter-connecting the centres.

A.2 THE VARIOUS VOICE COMMUNICATION DEVICES

Two sites may be interconnected by one or more different trunk groups with different signalling.

For two sites which are interconnected by a set of lines belonging to one trunk group, the declarations to be made on these two sites must be homogeneous (trunk group number, number of TS in service and their numbers.

For master/slave type signalling, as a standard, the site with the shorter number will use master type signalling.

A.2.1 PCM TYPE TRUNK GROUP

This is a digital link that can group together up to 30 useful TSs.

This is available on MiVoice 5000 iPBXs using LT2 card.

The most widely used signalling for this trunk group type is "colisee master" or "colisee slave". The characteristics to declare for the trunk groups are the same for a multi-site network and for a simple TL.

The physical device comprises 3 different pairs (1 transmission –1 reception). Cabling consists in connecting one site's transmission pair to the other site's reception pair.

A.2.2 T0 - T2 / QSIG TYPE TRUNK GROUP

These are digital links connecting together from 2 channels (case of T0) to 30 channels (case of T2).

T2 / QSIG type trunk group can be used by XS/XL/XD iPBXs (LT2 card) by deploying a direct link or a leased line whose throughput depends on the number of TSs in service.

T0 / QSIG type trunk group can be used by any MiVoice 5000 PBX, provided the two sites concerned are directly interconnected (cable length: < 350 m).

The only signalling available for this trunk group type is "master QSIG ISDN" or "slave QSIG ISDN".

The characteristics to declare for the trunk groups and lines are the same for a multi-site network and for a simple TL. These somewhat unusual characteristics are:

- For T0 / QSIG type trunk group, the site using the master QSIG signalling must declare an S0 equipment instead of a T0 equipment (selection of equipment by equipment number). On the other hand, if only one of the two sites is connected to the public network, this site must use master type signalling.

MASTER SIDE	SLAVE SIDE
Trunk group characteristics: level 3 behaviour: master	**Trunk group characteristics:** level 3 behaviour: slave
Line characteristics level 2 behaviour: master Link established by equipment: YES	**Line characteristics** level 2 behaviour: slave Link established by equipment: no

- For T0 trunk group and T2 trunk group, the physical device comprises two different pairs (1 transmission –1 reception). Cabling consists in connecting one site's transmission pair to the other site's reception pair.

A.2.3 ANALOGUE TL TRUNK GROUP

This is an analogue link that can group together several card channels.

The most widely used signalling for this trunk group type is IMM START. It does not use the master – slave principle.

The characteristics to declare for the trunk groups are the same for a multi-site network and for a simple TL.

The physical device comprises one or two voice link pairs (depending on the card settings), and one signalling pair (E & M). Cabling consists in connecting one site's voice pair to the other site's voice pair (no polarity), and connecting one site's E wire to the other site's M wire (and vice-versa).

If several sections are required to set up a telephone call, we recommend that you do not combine this trunk group type twice or more than once. The transmission and attenuation plan will probably not be respected in this case, especially if you are using a multiplexer.

A.2.4 DYNAMIC SWITCHED T0 – T2 LINK

It is possible to define a dynamic inter-site trunk group. The resources used are T0 and T2 accesses connected directly to an operator. A switched circuit is set up according to the inter-site traffic and the frame windows defined by the installer.

This type of trunk group can be used on any MiVoice 5000 iPBX fitted with ISDN cards.

The signalling used is ISDN / T0 or ISDN / T2.

A.3 THE VARIOUS SIGNALLING AND DATA DEVICES

A.3.1 PERMANENT VIRTUAL CIRCUIT

A permanent virtual circuit is a logical channel reserved for a specific X25 communication. On the multi-site network, the signalling channel is a permanent virtual circuit which should only be used by message packets.

It is also possible to set up a permanent virtual circuit for data transmission between the different sites. In this case, we talk of data channel.

We recommend that you separate the data channels from the message channels using two different permanent virtual circuits. The advantage in this case is that both exchange types are independent of each other, which makes it possible to avoid signalling channel saturation.

The permanent virtual circuit can be created with the help of special cards and direct or permanently switched physical devices.

A.3.2 CIRCUIT/PACKET COUPLING: MIC

A signalling-specific TS exists on this type of device (TS 16) which should not be mistaken for an X25 channel that allows the transmission of MOVACS data or messages in form of packets.

Here, the solution consists in reserving one or more PCM time slots for the routing of the data and message packets. In this case, we talk of **permanent marking**.

The function used to include one or more X25 packets in a TS and, inversely, to retrieve the packets transmitted in a TS is the “packet – circuit switching” function.

A.3.3 PERMANENT LOGICAL LINK - T0 OR T2 / QSIG

The T0 and T2 interfaces both have a data channel called D channel. This is the channel through which signals pass in form of X25 packets.

Since the average throughput required for the transmission of QSIG signalling* is 48Kbit/s for the T2 interface and 6.4.4Kbit/s for the T0 interface, part of this D channel can be used to transmit data or message packets.

The available average throughput is:

- for T2: 64 kbit/s - 48 kbit/s = 16 kbit/s
- for T0: 16 kbit/s - 6.4 kbit/s = 9.6 kbit/s

The part of the D channel used for message and data transmission is called **permanent logical link**.

