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# Nationwide Number Portability: a MODERN Use Case
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Abstract

A proposed solution for geographic number portability in the USA calls for a new non-geographic numbering resource. This draft uses this proposal as a use case for a MODERN solution. While this focuses on an effort occurring in the USA the concepts are applicable to any country.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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Table of Contents



## 1. Introduction

The Federal Communications Commission (FCC) in the USA has asked the North American Numbering Council, an advisory body, to recommend actions to enable nationwide number portability (NNP). NNP is the ability to port a geographic TN to a different geographic area than the one to which it is associated. One solution proposes establishing a new non-geographic numbering space to be used for call routing for NNP TNs.

The format of a USA TN is:

- NXX-NXX-XXXX, where N=digits 2-9 and X=digits 0-9

- The first 3 digits (NXX) is called the area code

    - The area code is assigned to a geographic area or a specific service

- The first 6 digits (NXX-NXX) is called the central office code (CO Code)

    - The CO code in a geographic area code is assigned to a specific service provider and switch and is used as an address for that switch

- In some geographic areas all ten thousand TNs in a CO code (NXX-NXX-0000 to 9999) are assigned to that service provider as inventory

- In most geographic areas one thousand TNs identified by the first 7 digits (NXX-NXX-X) are assigned to service providers as inventory

- The full 10 digits is called the line number

  - Line numbers are ultimately assigned to users

Area codes can be either geographic or non-geographic. Geographic area codes are assigned to a specific geographic region. For example, the 202 area code is assigned to Washington, DC. TNs within the 202 area code are assigned as inventory to service providers. Service providers use this inventory to assign TNs to users who have a presence on their networks in Washington, DC. CO codes assigned to switches in the 202 area code have a connection to the PSTN in the Washington, DC area. Mobile and landline networks both use CO codes and TN inventory in the same geographic area codes.

Non-geographic area codes do not designate a specific geographic region. They are considered nationwide, i.e., TNs within the area code can be assigned to a User anywhere in the country. Today non-geographic area codes are used to designate a specific service. For example, the 800 area code is used to designate toll free service.

Networks use the CO codes of geographic TNs to route calls. For TNs that have been ported the TN is assigned a routing number (RN). (In the USA, the term local routing number (LRN) is used. The term RN is used in this document.) The assignment of the RN to the TN is done in an industry database called the number portability administration center (NPAC). Networks use the CO code of the RN to route calls to a ported TN. Today all calls to geographic TNs are routed based on a CO code.

Portability is limited to the geographic area associated with the TN. One of the ways this is achieved is by implementing an edit in the NPAC that ensures the RN and the TN are in the same geographic area. The request by the FCC is asking the industry to remove this limitation.

One way to enable NNP is to remove the NPAC edit and allow the TN and RN to be in different geographic areas. However, there are many technical and operational aspects of the communications networks

that rely on the TN and RN being in the same geography. These would have to be investigated, tested, and resolved. It's been reported that a call of this type in certain older technology switches will fail. If so, then new software would have to be developed for these switches to implement this solution.

An alternative solution has been proposed that would use a new non-geographic area code for RNs. These are called non-geographic routing numbers (NGRN). They would be hosted on an all-IP network of switches called non-geographic gateways (NGGW), rather than the existing TDM tandems operated by the incumbent local exchange carriers (ILECs). The non-geographic area code would indicate to older technology infrastructure the need to send the call to an IP network for call processing. Once on the IP network the NGGW is identified and the call is routed.

A call to an NGRN can involve four entities:

- Originating CSP - the CSP that has performed the number portability dip and is routing to the NGRN
- NG Transport Provider - the network that can route the call to the correct NGGW
- NGGW - the switch that hosts the NGRN
- Terminating CSP - the CSP that is connected to the NGGW and is assigned the NGRN or NGTN and completes the call to the User

Some of these entities can be collapsed, for example NGGW and terminating CSP or originating CSP and NG transport provider. There can also be additional entities involved in transporting the call. It's also been proposed that TNs within the non-geographic area code can be used for assignment to Users for traditional voice and text service. These are called non-geographic TNs (NGTNs). Today consumer voice and text service is limited to TNs from geographic area codes.

This document is a MODERN use case for a new non-geographic numbering space proposed to enable GNP in the USA. It uses the following assumptions:

- Numbering space to be managed is a non-geographic area code in the format of NXX-NXX-XXXX
- Both NGRNs and NGTNs are assigned from this space

- NGRNs are assigned on a 10-digit basis - not a 6-digit basis, as they are for geographic RNs
- The service provider and the NGGW associated with an NGRN can change
- NGTNs are assigned on a 10-digit basis to CSPs - not in blocks, as they are for geographic TNs
- NGTNs have an associated NGRN, i.e., calls to NGTNs are routed based on the NGRN
- The service provider, NGRN, and NGGW associated with an NGTN can change

This document uses definitions from [I-D.peterson-modern-problems]. It also assumes that either a single authoritative registry or a distributed registry can perform the Registry functions. Here the term Registry is used to cover both types of solutions.

## 2. Definitions

These mostly address terms associated with numbering in the USA or new terms created for this document.

