OpenScape Solution Set V11

Number Modification Implementation with WebCDC

Administration Guide
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Mitel

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1 Introduction

1.1 Scope

This OpenScape Solution Concept paper provides an in-depth treatment of the number modification reference architecture with concise explanations of its various underlying concepts and assumptions. This document is intended as a supplemental aid to personnel that are responsible to configure number modification via the WebCDC tool. It is also helpful to anyone that requires or desires a better understanding of the OpenScape Voice number modification reference architecture model.

Background:

Just as the dial plan tables, the number modification tables of the OpenScape Voice show a very high flexibility. With flexibility comes complexity and though very complex scenarios can be built, the underlying mechanism of number modification is not hard and can easily be derived from the thin sheets of the standard deployment.

Starting with V5, V6, V7 and continued in V8, the WebCDC tool provides a first step in the direction of a standardized way of implementing/ configuring number modification for the majority of implementations.

1.2 WebCDC and Number Modification

The WebCDC has two kinds of sheets:

- Basic sheets
  The Basic sheets depend on the chosen deployment model. When generating the configuration for a deployment model the advanced sheets are filled in the background according to the concept used for the deployment model and afterwards the configuration files are generated.
- Advanced sheets
  The Advanced sheets are used to generate the OpenScape Voice or other aspects of the configuration. Basically these sheets do not contain a deployment model based concept and just generate a configuration file.

This document describes the number modification table entries generated when filling out the WebCDC Basic sheets for the standard deployment model.

INFO: The Advanced sheets are not as extensively tested as the Basic sheets, and only the most expert WebCDC users should access the Advanced sheets.

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2 Number Modification in the Standard Deployment Model

The following assumptions are made and are actually generally valid for any deployment:

- CSTA applications require normalized numbers
- Presentation numbers sent to SIP gateways are always within the DID number range associated with the gateway and are sent in National prefixed format. If the prresenting party is not part of the DID range (break-out or backup), then the gateway's default Home DN is sent (also in National prefixed format).
- Presentation numbers sent for subscribers to SIP-Q gateways are either International or L0 numbers.
- Presentation numbers sent for SIP gateways to SIP-Q gateways are sent in International format. For SIP gateways, normalization rules are always in place to normalize a received presentation number.

The following chapters discuss the build up of the number modification table entries from the information entered in the standard deployment data sheets.

2.1 Standard Deployment Sheets

2.1.1 Site Data Sheet

A simple standard deployment is shown in Figure 1.

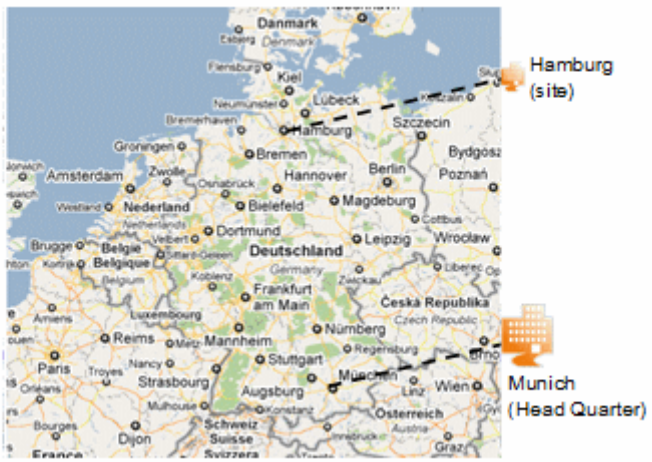


Figure 1: Example Customer Deployment

INFO: More complicated scenarios are supported as well of course.

In a typical customer deployment, a company is identified via a head quarter and has one or more satellite locations.The basic WebCDC tool for a standard deployment supports this concept in the Site data sheet.

The items listed below are relevant for the automatic generation of the number modification tables entries for the standard deployment.

- **Site Name:** is used to mark all site-specific resources such as Numbering Plan (NP_<Site Name>).
- **Access code for outgoing line:** also called the Public Network Access Code (PNAC); is used to create a sites number prefix table entries.
- **Site prefix:** the standard deployment solution automatically supports the concept of dialing site prefixes to reach a particular site from other sites.These site prefixes are L0 private codes and their definition needs to be entered in the number definition tables.

Other important fields in the Site data sheet that influence the auto-generated number modification tables are:

- **Extension ranges:** is used to calculate the length of the extensions used in a site.The minimum and maximum length for private numbers needs to be entered in the site prefix number definition table entries.
- **Use Local Toll Tables:** This is a North American Numbering Plan setting to activate the use of local toll tables for the site.
  - If set to No (default setting if left empty), only national or international numbers are sent to the site's subscribers.
  - If set to Yes, local toll tables are generated and used to provide number optimization for incoming PSTN calls towards the site's subscribers.

  This parameter has no effect for sites that are not part of the North American Numbering Plan (i.e. do not use country code 1)
- **Do Carrier Codes need to be Dialed?:** This setting applies only for sites of countries where carrier code dialing is supported (e.g. Brazil).To activate this field, the Is Carrier Dialing Supported field in the General data sheet must be set to Yes.
  - When setting this field to Yes, the user needs to dial a carrier code to dial out to the PSTN.This carrier code is not remembered and will not be used on the outbound route.
  - When setting this field to No, the user does not need to dial a carrier code to dial out to the PSTN.

INFO: **Warning:** no carrier code is entered when presenting numbers received from the PSTN to the local

subscribers.This means that the presented numbers will **not** be dialable.

2.1.2 Endpoints Data Sheet

From a number modification perspective, the Endpoint data sheet allows entering the information regarding the PSTN gateways in use by the customer.

Especially important are the following fields:

- **Endpoint Name (Gateway or Proxy Name):** name given to the endpoint.This name will be used as endpoint name in the Number Normalization and Number Modification table entries.
- **Site Name:** name of the site in which the endpoint is located.Per definition, any gateway created this way is a local gateway for the site.The numbering plan created for the site NP_<Site Name> will be used extensively in all of the number modification table entries (except the Local Toll Tables).
- Endpoint Signaling Type: the endpoint is considered to be a PBX when this is set to SIP-Q.Specific Number Modification table entries are created for SIP-Q endpoints.
- **Country Code:** country code of the DID numbers served by this gateway. This is a mandatory field.It will be used for the Public Number Definition table entry.
- **Area Code:** area code of the DID numbers served by this gateway. This is an optional field. However, one of Area Code or Subscriber Code/Local Exchange Code below must be configured. It will be used for the Public Number Definition table entry.
- **Subscriber Code/Local Exchange Code:** local office code of the DID numbers served by this gateway. This is an optional field. However, one of Subscriber Code/Local Exchange Code or Area Code above must be configured. It will be used for the Public Number Definition table entry.
- **Subscriber DID Extension Range:** Extensions and/or Extensions ranges that together with country, area and local exchange code form the DID numbers ‘purchased’ from the carrier for this gateway.It will be used to calculate the minimum and maximum length for the Public Number Definition table entries.
- **Default Home DN:** this field must be filled out for SIP Gateways and must contain a public number assigned to the gateway (the WebCDC tool requires this to be a configured subscriber). It will be used by the number modification library in case a non-local subscriber attempts to make a call out via a SIP gateway (break-out/backup).

2.1.3 Subscribers Data Sheet

The Subscriber data sheet assigns numbers to subscribers.

Especially important are the following fields:

- **Subscriber Name:** name given to the subscriber.This name will be used as name for the SIP Subscriber created on OpenScape Voice.
- **Site Name:** site to which the subscriber belongs.The site name will limit the numbers that can be entered in the Direct Inward Dialing Number field.
- **Direct Inward Dialing Number:** a public number assigned to the subscriber and used as Subscriber Directory Number.
  - If left empty and the Extension is in the range of the Endpoint data sheet, than the subscriber receives a public number from the Endpoint sheet.The subscriber has a public Home DN.
  - If filled out, the number is uniquely bound to the subscriber and can therefore not be reused for other subscribers.The subscriber has a public Home DN.
  - Otherwise, the subscriber receives a private number based on Site Prefix and Extension. The subscriber has a private Home DN.
- **Extension:** Only private extensions from the Site data sheet Extensions range or Subscriber DID Extensions from the Endpoints data sheet for the given ‘Site Name’ should be entered here.Although it is possible to enter an extension that has been listed neither in Endpoints data sheet nor in Site data sheet.If that’s the case, the extension is automatically considered a private extension.The extension field must be filled out (mandatory) and the number is uniquely bound to the subscriber within the site mentioned under ‘Site Name’ and cannot be reused for other subscribers within that site. This number will become the Display Extension in the OSV subscriber object.No attempts are made at making this number dial-able if a Direct Inward Dialing Number is provided.In the latter case only the extension defined for the Direct Inward Dialing Number is dial-able.
- **External Caller ID:** For subscribers with private numbers (i.e. without Direct Inward Dialing Number and with private Extension), the External Caller ID is used by the number modification library to add location information to the private subscriber number.This location information could also be entered by attaching a local toll table to the private number definition, but that is only done for NANP sites.

2.2 OSV Objects

The following dial plan related OSV objects are created directly from the information obtained in the standard deployment data sheets:

- Office Codes

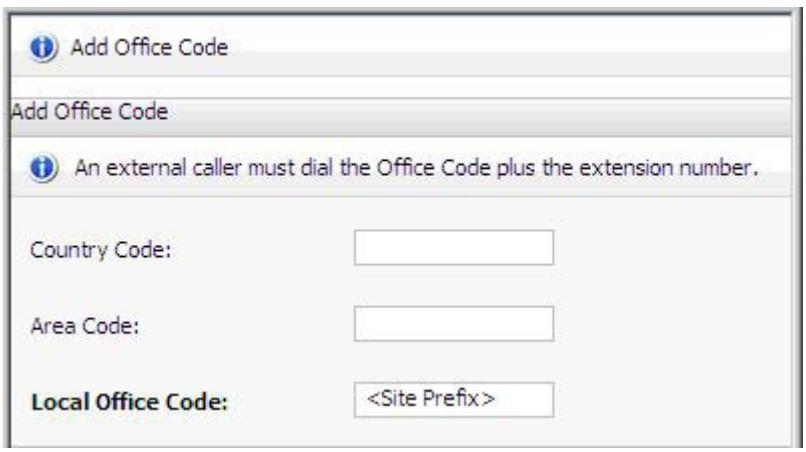
- Business Group
- Numbering Plans
- Endpoints

> ***INFO:*** The presentation of the OSV objects in the following sections are shown from the perspective of the OSV Assistant GUI (i.e. they are not WebCDC GUI images).

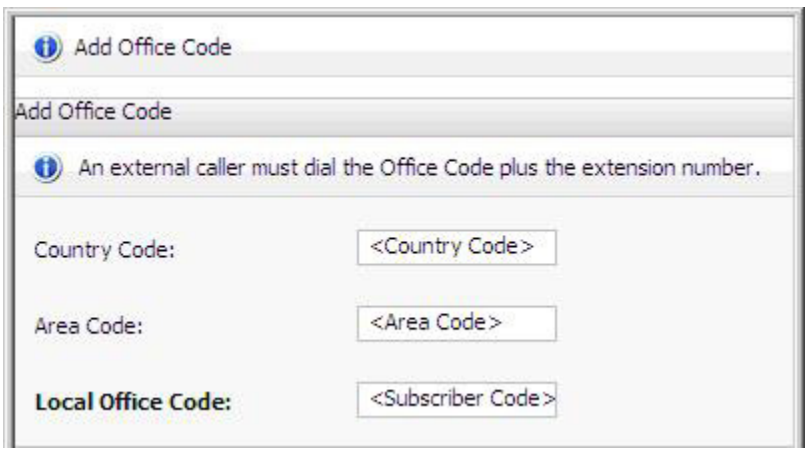
2.2.1 Office Codes

Private and Public Office codes are created.