* Not to be mistaken for multi-site MOVACS signalling (signalling messages).

A.3.4 SYNCHRONOUS DATA CARD AND MODEM

The two previous examples have shown that it is possible to use the same physical device to set up the voice gateways and the message gateways.

It is also possible to set up a permanent virtual circuit using a data card such as CS1 (XS, XL, XD: 2 synchronous accesses). It is also possible to create a permanent virtual circuit.

Wiring can be done directly if the two sites are very close to each other. Otherwise, it is necessary to use a pair of synchronous MODEM and a special line.

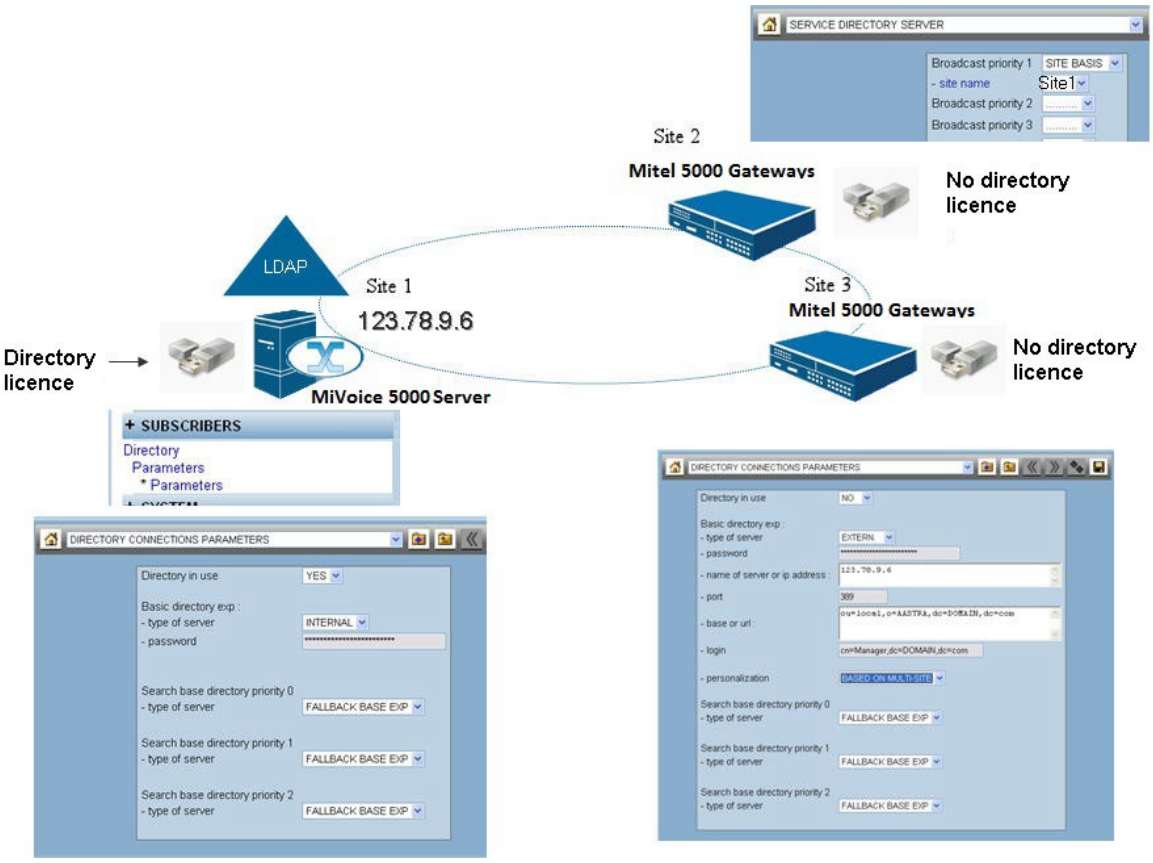
A.3.5 IP TUNNELLING LINK

This type of link is used between two sites connected together through an IP link.

The tunnel is a logical connection set up between two iPBXs. X25 packets are encapsulated by the transmitting iPBX, via the gateway link in IP frames, then carried in the tunnel and decapsulated by the receiving iPBX. This link transmits, on the LAN, the MOVACS signalling over TCP as well as the data.

