Clearspan® Directory Number, Country Code, National Destination Code Guide

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1   REVISION HISTORY

The following represents the revision history of this publication.

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003	10/05/13	Bev Marsh	R19.0
002	11/11/08	Deb Bechtloff	Corrections and additions.
001	09/08/08	Deb Bechtloff	Initial release of this publication.

2 SUMMARY OF CHANGES

2.1 CHANGES FOR RELEASE 22.0

No changes were made in this version of the document.

2.2 CHANGES FOR RELEASE 21.0

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2.3 CHANGES FOR RELEASE 20.0

Changes made in this version of the document:

- Updated data stored against each country code.

3 INTRODUCTION

This guide provides information on directory numbers (DN), country codes (CC), and national destination codes (NDC). Be sure to follow the instructions corresponding to your network and server configuration.

4 VALIDATE DIRECTORY NUMBERS USING CC AND NDC

The Network Server must be configured so that it can determine how directory numbers (DNs) are structured, as well as to recognize valid DNs or digit patterns from invalid ones. To define rules for phone numbers using the command line interface (CLI) on the Network Server, the administrator completes the country code and national destination code tables. Rules must be defined in these two tables before DN provisioning can be performed on the Network Server. Directory number validation against the rules is performed at the time of provisioning. Therefore if the rules change after DNs have been provisioned, some DNs on the Network Server may no longer be considered valid.

The following sections explain how Network Server DN validation is performed and also specify the minimum provisioning requirements to ensure proper DN validation.

4.1 COMPLETE TERMINATING DN USING ORIGINATING DN

The Network Server Call Typing policy (as well as Pre-Call Typing policy) supports DN completion of the called party number. This feature allows the Network Server to convert a dialed phone number into its full E.164 equivalent, using information from the calling party number. This step is important because many policies only use E.164 numbers to search the database or access tables.

For DN completion, country codes and national destination codes should be provisioned for all regions where the dialing of a station code is sufficient to route a call within the same NDC. National destination codes that support station dialing and served by the Network Server require a match in the table managed by the NDC level of the CLI.

For example:

```
CC/NDC provisioning in the Network Server.

  Country Code           Name  DN Length  Intl Prefix  Natl Prefix
Carrier Prefix  Intra-LATA  Inter-LATA  International  Profile
=====================================================================
=====================================================
          1  North America        10          011          1
101      Bell      Bell          Bell  Profall
  Country Code  From   To        Name  Min STNC Length  Max STNC
Length  NDC Length  Zone  Rate Center  LCA Id
=====================================================================
=====================================
          1   201  990  North America              7
7        3
Calling party number: 12403641234
Based on CC/NDC, the Network Server determines that CC=1, NDC=240,
STNC=3641234.

Called party number : 6501234
Call type determined by Call Typing policy: Local

The Network Server prepends 6501234 with 1240. According to CC and NDC
tables, the network server determines that CC=1, NDC=240, STNC=6501234.
```

4.2   PROVISION DNS IN USER GROUPS

The Network Server stores in its database all DNs hosted by hosting network elements (NEs) defined in the Network Server. To ensure global uniqueness, these DNs are stored in E.164 format.

The Network Server performs a complete validation of the DNs before they are entered in the database. The validation includes the country code, national destination code, and length of each DN component. Therefore, if the Network Server is configured to perform subscriber location, valid CC, and NDC provisioning is required for each DN in the system.

4.3   PROVISION LOCATION FOR ROUTING NE

A routing network element (NE) in the Network Server can be given a location value. The location of a routing NE is used to determine where the NE is located in the network and how calls originated from this NE should be treated. If specified, the location represents the most significant digits of an E.164 number, with at least a full country code present. The more digits the location contains, the more precise the location and characteristics of the routing NE in the network.

The provisioning of location for routing NEs requires entering the country codes for the countries in which the routing NEs reside. If the routing NE is located in North America, the location should be formatted as "1NPANXX".