The private office codes are based on the ‘Site Prefix’ information entered in the Site data sheet.Each Site Prefix generates the following office code:



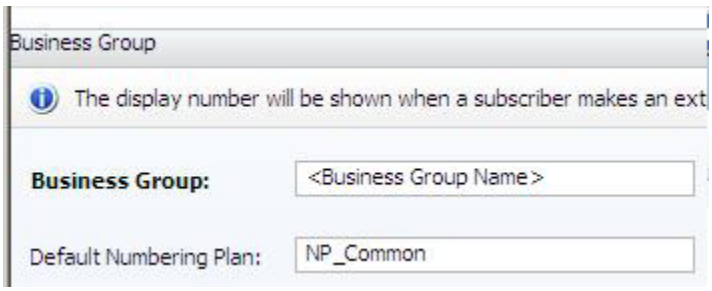
The public office codes are based on the ‘Country Code’, ‘Area Code’ and ‘Subscriber Code/Local Exchange Code’ information collected in the Endpoints data sheet.Each row leads to the following office code:



These office codes are created for SIP and SIP-Q endpoints.

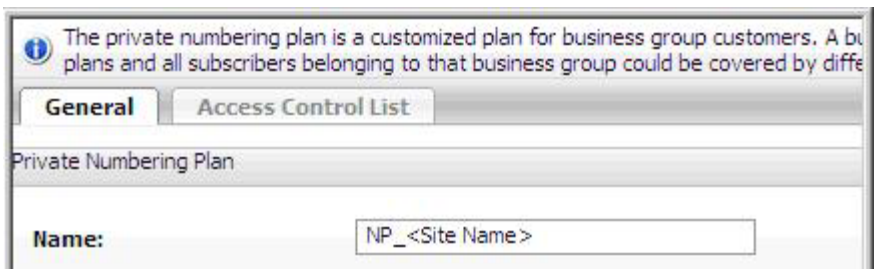
2.2.2 Business Group

A single business group is created with the name entered in the ‘Business Group Name’ field in the General data sheet.This business group gets a numbering plan with name NP_Common that is used as the business group’s default and common numbering plan:



2.2.3 Numbering Plans

For each site a local private numbering plan is created using the ‘Site Name’ information entered in the Site data sheet.Each site receives the following private numbering plan under the above created business group:

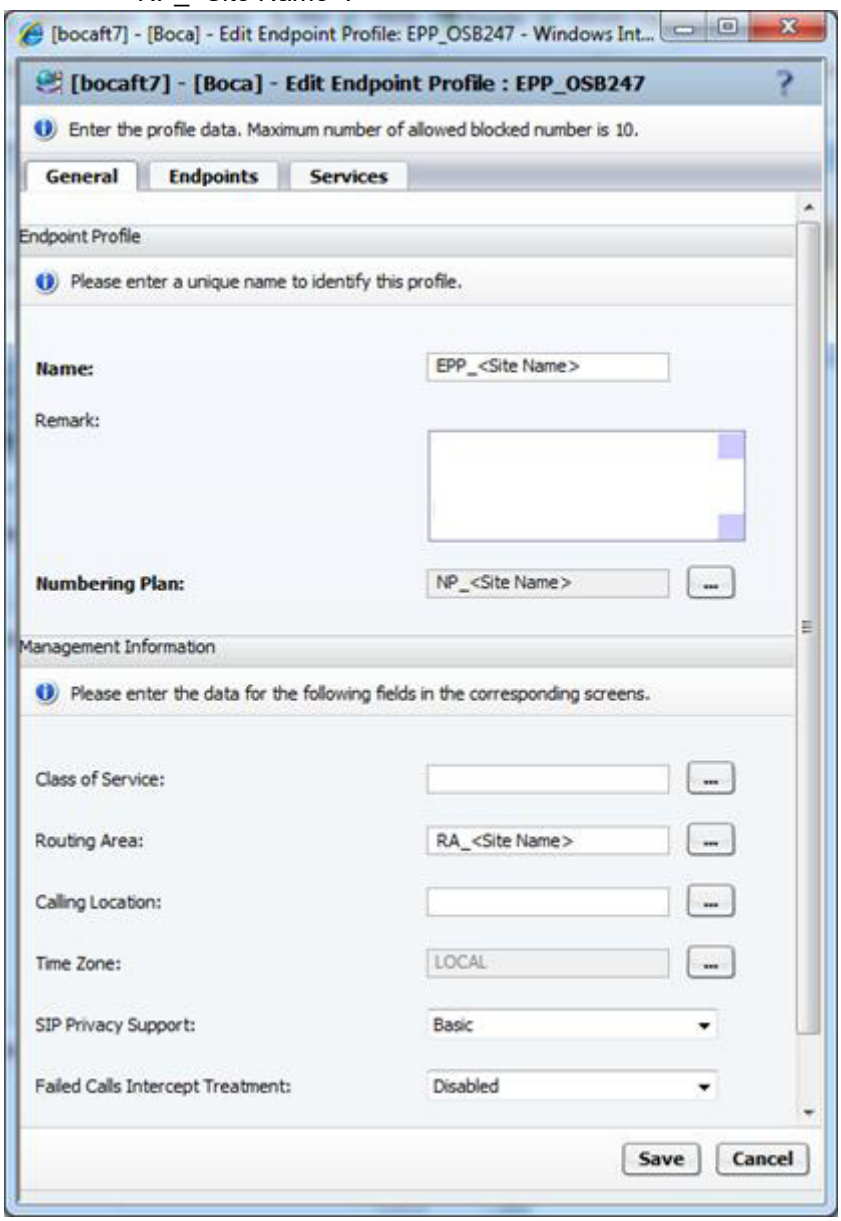


The private numbering plan will be used by all subscribers and endpoints assigned to the site.

2.2.4 Endpoints

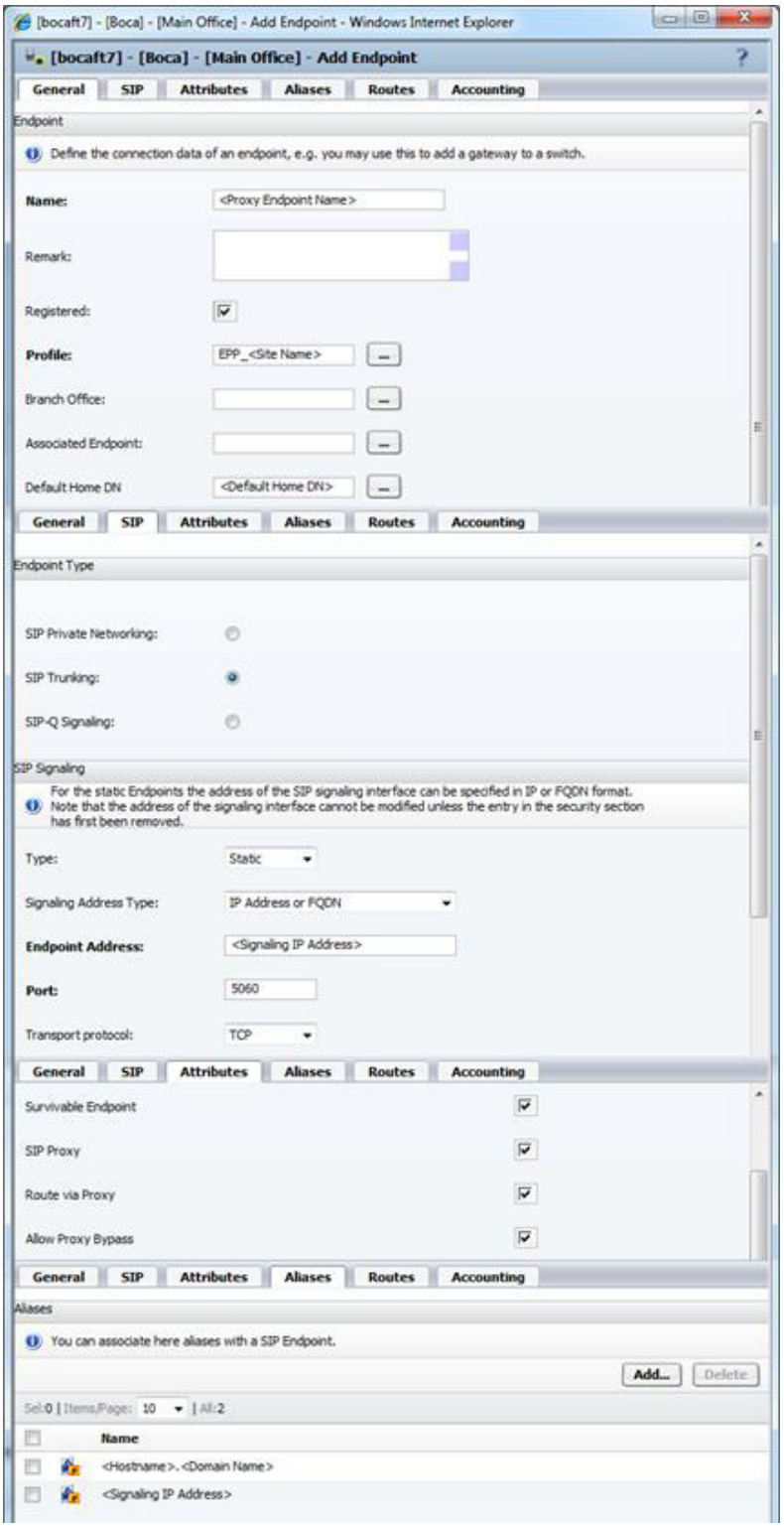
Endpoint profiles are created using information from the Endpoints data sheet and the Site data sheet:

All endpoint profiles of the same site receive the site's numbering plan NP_<Site Name>:

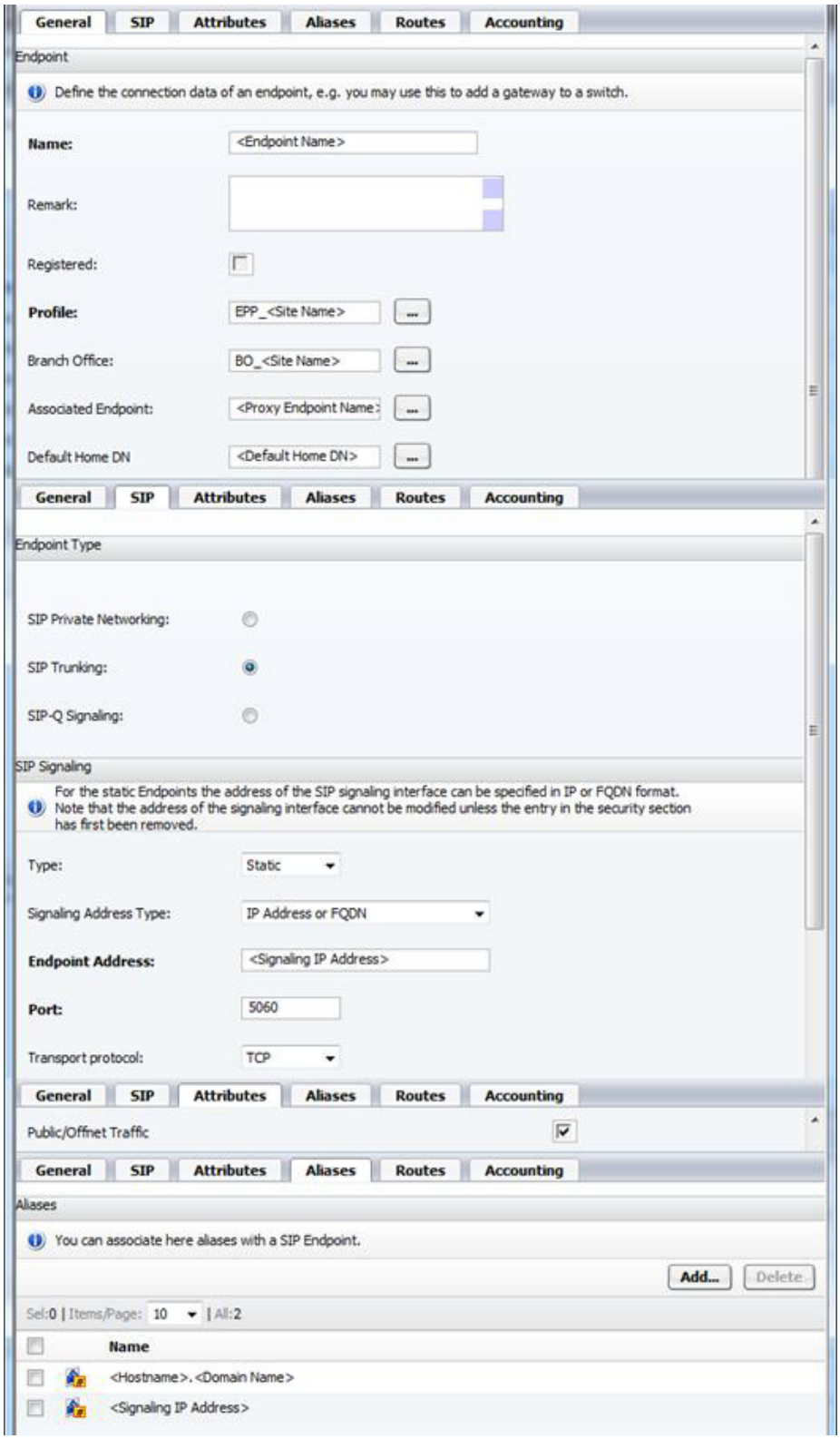


Endpoints are then created using these endpoint profiles and the information from the Endpoints data sheet and the Site data sheet:

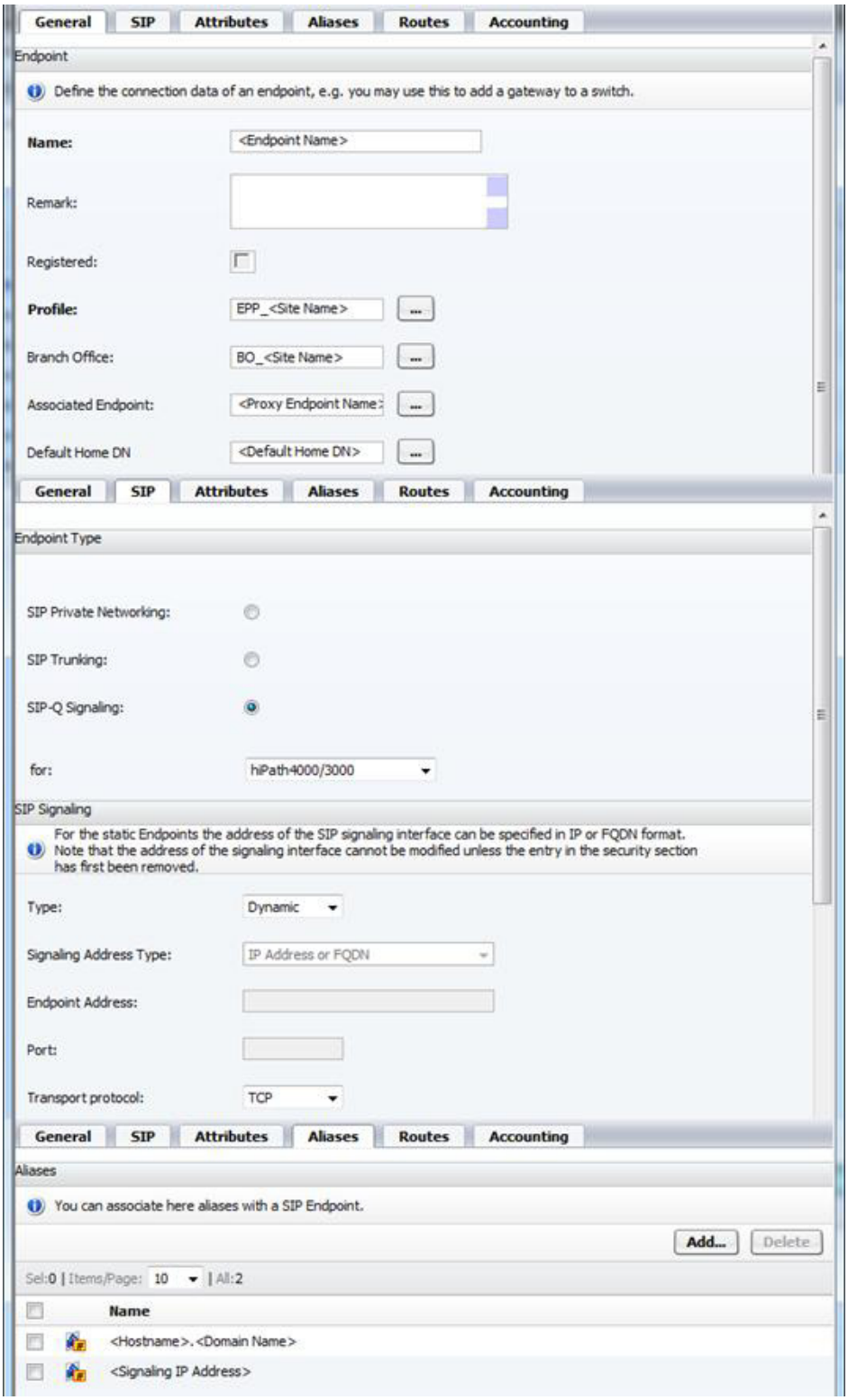
- For SIP proxies:



- For SIP Gateways:


General
SIP
Attributes
Aliases
Routes
Accounting
Endpoint
Define the connection data of an endpoint, e.g. you may use this to add a gateway to a switch.
Name:
<Endpoint Name>
Remark:
Registered:
Profile:
EPP_<Site Name>
Branch Office:
BO_<Site Name>
Associated Endpoint:
<Proxy Endpoint Name>
Default Home DN
<Default Home DN>
Endpoint Type
SIP Private Networking:
SIP Trunking:
SIP-Q Signaling:
SIP Signaling
For the static Endpoints the address of the SIP signaling interface can be specified in IP or FQDN format.
Note that the address of the signaling interface cannot be modified unless the entry in the security section has first been removed.
Type:
Static
Signaling Address Type:
IP Address or FQDN
Endpoint Address:
<Signaling IP Address>
Port:
5060
Transport protocol:
TCP
Public/Offnet Traffic
Aliases
You can associate here aliases with a SIP Endpoint.
Add...
Delete
Sel:0 | Items/Page: 10 | All:2
Name
<Hostname>.<Domain Name>
<Signaling IP Address>

- For SIP-Q Gateways:



The following special endpoints are created as well:

- **EP_MediaSrv1** with endpoint profile EPP_MediaSrv and attributes “Send International Numbers in GNF” and “Allow Sending Insecure Referred-By Header” and a single alias with the IP address of the Media Server.
- **EP_Xpressions** with endpoint profile EPP_Xpressions and attribute “Voice Mail” and a single alias with the IP address of the Voice Mail Server.
- **PX_Dummy_HQ** with endpoint profile EPP_<Site Name of Headquarters> and attribute “Survivable” without any aliases.
- **Fallback** with endpoint profile EPP_Fallback without attributes or aliases.

2.3 Automatic Number Modification Tables Creation

It is important to know which number modification rules are created as a consequence of the settings in the WebCDC tool’s basic configuration sheets for the standard deployment model.

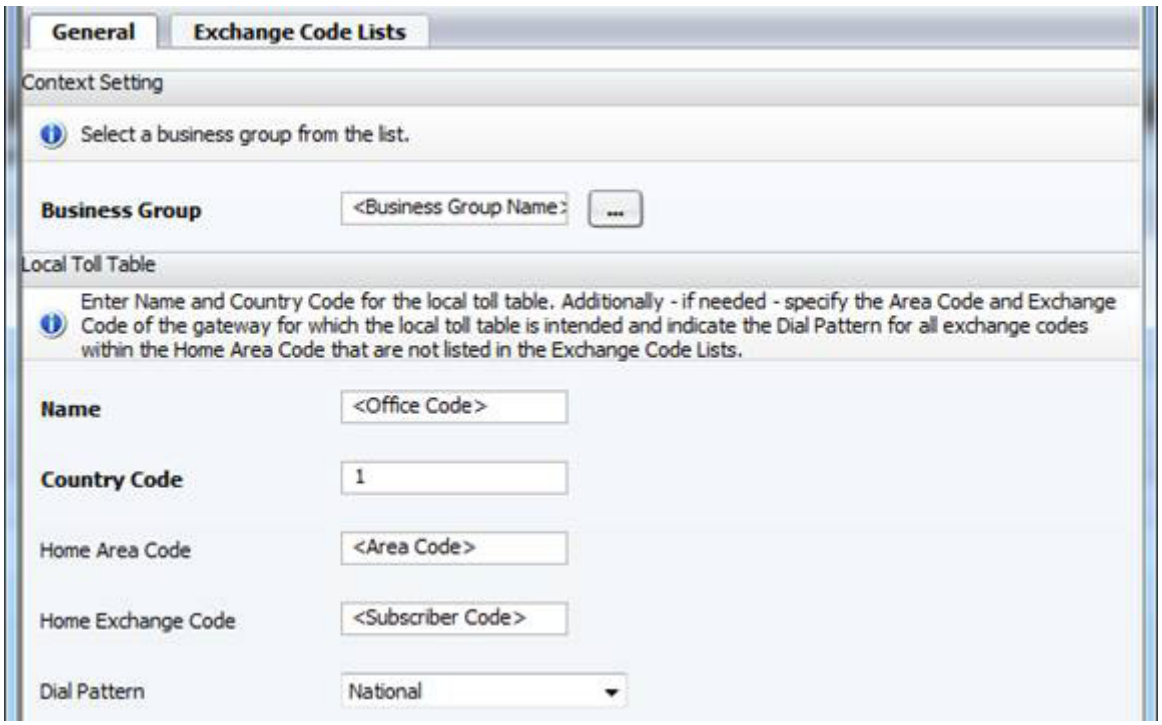
In what follows the entries created within each of the number modification tables are described and explained.

2.3.1 Local Toll Table

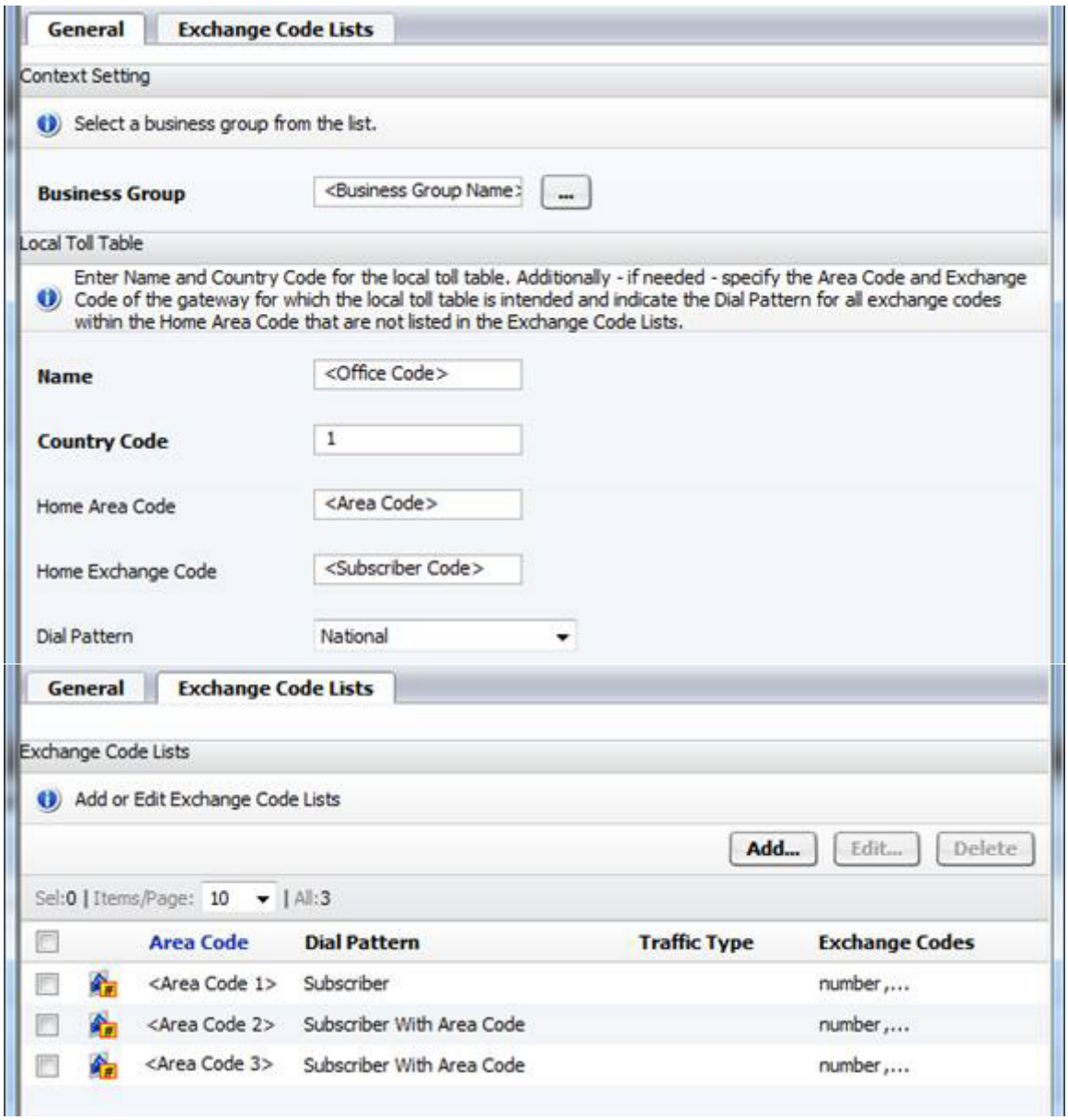
Though technically not necessary, the WebCDC tool generates local toll tables for each endpoint in the Endpoints data sheet. Normally these local toll tables are only used in the NANP market; however, nothing prevents the administrator from creating these for the non-NANP market as well.Local toll tables serve a dual purpose:

- They indicate how calls are to be dialed out for a gateway.
- They indicate how calls are to be presented to the subscribers of a site.

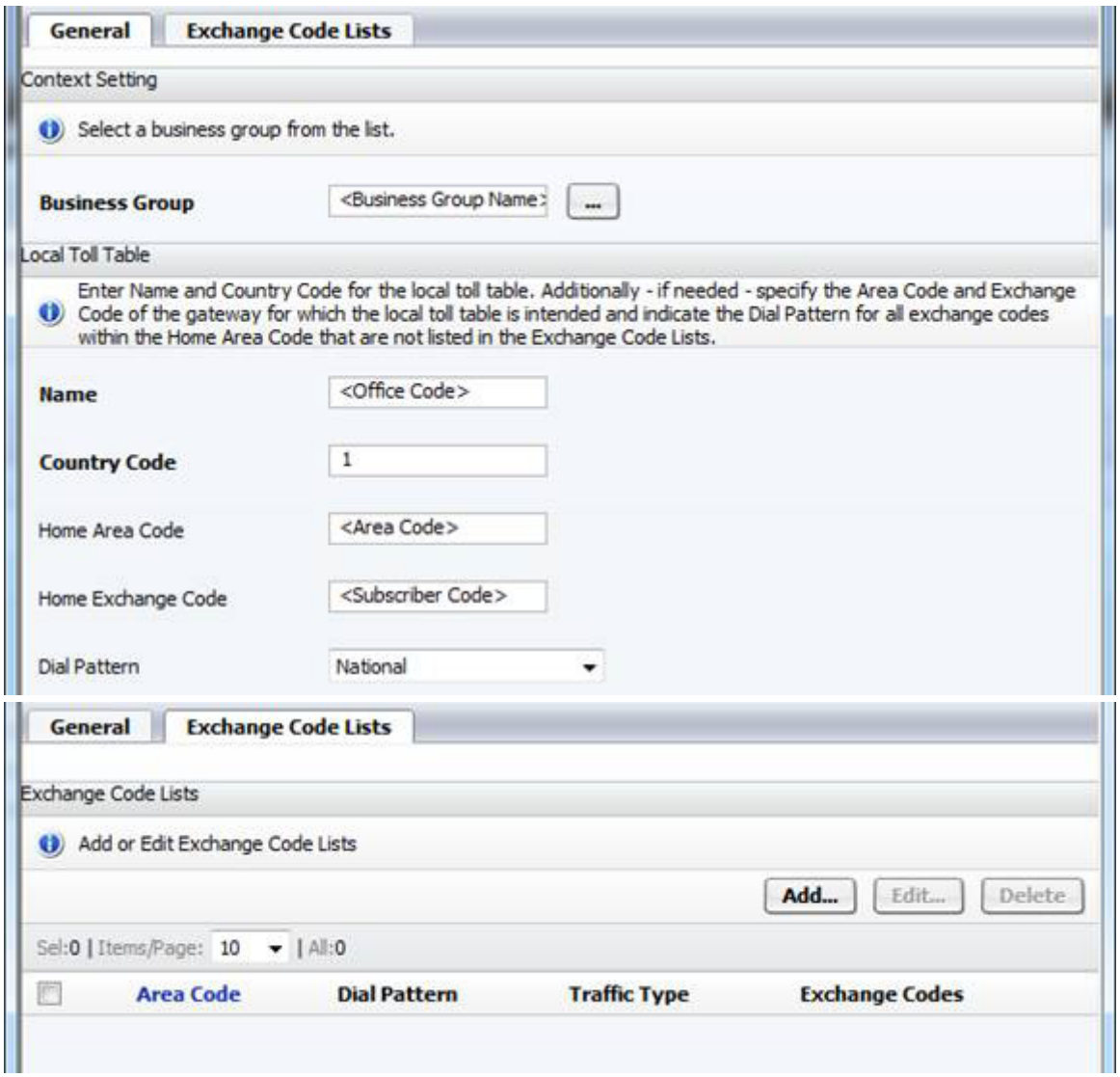
For the non-NANP market, the local toll tables are created by the WebCDC tool using information stored in the hidden Country Data advanced data sheet. e.g. for a country that supports local number dialing:



For the NANP market, the local toll table is downloaded from public web-sites if the sites Use Local Toll Tables field is set to yes. Note that the dial pattern on the General tab is determined by one of the web-sites (NANPA.org) and may be one of National, Subscriber with Area Code or Subscriber.



If an NANP site's Use Local Toll Table field is set to no, a bare minimum local toll table is still created which looks the same as the local toll table created for a country that does not allow subscriber number dialing. Note that the Dial Pattern on the General tab is always National and that the exchange codes list is empty for this entry.



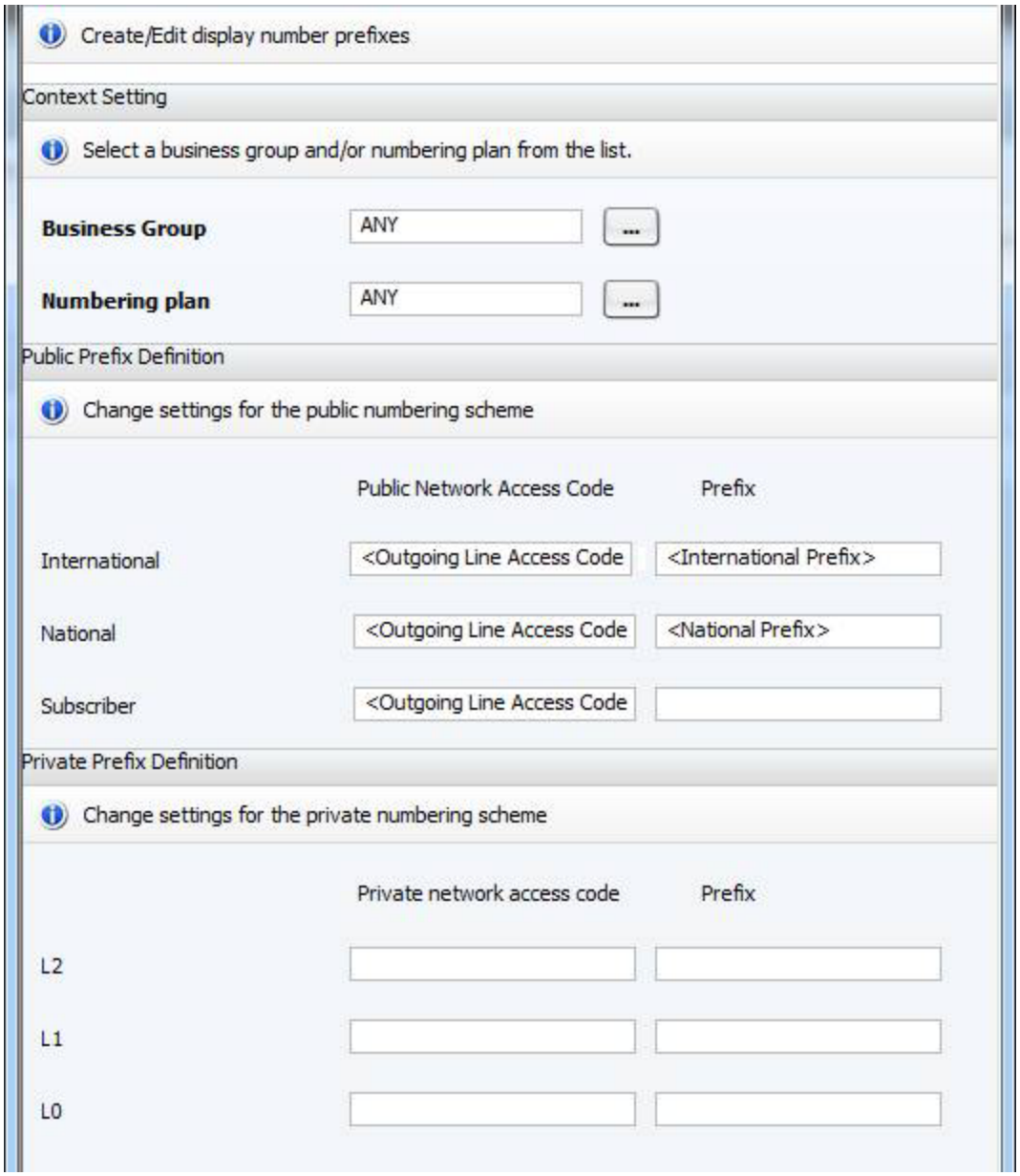
2.3.2 Number Prefix Table

The number prefix table is populated based on 2 entries for each site:

- Outgoing line access code of the Site data sheet
- Country code of one of the endpoints in the Endpoints data sheet