A.4 EXAMPLES OF DIRECTORY CONFIGURATION

A.4.1 MULTI-SITE CONFIGURATION WITHOUT MIVOICE 5000 MANAGER AND WITHOUT TWP SERVER



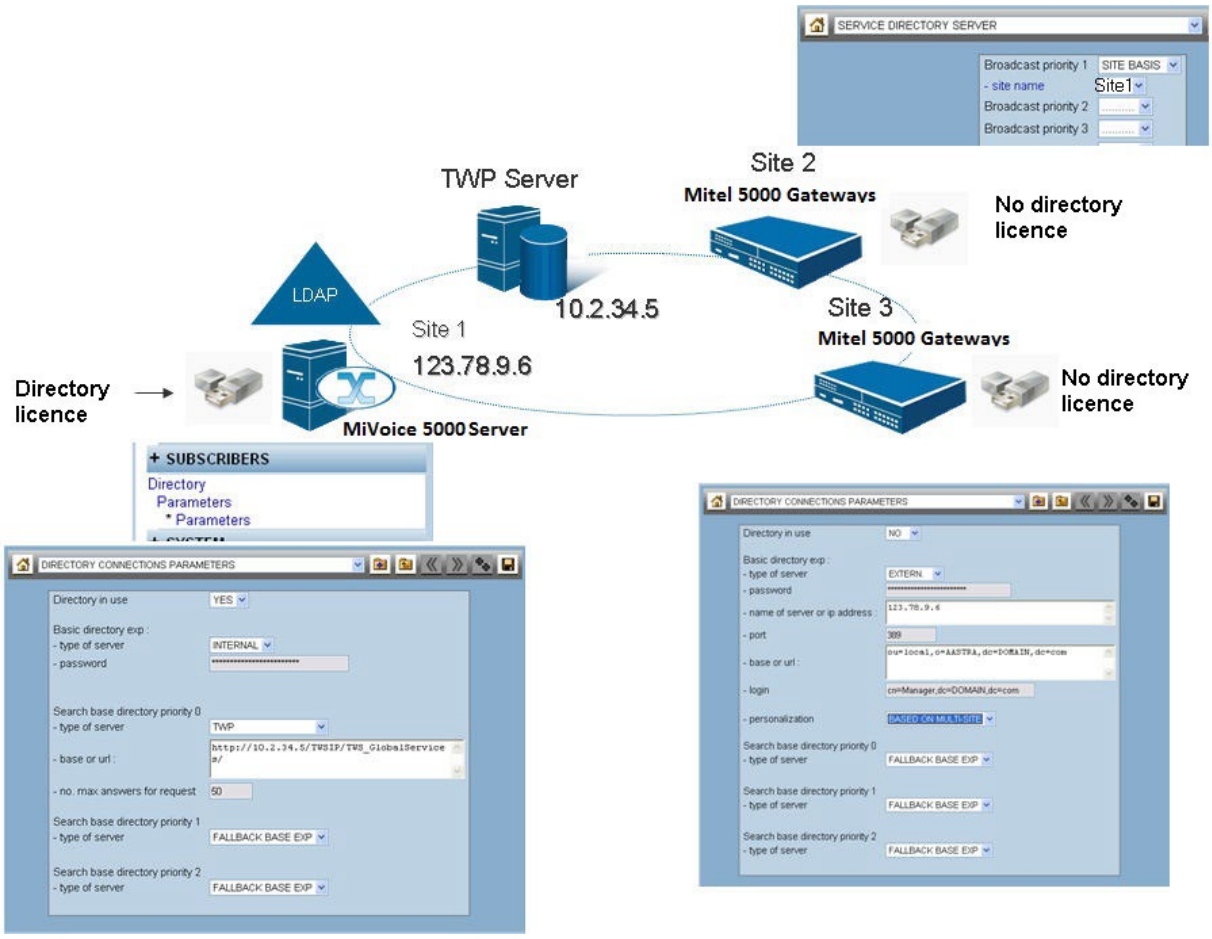
On site 1:

- The operator directory database is the MiVoice 5000 server's internal LDAP database.
- The directory service is working and uses the MiVoice 5000 server's internal LDAP database. It can be used by sites 2 and 3 because this is allowed by the software licence.

On sites 2 and 3:

- The operator directory database is the MiVoice 5000 server's external LDAP database.
- The directory service used is that of site 1.

A.4.2 MULTI-SITE CONFIGURATION WITHOUT MIVOICE 5000 MANAGER AND WITH TWP SERVER



Directory licence ------> No directory licence

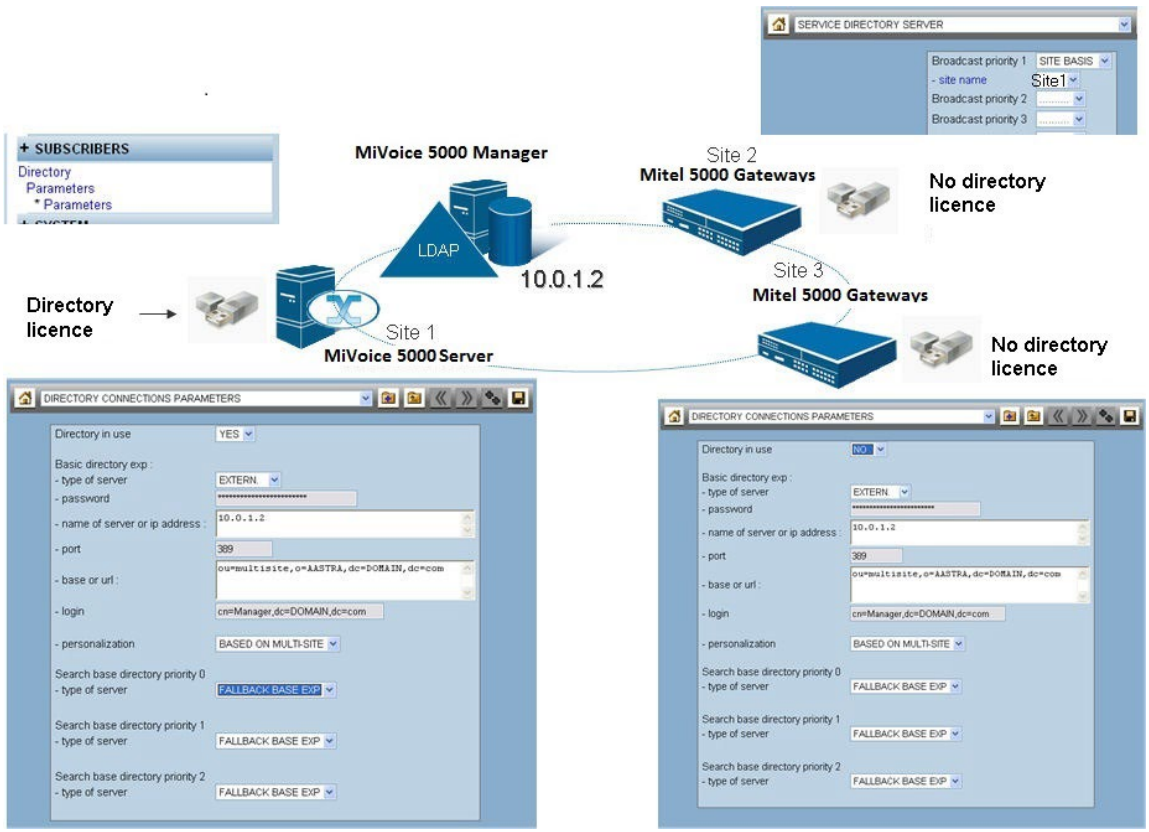
On site 1:

- The operator directory database is the MiVoice 5000 server's internal LDAP database.
- The directory service is operational and uses:
  - In priority 0, the TWP server directory database
  - In priority 1 and 2, the internal LDAP database of the MiVoice 5000 Server.
- The directory server can be used by sites 2 and 3 because this is allowed by the software licence.

On sites 2 and 3:

- The operator directory database is the MiVoice 5000 server's external LDAP database.
- The directory service used is that of site 1.

A.4.3 MULTI-SITE CONFIGURATION WITHOUT MIVOICE 5000 MANAGER AND WITHOUT TWP SERVER



Directory licence ------> No directory licence

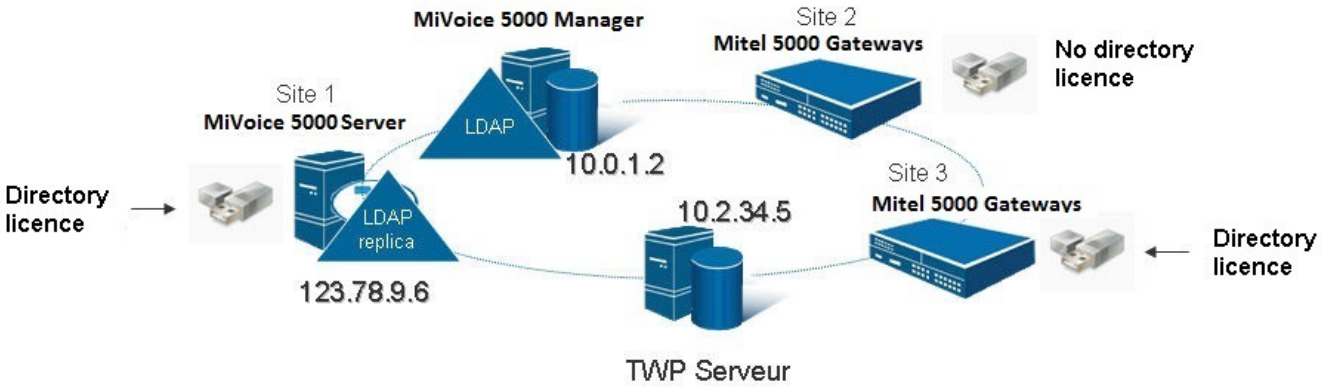
On site 1:

- The operator directory database is the external LDAP database located on MiVoice 5000 Manager server.
- The directory service is working and uses the external LDAP database located on MiVoice 5000 Manager. It can be used by sites 2 and 3 because this is allowed by the software licence.

On sites 2 and 3:

- The operator directory database is the external LDAP database located on MiVoice 5000 Manager server.
- The directory service used is that of site 1.

A.4.4 MULTI-SITE CONFIGURATION WITH MIVOICE 5000 MANAGER AND WITH TWP SERVER



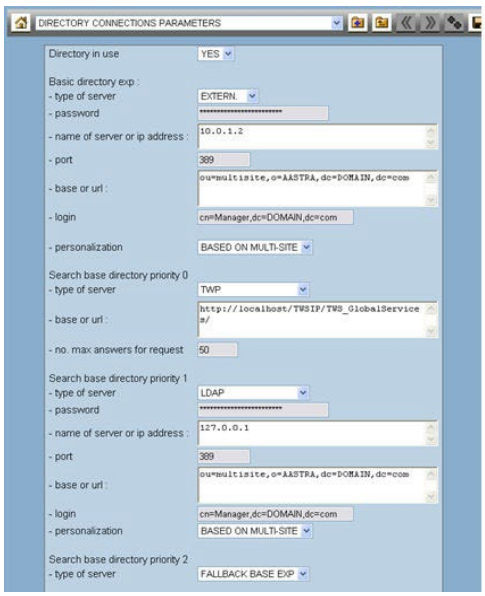
Directory licence ------> No directory licence