When a call originates from a routing NE, the Network Server considers that the call originator (for route processing purposes) is a DN derived from the location of the routing NE and padded with zeros (up to the allowed DN length for the country). If the country of the routing NE has a variable-length dialing plan, the derived DN contains 15 digits (the maximum length of an E.164 number), unless NDC entries are defined for this country, in which case the length of the DN depends on the NDC entry matching the location of the routing NE.

4.4   PROVISION COUNTRY CODE FOR HOSTING NE

Hosting NEs that communicate with the Network Server are provisioned as hosting NEs. A hosting NE can be given a country code value as long as it has been defined as a valid country code on the Network Server.

5   NEW COUNTRY CODES

The Network Server has defaults for all existing country codes as defined by the International Telecommunications Union (ITU). However, as geopolitical changes occur, it may be necessary to add or delete country codes using the CLI. Additionally, when a Network Server is deployed in a new country, country code properties should be changed or updated.

The following table shows the data that the Network Server stores on a country code basis, along with an example using country code 1.

ATTRIBUTE	DESCRIPTION	EXAMPLE
cc	The country code, which is a 1 to 3 digit string.	1
name	Information string associated with a country code.	North America
fixedDnLength	Some countries have a fixed-length dialing plan, meaning that all phone numbers assigned in that country have the same length. If this is the case, the administrator should enter this length here. If the country uses an open dialing plan whereby phone numbers can be of different lengths within the country, this field should be set to "0".	10
intlPfx natlPfx carrPfx	Each country defines its own dialing prefixes that end users dial to inform the network of their intentions. The international prefix is the prefix required when a user calls a number in another country. The national prefix is the prefix required when a user calls a user in his/her country, but in another NDC. Finally, a carrier prefix is used to prepend the called number with a carrier ID number. All of these prefixes are country-specific and exceptions may occur.	011 1 101
intraPic interPic intlPic	A country can define default carriers for intra-LATA, inter-LATA, and international calls.	Bell Bell Bell
profile	A country can define a default routing profile.	NIL_PROFILE
intlCarrPfx	The international carrier prefix. It is used as a prefix in the returned contacts when addCICasCAC is enabled within an applicable policy and the call is an international call. If set to an empty string, no CAC is added as a prefix for international calls.	101
stripPfx	Set to true to strip the national/international prefix from the returned contacts when addCICasCAC is enabled within an applicable policy. The default value is false.	false

6 NEW NATIONAL DESTINATION CODES

When the Network Server supports a public dialing plan for a new country, the NDC table for that country should be provisioned. The NDC entries for a country are used to define the valid syntax of DNs within a country code, but not the semantics of DNs (which is done by call typing). NDC entries for a country specify the DN length and structure.

In a fixed-length dialing plan country, where all DNs in the country have the same NDC length, one NDC entry is sufficient to fully describe a DN in that country. For example, in North America, all NDCs have the same length (3), and all station codes (STNC) also have the same length (min=7, max=7).

For example:

```
NS_CLI/System/CallP/CountryCodes/NDC> get 1
Retrieving data... Please wait...
  Country Code  From   To          Name  Min STNC Length  Max STNC
Length  NDC Length  Zone  Rate Center  LCA Id  Call Ind
========================================================================
=================================================
           1   201  990  North America              7
7         3

1 entry found.
```

In a variable-length dialing plan country such as Germany, many NDC entries are required to fully describe valid DNs. In fact, the simplest method is to define one entry per valid NDC and to specify for each of them, the NDC length and the valid length (minimum and maximum) of station codes hosted in that NDC.

Example:

```
NS_CLI/System/CallP/CountryC/NDC> get 49
About to access 3 entries. Continue?
Please confirm (Yes, Y, No, N): y
Retrieving data... Please wait...

  Country Code  From   To          Name  Min STNC Length  Max STNC
Length  NDC Length  Zone  Rate Center  LCA Id  Call Ind
========================================================================
======================================
         49   69   69 Frankfurt am Main              4
11         2

         49  7541 7541   Friedrichshafen            2
6         4

         49  7545 7545       Immenstaad             2
6         4


3 entries found.
```

7 INTERNATIONAL CALL SCREENING

The following definitions are used in this section of the document:

LATA (Local Access and Transport Area) is a term in the U.S. for a geographic area covered by one or more local telephone companies, which are legally referred to as local exchange carriers (LECs). A connection between two local exchanges within the LATA is referred to as intraLATA. A connection between a carrier in one LATA to a carrier in another LATA is referred to as interLATA.