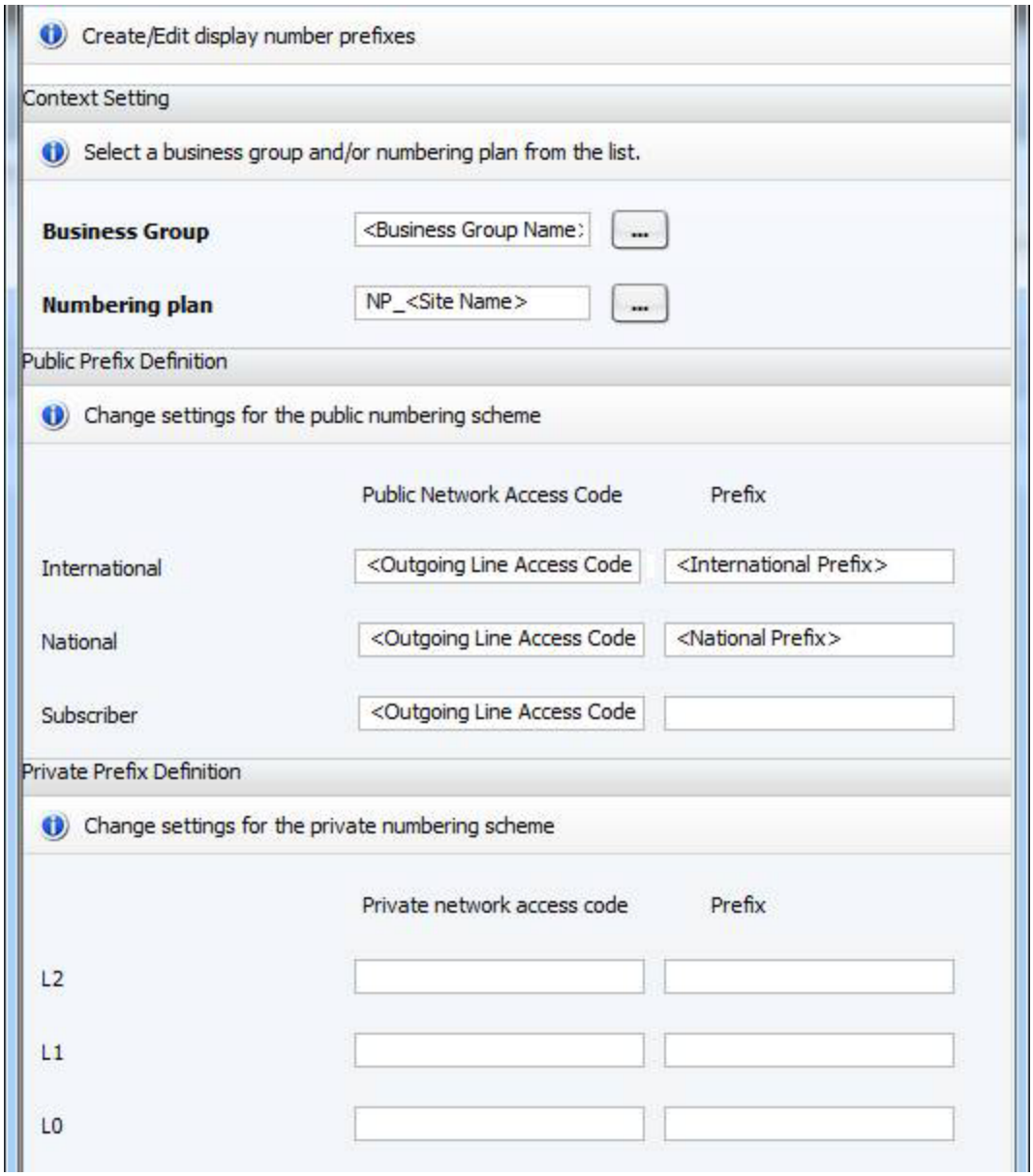
The hidden Country Data advanced data sheet contains information regarding the international and national prefix in use for the site's country.

The first entry created is for the headquarters site:



Above number prefix table entry will be used by any site which uses the same Outgoing Line Access Code and International and National Prefixes.

For the remaining sites which are not covered by above rule, specific entries are created for each site as follows:



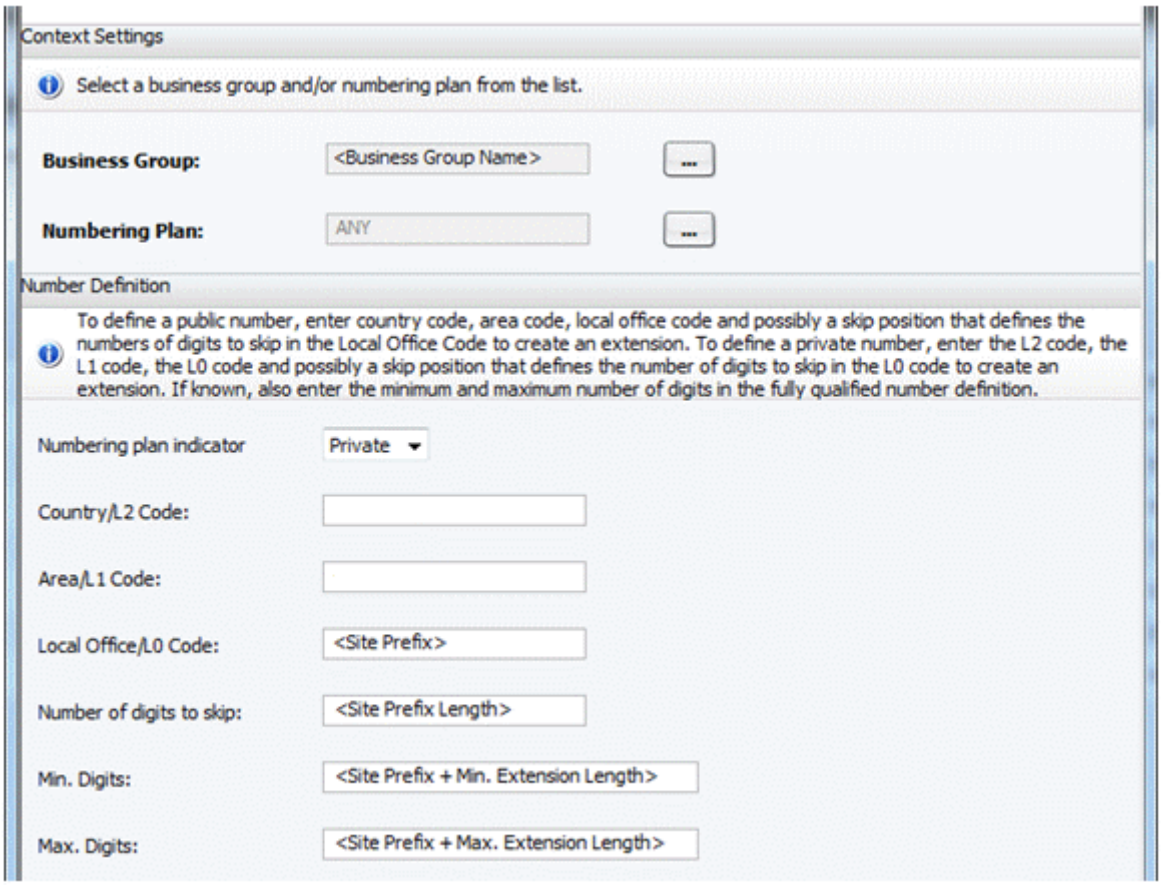
2.3.3 Number Definition Table

The number definition table is populated based on the following entries for each site:

- Extensions range of the Site data sheet.This leads to a definition of the length used for extensions within the site.
- Site Prefix of the Site data sheet.This will become an L0 private office code.If no site prefix is listed for a site, the default site prefix 123 is used and entered in the number definition table as private office code.
- Country code of one or more endpoints in the Endpoints data sheet

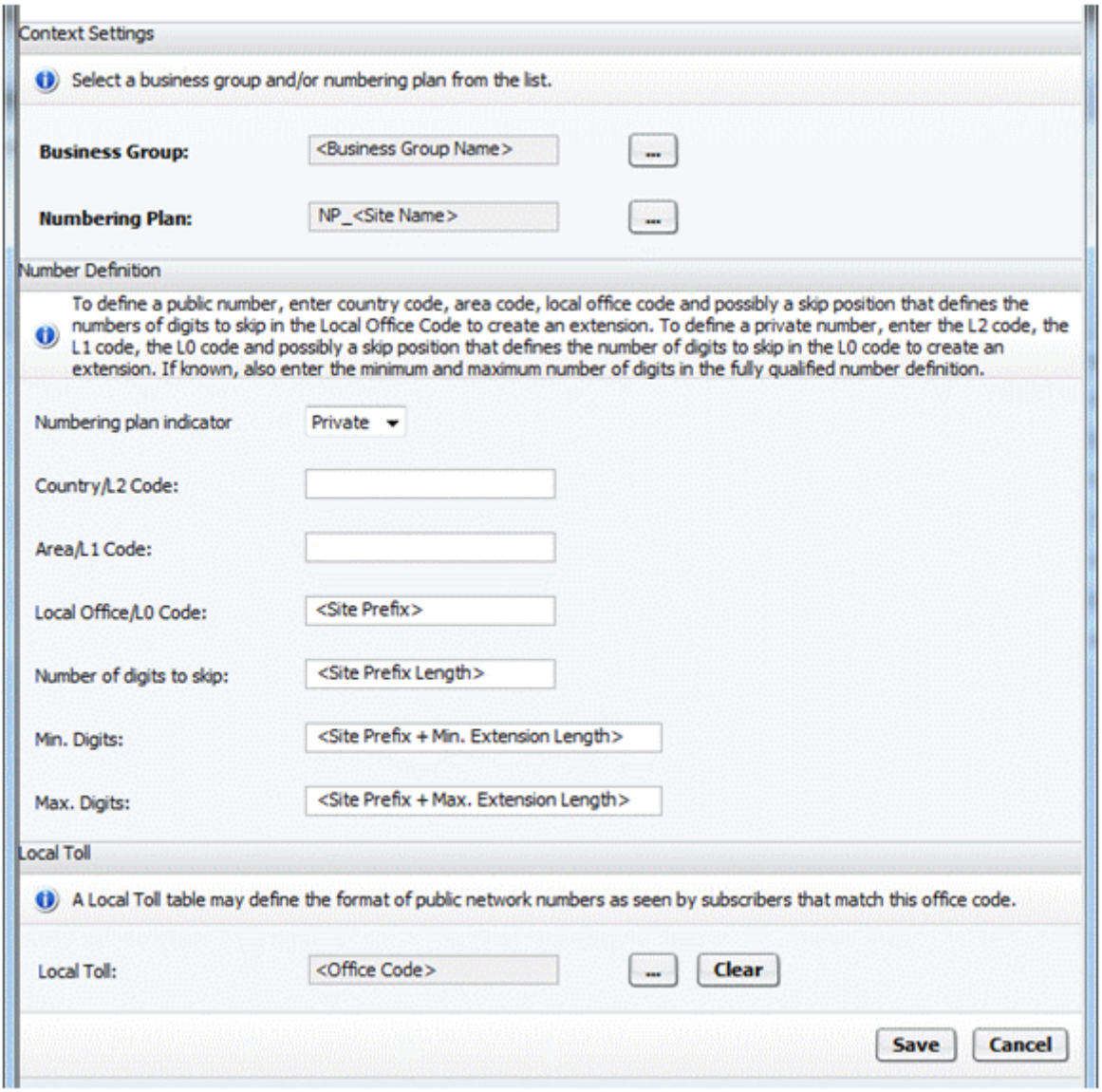
- Area code of one or more endpoints in the Endpoints data sheet
- Subscribercode/Local Exchange Code of one or more endpoints in the Endpoints data sheet
- Subscriber DID Extension range of one or more endpoints in the Endpoints data sheet.This is used to be able to verify the public extension number length vs the extension number length calculated for the first number in the Extensions range of the Site data sheet.Any discrepancies between these lengths affect the number of digits to skip to retain the extensions given a public or private number.