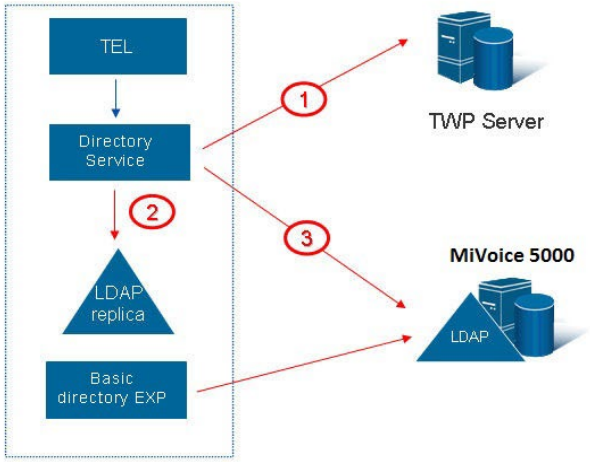
The configuration to be made must fulfil the following needs:

- White pages: full directory management (display and modification)
- Priority for directory service location:

1. TWP
2. MiVoice 5000 Manager (except for an existing internal LDAP database)
3. MiVoice 5000 Server

A.4.4.1 Configuring site 1 (MiVoice 5000 Server)

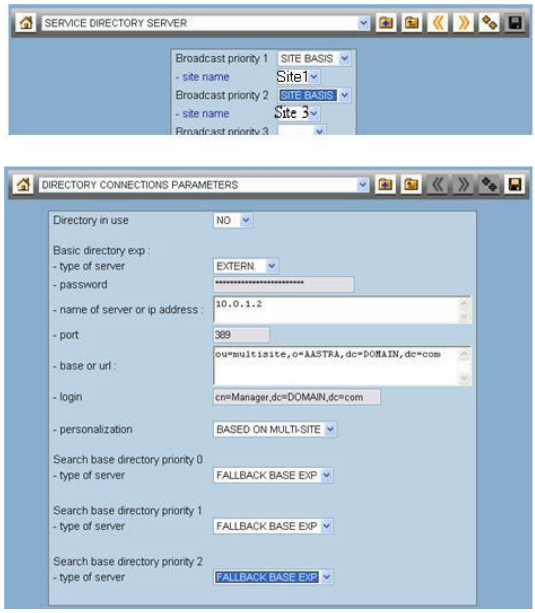


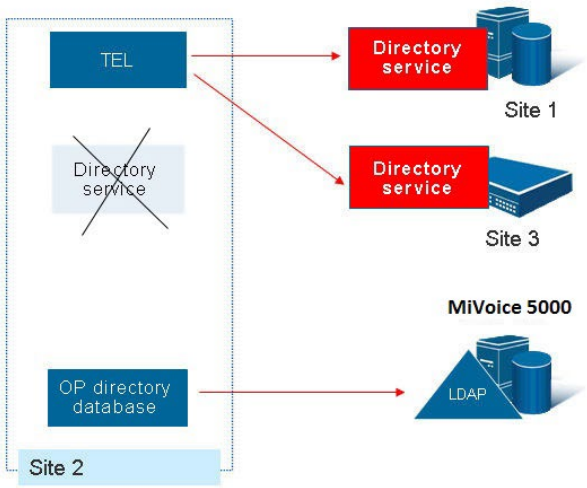


On site 1:

- The operator directory database is the external LDAP database located on MiVoice 5000 Manager server.
- The directory service is operational and uses:
  - In priority 0, the TWP server directory database
  - In priority 1, the internal LDAP database of the MiVoice 5000 server (database replica)
  - In priority 2, the external LDAP database located on MiVoice 5000 Manager
- The directory server can be used by sites 2 and 3 because this is allowed by the software licence.

A.4.4.2 Configuring site 2 (Mitel 5000 Gateways)