Zone is the Network Server name given to the concept of LATA in countries other than country code 1 (North America).

NNACL (NPA-NXX Active Code List) lists all NPA-NXX codes (area codes-prefixes, for country code 1) that are active as of the close of business on the last day of the month preceding each quarterly month. The list covers only active codes.

LCA (Local Calling Area) defines the area(s) a customer can call without toll charges being incurred. When the calling number and the called number are in the same LCA, the call category is set to "LOCAL".

RC (Rate Center) a geographically-specified area used for determining distance and/or usage-dependent rates in the Public Switched Telephone Network (PSTN). The geographic point is identified by a specific vertical and horizontal (V&H) coordinate that is used to calculate distance-sensitive end-user traffic to/from the particular NDCs associated with the specific rate center. The concept of a rate center also exists in country codes other than 1, but without the notion of V&H coordinates.

LOCAL is the Network Server call category when the calling number and called number are both in the same LATA or Zone, and in the same rate center. A call is also considered in LOCAL category, if the calling number and the called number are in the same LCA.

INTRALAT is the Network Server call category when the calling number and called number are both in the same LATA or Zone, but in different rate centers and not in the same LCA.

INTERLAT is the Network Server call category when the calling number and called number are in different LATAs or Zones, and not in the same LCA.

INTERNAT is the Network Server call category when the calling number and called number are in different country codes.

The Network Server implements a multi-instance policy called **Call Screening**. Call Screening is a public routing policy that validates the call category of a call from its call type. It also screens out calls that are not dialed correctly.

CC (Country Code) is a digit sequence that uniquely identifies a country code as per ITU E.164. In the Network Server, country codes are managed under CLI level `NS_CLI/System/CallP/CountryCodes`.

NDC (National Destination Code) is a digit sequence that identifies a group of phone numbers (usually in the same region) within a country. The NDC is the most significant portion of a national phone number. Usually, a call between two numbers within the same NDC does not require the NDC to be dialed, only the extension digits, which compose the remaining digits of a national phone number. In the Network Server, NDCs are managed under the CLI level `NS_CLI/System/CallP/CountryCodes/NDC`.

## 7.1   INTERNATIONAL ZONES AND RATE CENTERS

To support call screening outside North America, the Network Server allows the creation of zones and rate centers in all countries. The zones CLI level under `NS_CLI/System/CallP/CountryCodes/NDC` supports the definition of zones and rate centers on a per-country code basis, as follows:

FIELD	TYPE	DESCRIPTION
cc	Number (1 to 3 digits)	Valid country code defined in the system under `NS_CLI/System/CallP/CountryCodes`.
zone	String (1 to 32 characters)	Name given to a zone. The zone name is unique within a country code. If the zone does not exist when an entry is added, the zone is created after a confirmation is obtained from the CLI user.
rateCenter	String (1 to 32 characters)	Name given to a rate center. The rate center name is unique within a zone. Many rate centers can be defined in a zone.
description	String (0 to 64 characters)	Description of the rate center or zone entry.

The system provider can then make NDCs refer to pre-defined zones/rate centers. This association specifies that an NDC belongs to a rate center in a zone.