For each distinct site prefix in the Site data sheet, an L0 number definition table entry is entered with the following information:

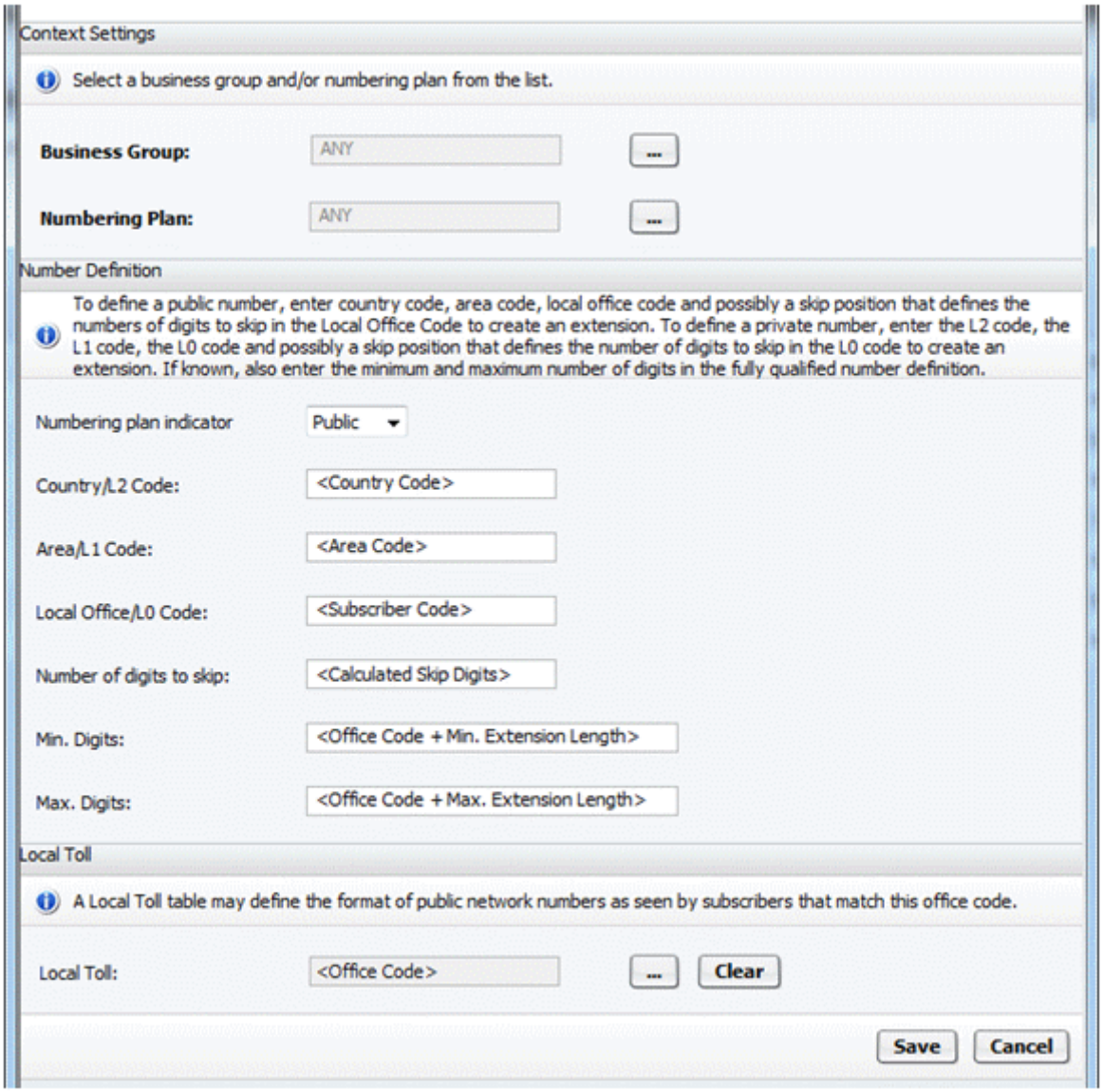


The <Min. Extensions Length> is calculated from either the Extensions range defined in the Site data sheet or – if missing – from the Subscriber DID Extensions range defined in the Endpoint data sheet.

For each site, a site-specific L0 number definition table entry is entered that lists the site's numbering plan and the site's first endpoint's local toll table.



For each endpoint in the Endpoints data sheet a public number definition table entry is entered provided it was not entered already (because definition of multiple endpoints with the same office code/ extensions is allowed).The entry has the following information:



To populate this entry, the WebCDC tool calculates the following information:

- Minimum Extension Length is the length of the shortest number in the Subscriber DID Extension range of the listed endpoint in the Endpoint data sheet.
- Maximum Extension Length is the length of the longest number in the Subscriber DID Extension range of the listed endpoint in the Endpoint data sheet.
- <Office Code Length> is the combined length of the Country Code, Area Code and Subscriber/Local Office Code fields of the listed endpoint in the Endpoint data sheet.
- <Calculated Skip Digits> is a bit more complex to calculate.It uses the Minimum Extension Length calculated for the site's Site Prefix rather than the Minimum Extension Length obtained from the

Endpoints data sheet.The <Calculated Skip Digits> are calculated by taking the length of the combined Subscriber/Local Office Code and the first extension of the Subscriber DID Extension range of the listed endpoint in the Endpoint data sheet and subtracting the length of the corresponding extension calculated for the extensions of the Site data sheet.This way WebCDC tool accounts for any borrowing of digits from the listed office code.

2.3.4 Number Conversion Table

The number conversion table is populated based on the following entries for each site:

- Extensions range of the Site data sheet.This leads to a definition of the length used for extensions within the site.
- Site Prefix of the Site data sheet.This will become an L0 private office code.If no site prefix is listed for a site, the default site prefix 123 is used and entered in the number definition table as private office code.
- Country code of one or more endpoints in the Endpoints data sheet
- Area code of one or more endpoints in the Endpoints data sheet
- Subscribercode/Local Exchange Code of one or more endpoints in the Endpoints data sheet
- Subscriber DID Extension range of one or more endpoints in the Endpoints data sheet.This is used to be able to verify the public extension number length vs the extension number length calculated for the first number in the Extensions range of the Site data sheet.Any discrepancies between these lengths affect the number of digits to skip to retain the extensions given a public or private number.

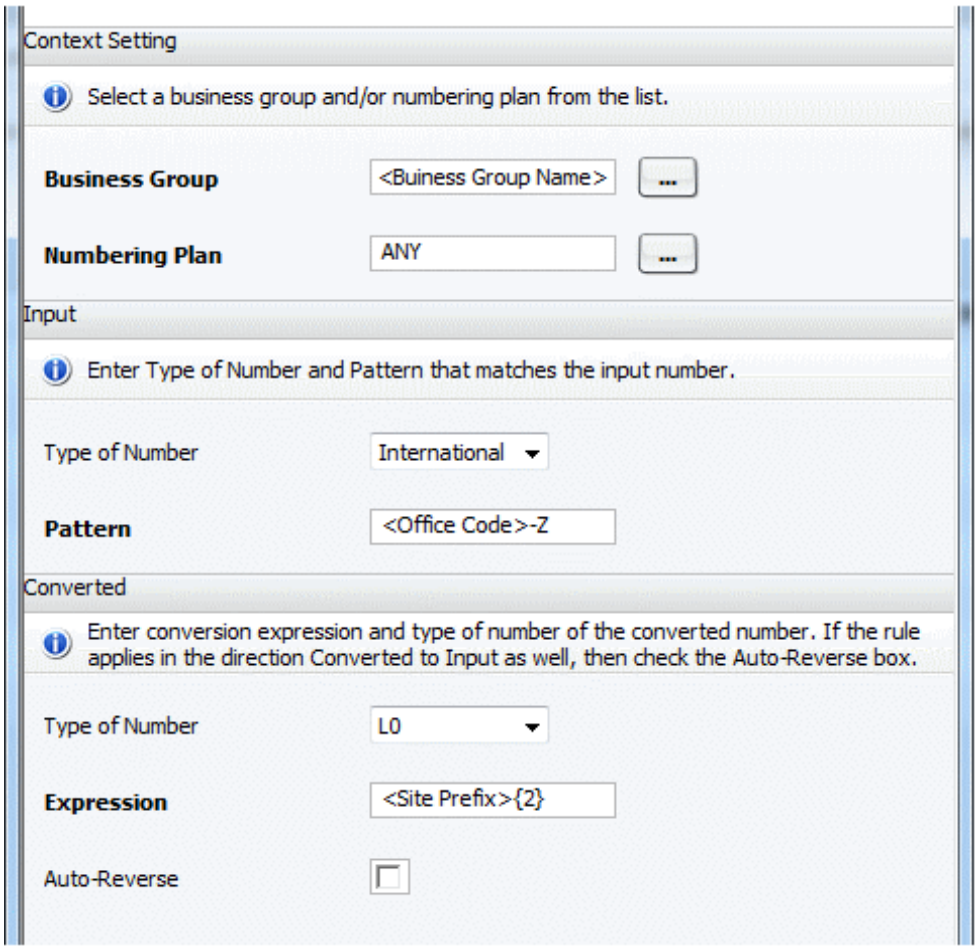
The number conversion table offers a conversion from public number to private number for all the DID numbers that are attributed to OSV or a PBX connected to OSV (the latter is necessary for scenarios where subscribers are migrated from the PBX to OSV.

Number conversion entries are created for every public number that is defined.Multiple entries need to be created in case extension ranges are defined with blocks which are not considered full number blocks (0-9, 00-99, 000-999, 0000-9999, etc.).

E.g. for a site with Subscriber DID Extension range 15619231000-15619231452 (with 5 digit extension numbers) and site prefix 5005:

Range 1000-1452	
(International) Input Pattern	**(L0)** **Output Expression**
156192-31[0-3]XX	5005{2}
156192-314[0-4]X	5005{2}
156192-3145[0-2]	5005{2}

The entries are generally (shown for full number blocks for sites that don't borrow digits from the office code for the extensions):



As mentioned before, two issues may complicate these rules:

- The use of non contiguous number blocks may lead to multiple rules being needed because the numbers that OSV owns in the public network don't form full number blocks.For the purpose of number conversion, digits which don't belong to a number block are
- If digits are borrowed from the office code, the borrowed digits are inserted between the <Site Prefix> and the {2}.

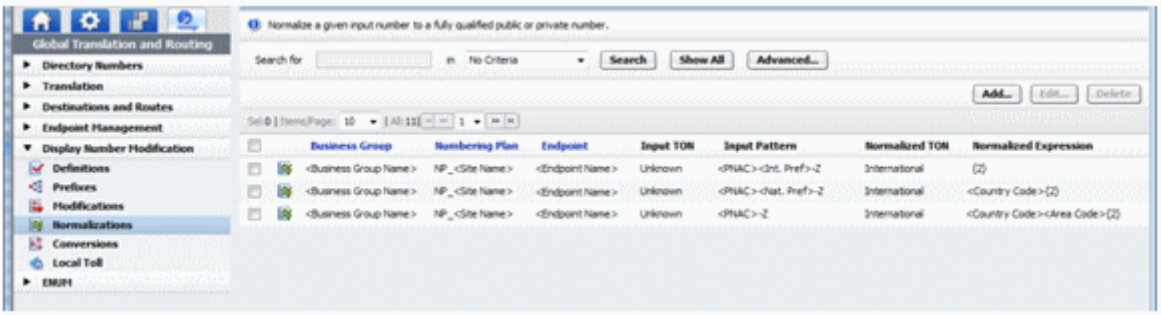
2.3.5 Number Normalization Table

The number normalization table normalizes the numbers received from the Gateway endpoints listed in the Endpoints data sheet.

The number normalization table is populated for each Gateway endpoint in the Endpoints data sheet based on the following entries for each site:

- Outgoing Line Access Code of the Site data sheet.This is also known as the Public Network Access Code (PNAC).
- Country code for the endpoint in the Endpoints data sheet
- Area code for the endpoint in the Endpoints data sheet
- Endpoint Usage for the endpoint in the Endpoints data sheet.The endpoint usage must include the word gateway
- Endpoint Signaling Type for the endpoint in the Endpoints data sheet.There are 2 types: SIP or SIP-Q.

SIP Gateways (Endpoint Usage contains word gateway and Endpoint Signaling Type is SIP) are setup by the WebCDC tool to send prefixed numbers (including a site's outgoing line access code set in the Site data sheet) to the OSV.These prefixed presentation numbers (mostly calling party numbers, but others are possible too) are normalized via the Normalization tables by listing 3 rules for each of these endpoints:



With:

- **<PNAC>:** outgoing line access code of the site in which the endpoint with name <Endpoint Name> is deployed.
- **<Int.Pref.>:** International prefix used within the country in which the endpoint with name <Endpoint Name> is deployed.
- **<Nat. Pref.>:** National prefix used within the country in which the endpoint with name <Endpoint Name> is deployed.

For SIP-Q gateways, the rule is normally that no normalization rules are necessary as these endpoints should already be sending normalized numbers on the SIP-Q interface.However, the WebCDC tool creates above number normalization entries regardless of the Endpoint Signaling Type.