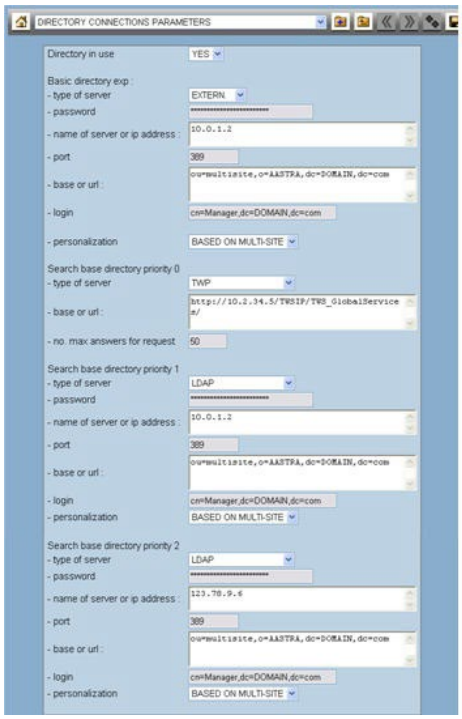


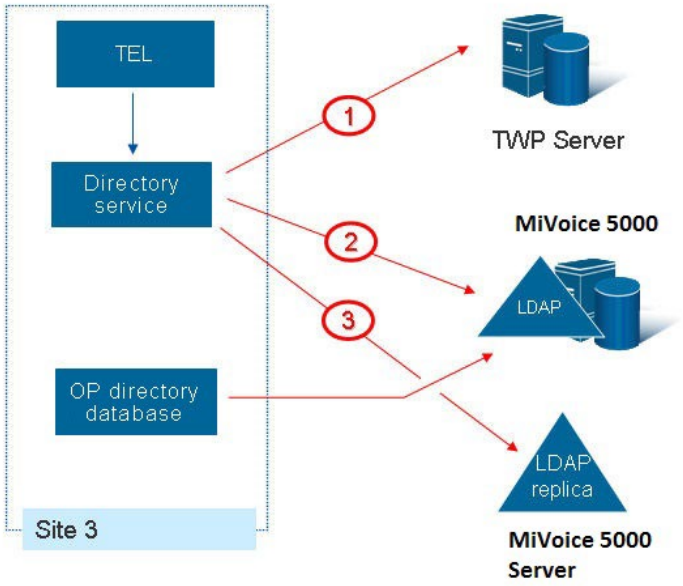


On site 2:

- The operator directory database is the external LDAP database located on MiVoice 5000 Manager server.
- The directory service used is that of site 1 in priority 1 and that of site 3 in priority 2.

A.4.4.3 Configuring site 3 (Mitel 5000 Gateways)



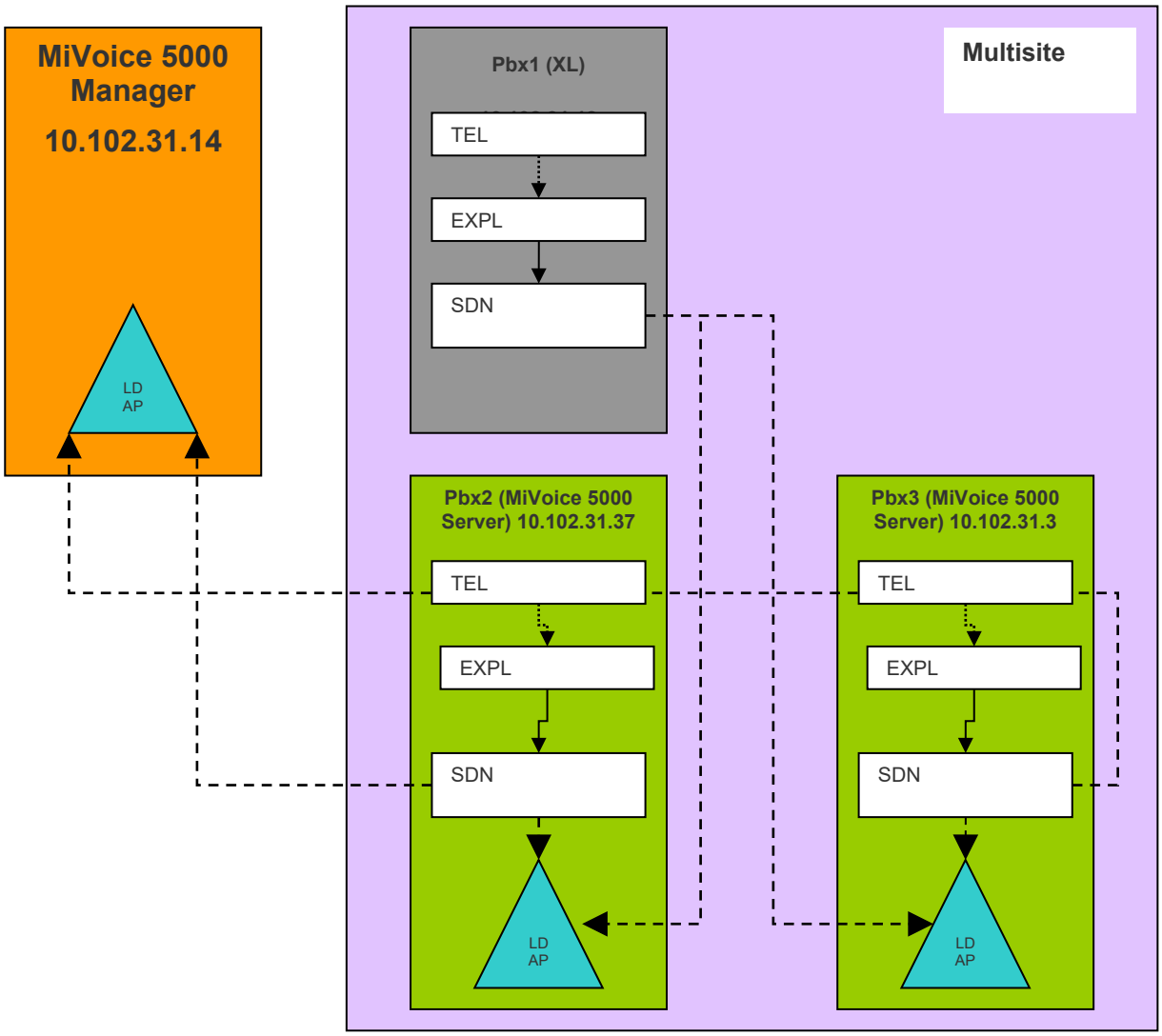


On site 3:

- The operator directory database is the external LDAP database located on MiVoice 5000 Manager server.
- The directory service is operational and uses:
  - In priority 0, the TWP server directory database
  - In priority 1, the external LDAP database located on MiVoice 5000 Manager
  - In priority 2, the external LDAP database located on MiVoice 5000 server (database replica)
- The directory server can be used by sites 1 and 2 because this is allowed by the software licence.