7.2   INTERNATIONAL CALL SCREENING

The existing Call Screening policy supports international call screening and North American call screening, meaning that it supports call category determination using "zones/NDC rate centers" as well as "LATA/NNACL rate centers". The call processing flow of Call Screening is as follows, where *cat* is the resulting call category:
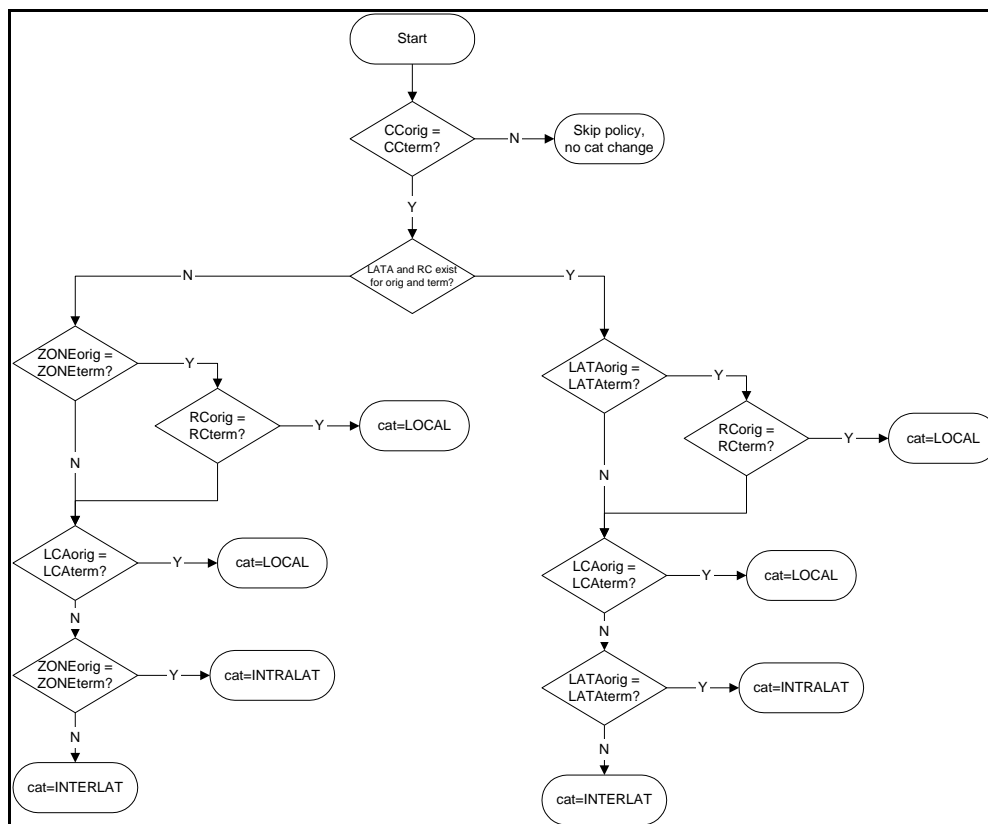
Figure 1 Call Processing Flow of Call Screening

> 📝 **Note**: International call screening does not introduce new call categories (INTRALAT and INTERLAT are also used in country codes other than 1). Instead, it reuses existing call categories and generalizes their meaning.

7.3 INTERNATIONAL LOCAL CALLING AREA

The Local Calling Area CLI level under `NS_CLI/System/CallP/CountryCodes/NDC` is used to create local calling areas for all countries. A local calling area entry has the fields shown in the following table. Note that a local calling area cannot cross country code boundaries. The creation of a local calling area is inclusive, meaning that entities added form the local calling area. There is no provision to exclude a smaller entity from a larger one already included in the local calling area.

FIELD	TYPE	DESCRIPTION
cc	Number (1 to 3 digits)	Valid country code defined in the system under `NS_CLI/System/CallP/CountryCodes`.
lcaid	String (1 to 32 characters)	Name given to a local calling area. The LCA name is unique within the entire system.
ndcList	List of number (1 to 10 digits)	Lists all NDCs that are part of the local calling area defined by lcaid.

FIELD	TYPE	DESCRIPTION
rcList	List of string (1 to 32 characters)	Lists all the rate centers that are part of the local calling area defined by lcaid.
zoneList	List of string (1 to 32 characters)	Lists all the zones that are part of the local calling area defined by lcaid.
lcaList	List of string (1 to 32 characters)	Lists all the local calling areas that are part of the local calling area defined by lcaid. This field allows a wider local calling area to be defined using a smaller local calling area. Recursive definitions are detected and not permitted.