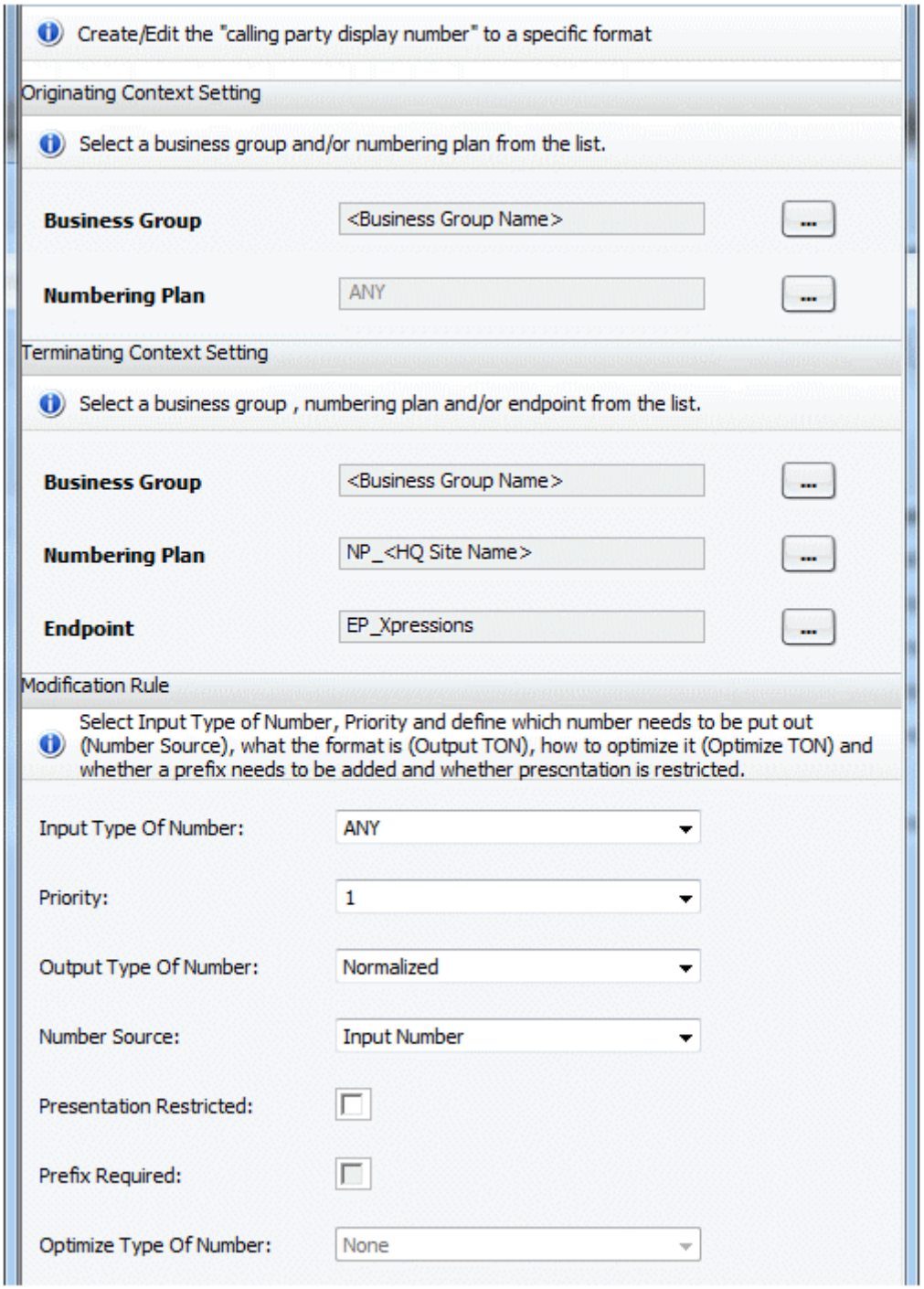
Presentation numbers from Xpressions and the Media Server are expected to be in GNF format.No special rules are created for this.

2.3.6 Number Modification Table

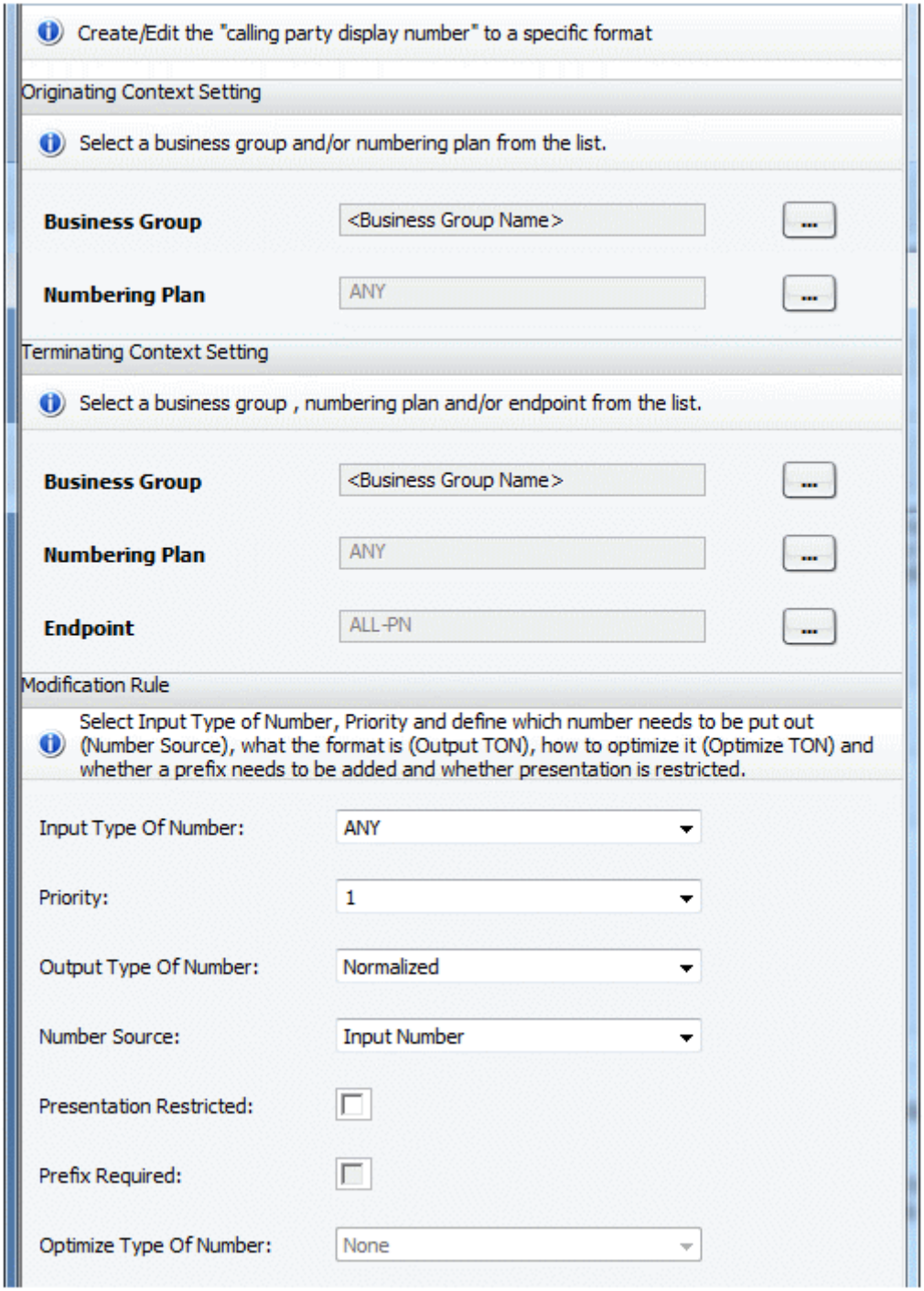
The number modification table specifies the modification rules for the presentation numbers.The creation of this table takes into account the subscribers and endpoints created on OSV.However, the created rule-set cannot be influenced.

Basically, the following rules are created:

- Only normalized numbers are sent towards Xpressions or the Media Server. This setting will guarantee that the OSV sends the Home DN as mailbox number to these endpoints. E.g. for EP_Xpressions:

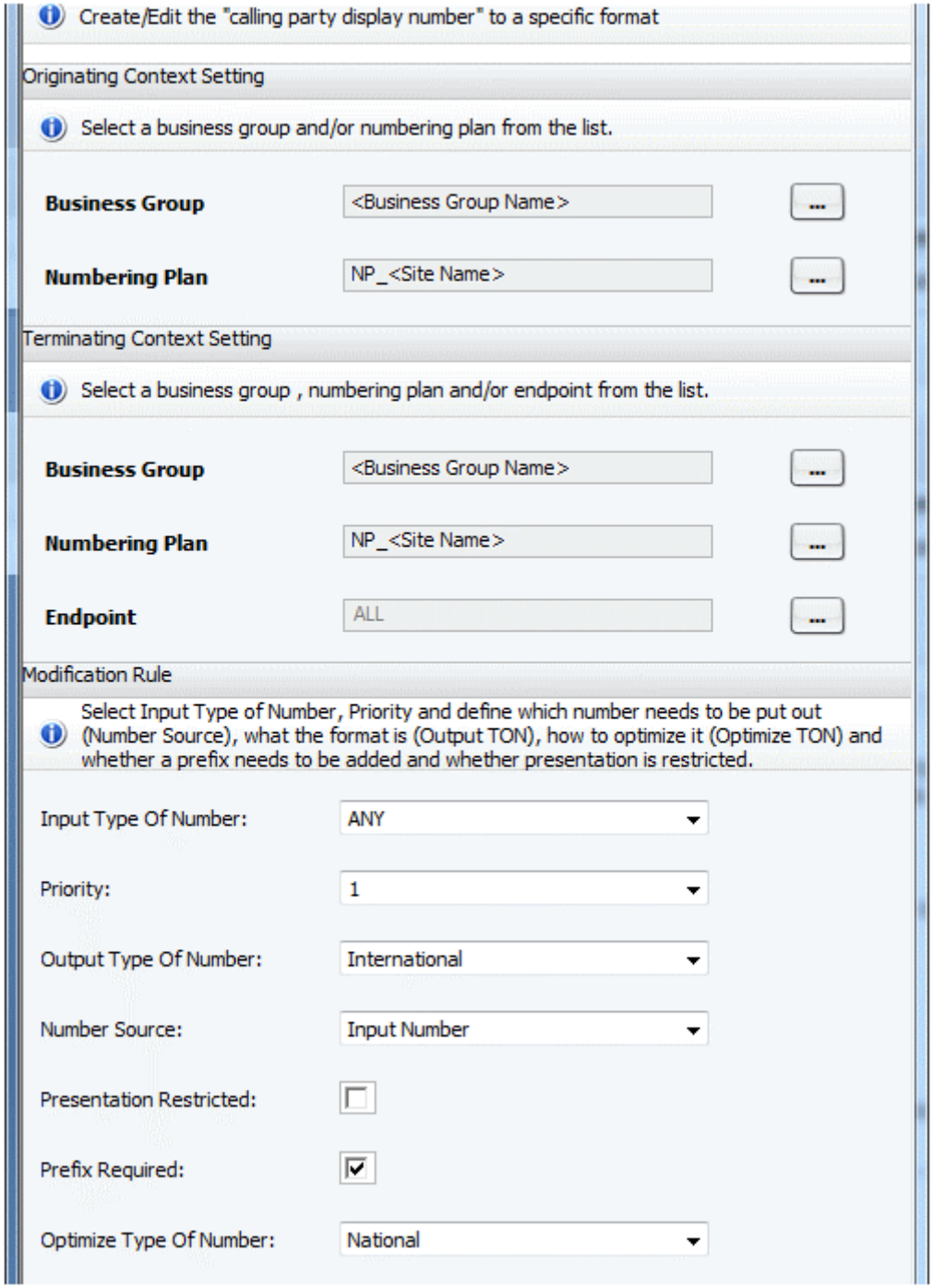


- PBX’es also receive normalized numbers.If a subscriber has a public Home DN, they receive the International number format of the Home DN and if they have a private Home DN, they receive the fully qualified private number format.