A.5 EXAMPLES OF NUMBER SERVICE CONFIGURATION WITH MIVOICE 5000 MANAGER

A.5.1 MIVOICE 5000 MANAGER EXEMPLE 1



In this configuration example, each iPBX uses its local SDN server.

Configuring iPBXs 2 and 3 (MiVoice 5000 Server)

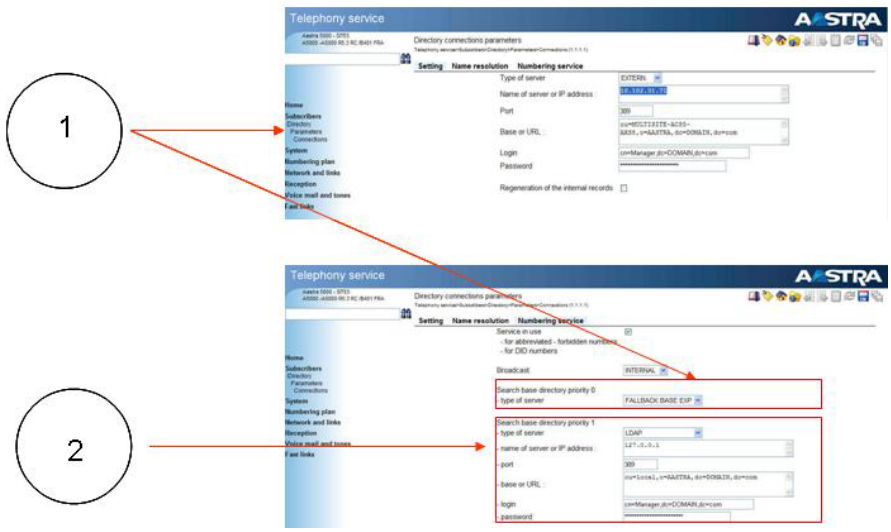
Phase 1:

- The main LDAP database installed on MiVoice 5000 Manager is declared and set to **priority 0** on iPBX2 and on iPBX3 for the SDN service.

Phase 2:

- The LDAP database is replicated. This replication is set to second priority (**PRIO1**) for each MiVoice 5000 Server.
- The replicas of iPBXs 2 and 3 are set to **priority 0** and **priority 1** on XL for the SDN service.

Configuration on iPBXs 2 and 3 (A5000 Server)



Configuring iPBX 1 (XL)

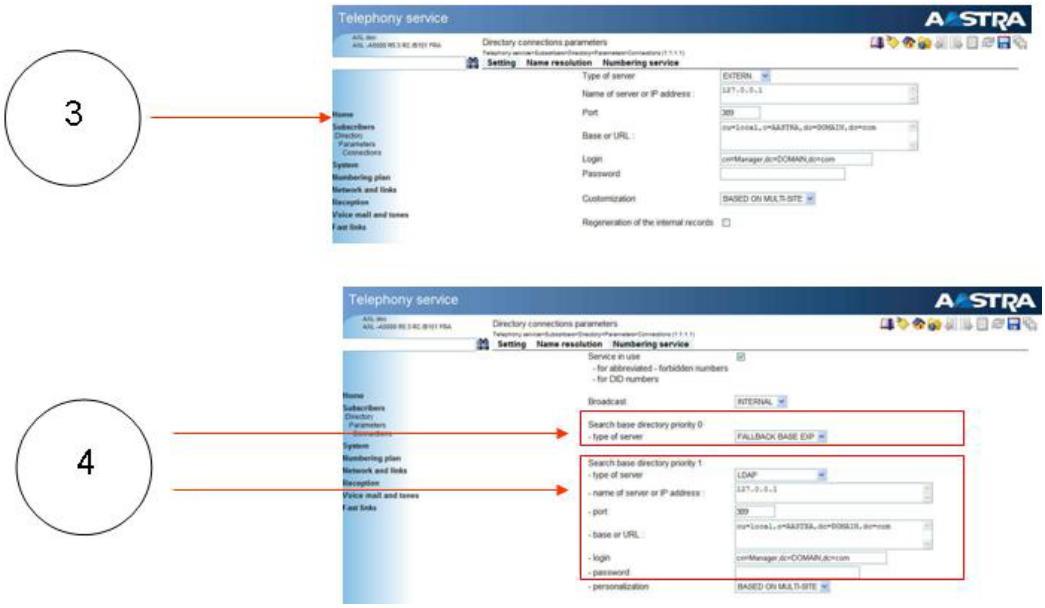
Phase 3:

- The replica of the LDAP database of iPBX2 is configured as database for management.