- Nationwide number portability (NNP) - the ability to port a geographic TN to a different geographic area than the one to which it is associated
- Area code - the first 3 digits of a TN that is assigned to a geographic area or a service
- Central office code (CO code) - the first 6 digits of a TN that is assigned to a specific service provider and switch
- Routing number (RN) - a geographic TN that is associated with a ported TN for the purposes of call routing
- Non-geographic routing number (NGRN) - a TN from a non-geographic area code that is used to route calls to NNP TNs
- Non-geographic gateway (NGGW) - an IP switch that hosts NGRNs
- Number portability administration center (NPAC) - an industry database that manages number portability information

## 3. Use Cases

The use cases cover processes for actors acquiring, managing, and retrieving data related to NGRNs and NGTNs.

### 3.1. CSP Acquires an NGRN from a Registry

A CSP is preparing to offer NNP service to its Users. The first step would be to register as a CSP with the Registry by providing profile information. The CSP profile should be data that will be referenced whenever the CSP attempts a transaction with the Registry. This could include administrative data such as CSP contact information. There could be multiple contacts in the CSP such as, administrative, billing, and technical. It could include administrative data about the CSP's NGGW provider(s). It could also include service data such as addressing data for the NGGW(s).

During the registration process the Registry should certify that the CSP is qualified to request an NGRN. This could be a credential or some other authorization provided by the Numbering Authority. It could also include verification that the CSP has the ability to offer service to the NGRN, such as an agreement with an NGGW provider. Upon assignment the CSP assigns it to an NGGW provider and NGGW addressing information and shares this with the Registry. The CSP and the NGGW provider can be the same company.

The Registry would make the assignment data available to others based on local policies. It can do this by providing an API or by distributing the data. Administrative data is more likely provided by API, reference addresses and service data could be provided by distribution.

There should be policies as to which and how many NGRNs the CSP can request. It could request a specific NGRN, or perhaps the Registry would assign one randomly or in sequence. Given that there should be a relatively small number of NGGWs there should be some limitation on how many NGRNs a CSP can request, perhaps some number per NGGW.

When the Registry assigns the NGRN they would issue a credential to the CSP. The credential can be used in future transactions.

### 3.2. User Ports a Geographic TN to an NGRN

There are seven regional NPACs that manage the process of porting geographic TNs. These are divided geographically by area code. Each area code is dedicated to a specific NPAC and no area code is

shared across two NPACs. For example, A CSP would port a 212 TN from New York in the Northeast regional NPAC. Geographic RNs are also specific to a region. Some CSPs only connect to some regions, i.e., a CSP may only connect to one region. If so, they can only port TNs and get porting information in the region(s) to which they connect. Those CSPs have arrangements with other CSPs to handle portability call processing for TNs in other regions. This is likely a transport provider that has connectivity to all NPACs.

NGRNs would have to be able to be in any and multiple regions. This is possible with current NPAC processes. The most efficient way to port numbers in this environment is to maintain the ported TN-to-region association. For example, if a CSP is porting a 212 TN to an NGRN, they would port it in the Northeast region.

When a CSP is porting a TN to an NGRN the CSP will first register the NGRN in the region associated with the porting TN. Then they will port the TN as they would today, except it is to an NGRN, not a geographic RN. The NPAC downloads the ported TN-to-NGRN data to all interconnected service providers.

### 3.3. User Acquires an NGTN from a CSP

A User requests service from a CSP, the CSP submits its credential to the Registry and requests an NGTN. It provides the Registry with NGGW information, administrative and service, related to the NGTN. The Registry verifies the CSP and assigns an NGTN along with a credential for that NGTN. The CSP could provide the User with the credential for them to use in future transactions.

The User provides contact information to the CSP. The CSP can either store the contact information and provide a reference address to the Registry, or it could send the contact data to the Registry for storage.

The CSP establishes service to the User and NGTN.

### 3.4. Call to an NGRN Via an NG Transport Provider

The originating CSP provisions the non-geographic area code as a valid area code on its network. When a call originates to an NNP TN, the CSP will perform an NP dip and will receive an NGRN. It routes the call based on the area code of the NGRN to an NG Transport Provider that it has an agreement with. The NG Transport Provider routes the call to the NGGW based on routing information related to the NGRN.

The routing information could simply be the NGRN itself. Most CSPs use traditional PSTN routing and interconnection techniques when routing IP traffic. They create SIP trunk groups (SIP TGs) between their session border controllers (SBCs). They choose a SIP TG based on the CO code. Because the number of NGGWs and NGRNs will be relatively small, it would be possible to create routing tables based on 10 digit NGRNs. Also there will be no need to route calls based on the first 6 digits of an NGRN, therefore there will be no conflict with the 10 digit tables.

Alternatively there could be some other routing information associated with the NGRN, such as a unique service provider identifier or a URI. This could be used to consolidate multiple NGRNs into a smaller number of identifiers. But this would likely require changes to the SIP protocol to add the new identifier to NP call processing.

### 3.5. Call to an NGTN from a TDM Network

The CSP provisions the NG area code as a valid area code in its network. When a call originates to an NGTN it can either do the NP query and hand the call off to an NG Transport Provider (as described above), or it can send the call to the NG Transport Provider and let it perform the NP dip.

Once on the NG Transport Provider's network it will route to the correct NGGW, as described above.

## 4. Security Considerations

[TBA]

## 5. IANA Considerations

This memo includes no request to IANA.

## 6. Normative References

[1] Peterson, J. and McGarry, T. (Editors), "draft-peterson-modern-problems-02.txt", October 19, 2105

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