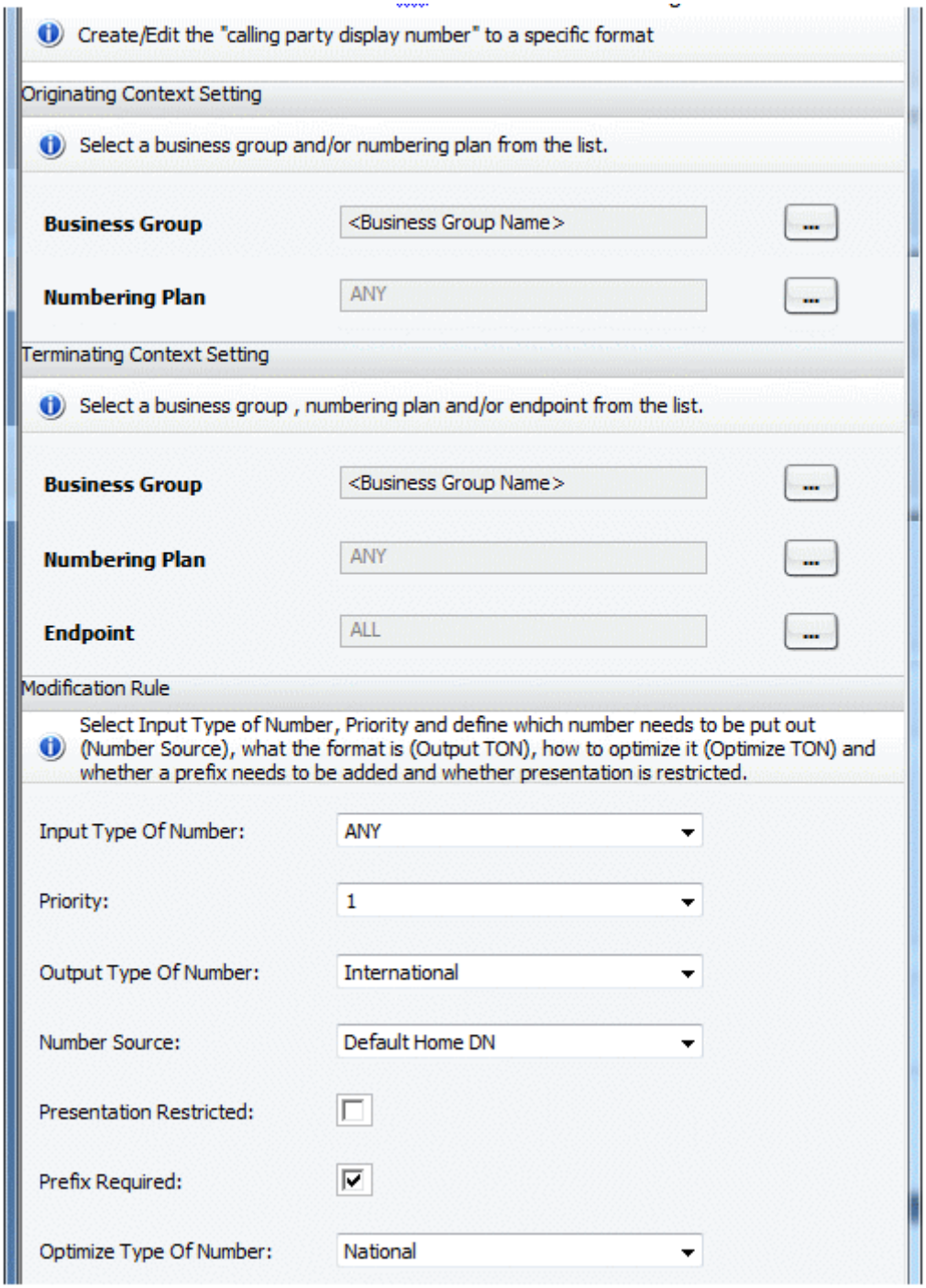


- DID numbers are only sent as calling party numbers to the gateways that own the DID number block.If other subscribers use these gateways (break-out, backup), the Default Home DN is sent.

For each site:

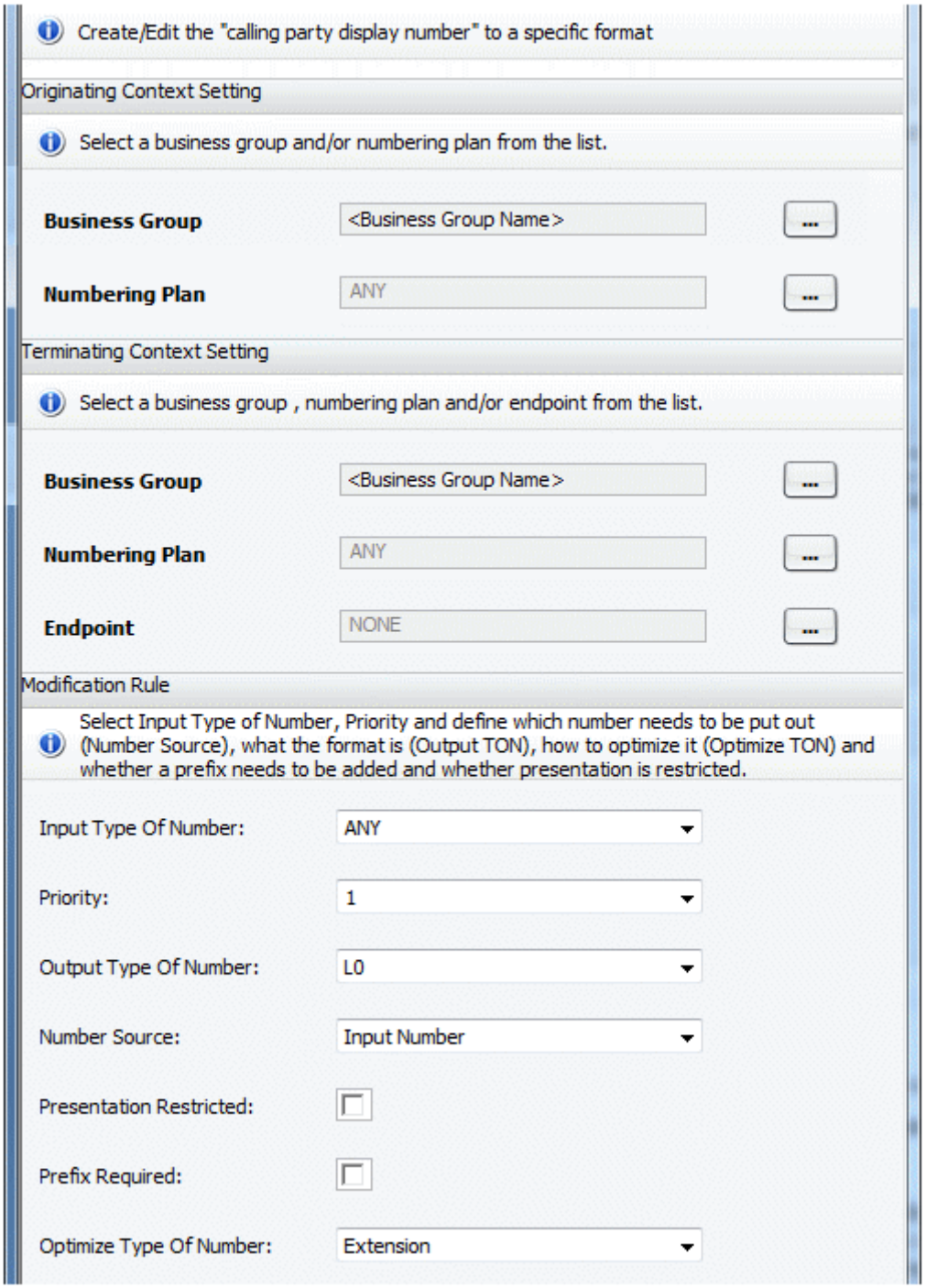


And to send the Default Home DN if the DID number is missing:



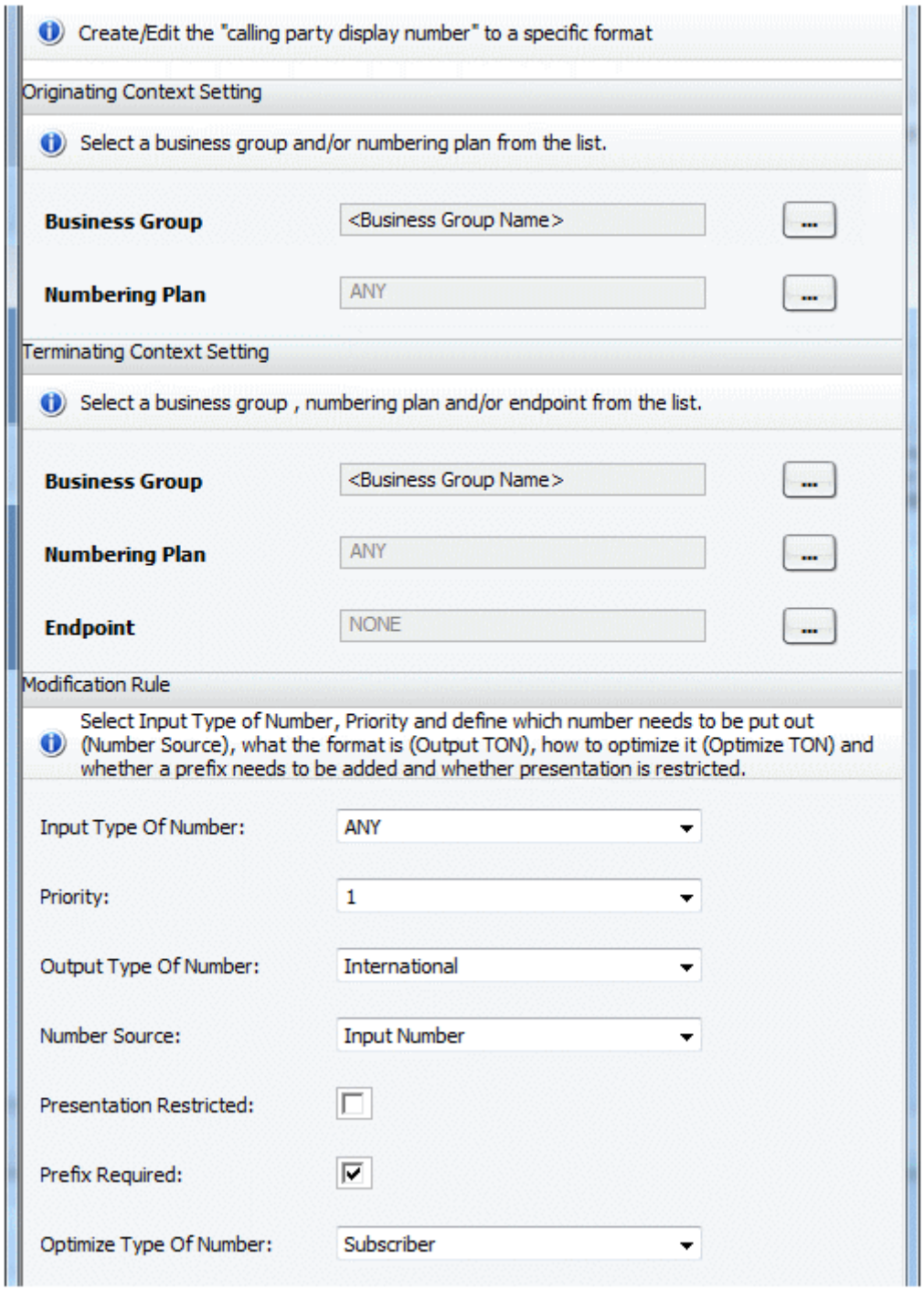
For sending calls to OSV subscribers, the following rules are generated.

- The first rule sends private optimized numbers between OSV subscribers.



- The second rule displays the optimized number to subscriber format for each number received from the PSTN.Note that the optimization is done as a factor of the local toll table attached to the definition used for the subscriber for whom the external number's presentation is created.If the subscriber's local toll table indicates that

subscriber dialing is not possible, then the optimization can only occur down to the National level.



3 Routing Concept: Abbreviations

Abbreviation	Meaning
AC	Area Code
CC	Country Code
INT	Number in E.164 international format without any prefixes
LOC	Local Office Code
NOA	Nature of Address (Unknown, Subscriber, National or International)
RTP	Resilient Telco Platform
TT	Traffic Type