Phase 4:

- The replica of the LDAP database of iPBX2 is set to **Prio0** for the SDN service.
- The LDAP database replica of iPBX3 is set to **Prio1** for the SDN service.

Configuration on iPBXs 1 and 3 (AXL)



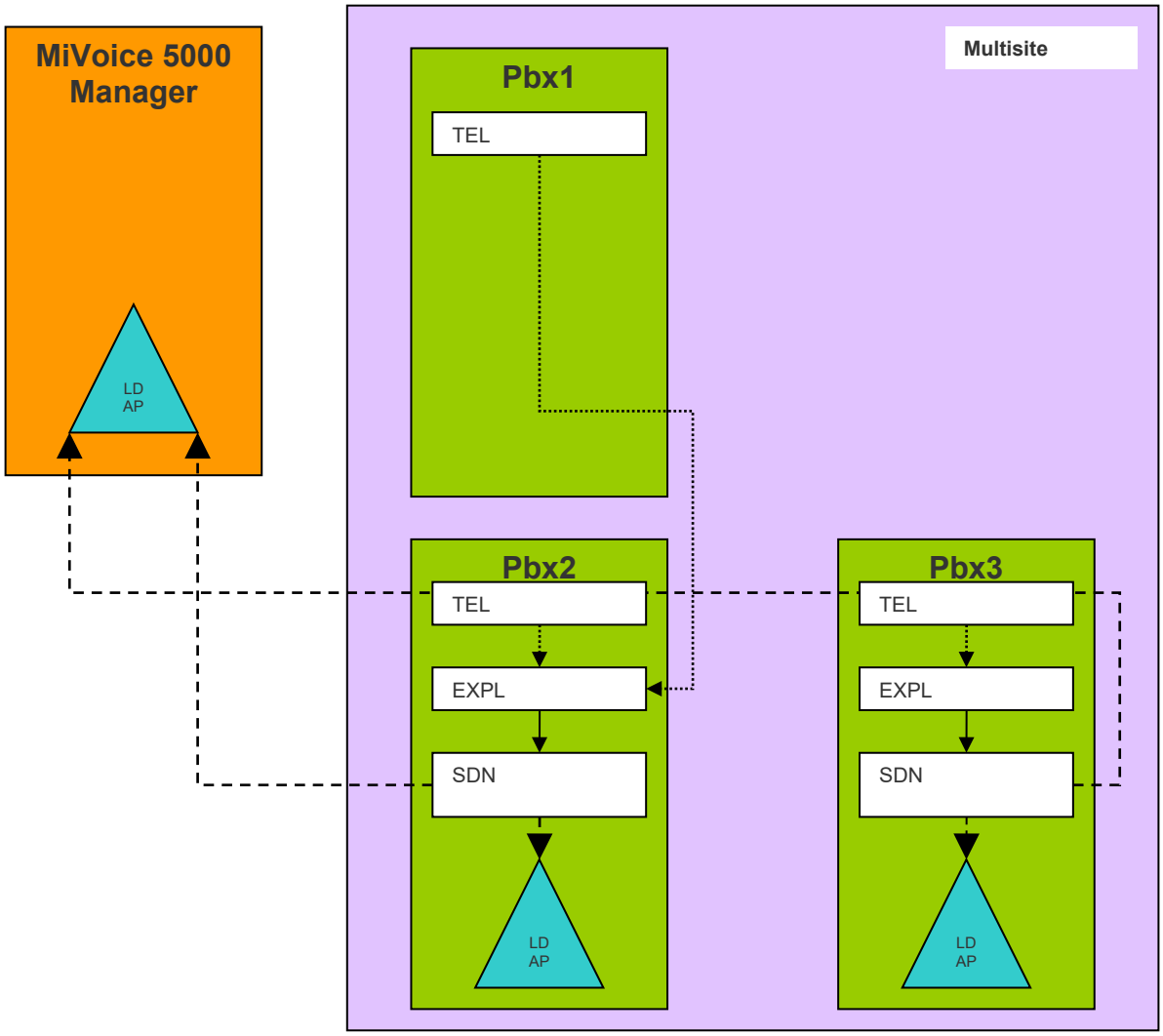
Phase 5:

The services are defined as **Internal** in each iPBX:

- The internal management database is used for speed-dial and barred number services.

- The management uses the internal SDN service.

A.5.2 EXEMPLE 2



Configuring iPBXs 2 and 3 (MiVoice 5000 Server)

Configuration identical to example 1 for both MiVoice 5000 Servers.

Phase 1:

- The main LDAP database installed on MiVoice 5000 Manager is declared and set to **priority 0** on iPBX2 and on iPBX3 for the SDN service.

Phase 2:

- The LDAP database is replicated. This replication is set to second priority (**PRIO1**) for each MiVoice 5000 Server.
- The replicas of iPBXs 2 and 3 are set to **priority 0** and priority 1 on XL for the SDN service.

Note : This configuration is very useful in case of interoperation. This enables an iPBX with a release earlier than R5.3 to benefit from the new management of general abbreviated number services and barred numbers.

Configuring iPBX 1 (XL)

Telephony uses the remote database of iPBX2 for general abbreviated number services and barred numbers.