It is then possible to assign an LCA to an NDC entry under `NS_CLI/System/CallP/CountryCodes/NDC`. An NDC only refers to a local calling area defined in the same country code as its own.

With this in place, Call Screening finds the NDC entry of the calling number, determines if this NDC has an LCA defined, and if so, extracts its content. It then verifies if the called number falls in the LCA of the originator, for one of the following reasons:

- The NDC of the called number is listed in the ndcList of the originator's LCA.

- The rate center of the called number's NDC is listed in the rcList of the originator's LCA.

- The zone of the called number's NDC is listed in the zoneList of the originator's LCA.

If the called number is in the LCA of the calling number, the Network Server flags this call with the LOCAL category.

Zones and rate centers used to define local calling area rules can be assigned to NDCs. This allows the Network Server to identify in which zone and rate center an NDC belongs. An NDC cannot belong to a zone alone because a zone can contain many rate centers. An NDC can only be part of zero or one rate center, and in the latter case, a zone must also be specified since the rate center is only unique within a zone.

7.4   SUBSCRIBER LOCAL CALLING AREA

Local calling areas are not only defined system-wide but are shared by all subscribers in the system. The Network Server also supports the concept of subscriber local calling areas. This means that a user group or an enterprise can be provisioned with a local calling area (that is, the lcaid). The following rules apply:

USER GROUP	ENTERPRISE	NDC	CALL SCREENING CHOICE
LCA specified	Do not care	Do not care	If the caller is part of a user group that has an LCA specified, Call Screening uses this LCA.
No LCA specified	LCA specified	Do not care	If the caller is part of an enterprise that has an LCA specified and none defined at the

USER GROUP	ENTERPRISE	NDC	CALL SCREENING CHOICE
			user/group level, Call Screening uses this LCA.
No LCA specified	No LCA specified	LCA specified	Call Screening uses the LCA defined at the system/NDC level if the user/group and enterprise of the caller have no LCA specified.
No LCA specified	No LCA specified	No LCA specified	Call Screening skips LCA screening if no LCA is specified at the user/group, enterprise, or system/NDC level. Note however that LCA screening based on NPANXX/rate center continues to apply if NPANXX/NNACL is used.

The Network Server supports the loading and management of LCA files. Using the commands under `NS_CLI/System/CallP/Translation/`, the LCA file can be loaded and stored in the Network Server database. The LCA content can then be altered using the commands under `NS_CLI/System/CallP/Translation/LCA`.

The Network Server continues to support the current LCA management, but the LCA file content syntax also supports the grouping of LCA rules under an lcaid. This lcaid can then be used as the subscription key assignable to user groups and enterprises to refer to a set of LCA rules.

The LCA file syntax is shown in **bold** in the following example.

```
Rule Name       Production or Comment
LCAFILE         = *("<LCABLOCK>" CRLF LCAID CRLF ([GROUPSECTION  CRLF]
LCASECTION) CRLF "</LCABLOCK>" CRLF)
GROUPSECTION    = "<LCAGROUP>" CRLF *(GROUPENTRY) CRLF "</LCAGROUP>"
LCASECTION      = "<LCA>" CRLF *LCAENTRY CRLF "</LCA>"
GROUPENTRY      = GROUPNAME ";" *([RCLATA|NPANXX] ";")
LCAENTRY        = ORIGRCLATA ";" *([RCLATA|NPANXX|GROUPNAME] ";")
GROUPNAME       = char(10)
LCANAME         = char(10)
NPANXX          = digit(6)
ORIGRCLATA      = RCLATA
RCLATA          = LATA "," RC
RC              = char(30)
LATA            = digit(3)
LCAID           = char(32)
```

The Network Server defines a reserved lcaid called "DFLT_LCA_ID" that cannot be created nor deleted using the CLI. This lcaid is reserved to support local calling areas defined before the introduction of international call screening.

The lcaid chosen to define a local calling area based on NDC/rate center/zone cannot be used to define a local calling area based on NPANXX/rate center, or vice versa.