**CRTC INTERCONNECTION STEERING COMMITTEE**

**TIF REPORT**

**Date Submitted:            2 April 2024**

**WORKING GROUP: CSCN**

**REPORT #:    138B      File ID: CNRE138B**

**REPORT TITLE**:
**Methods to Address the High Assignment Rate of Non-Geographic (6YY) CO Codes**

**OUTCOME: CONSENSUS**

**RELATED TASK(s) #: n/a**

**BACKGROUND:**

In mid-2022, the Canadian Numbering Administrator (CNA) compiled an updated Non-Geographic (6YY) Numbering Resource Utilization Forecast (NRUF) based on revised data that had been received. The updated forecast indicated a significant acceleration in the rate of Non-Geographic NXX assignments that would substantially impact both the number of NPA Codes reserved for Non-Geographic assignments in Canada and the North American Numbering Plan as a whole.

The CNA notified Canadian Radio-television and Telecommunications Commission (CRTC) staff in a letter and suggested that CRTC staff direct the CNA to publish the updated NRUF and request that the Canadian Steering Committee on Numbering (CSCN) convene a meeting to discuss the Non‐Geographic forecast results and to develop possible solutions for decreasing the demand for 6YY NXXs.

On 8 August 2022, CRTC staff advised the CNA via letter to proceed with the CNA’s suggestions.

On 15 August 2022, the CNA published the July 2022 Non-Geographic NRUF aggregate results on the CNA website (<https://cnac.ca/NRUF/NRUF.htm#2022> ) and sent a letter to the CSCN which was also posted on the CNA website (<https://cnac.ca/cscn/drafts.htm#documents> ).

The CSCN noted that some initial work related to this topic was conducted and captured in section 7.5 of CSCN report CNRE135A (Potential Remedies for CO Code and NPA Exhaust) from TIF 110 (Identify Solutions to Mitigate NPA and NXX Numbering Exhaust). CNRE135A was submitted to the Commission. On 23 March 2023, the Commission released Notice of Consultation CRTC 2023-92, “Call for comments – Implementing thousand-block pooling.”

The CSCN met on 24 August 2022 to review the Non-Geographic NRUF aggregate results which were posted on the CNA website on 15 August 2022. The CSCN agreed to draft and open TIF 112 (CNTF112A) – “*Address assignment rate of Non-Geographic (6YY) CO Codes*.”

The CNA notified NANPA on 29 November 2022, of this Non-Geographic NRUF aggregate result.

The CNA conducted another G-NRUF in January 2023 and a S-NRUF in July 2023 and published the results, which are included in this report. The CSCN also requested that the CNA conduct Non-geographic NRUFs of the 6YY resources twice per year.

**POTENTIAL IMPACTS:**

* Availability of sufficient non-geographic numbers to satisfy demand.
* CRTC-approved guidelines associated with NPA and NXX assignment.
* Internet of Things (IoT)/Machine to Machine (M2M) network address structures.
* Consumer impacts of expanded or different network address schemes.
* Carrier infrastructure impacts of expanded network address schemes, if implemented. Carrier infrastructure includes network elements or platforms, carrier Operational Support Systems (OSS), carrier Billing Support Systems (BSS) and the CNA’s number administration system.

**ALTERNATIVES:**Many alternatives are considered and analyzed in this report. The alternatives include those that may be implemented in the near term or long term. The alternatives make available either a nominal number of new numbering resources or many new numbering resources.

**CONCLUSIONS:**

The CSCN concludes that demand for IoT/M2M is growing at a rate that will quickly exhaust available numbering resources and that relief for Non-Geographic NPAs is required.

**RECOMMENDATIONS:**

The attached report includes recommendations to prevent the exhaust of currently available numbering resources for non-geographic NPAs for the foreseeable future.

**ATTACHMENTS:**

TIF 112 Consensus Report CNRE138B Non-Geographic 6YY NPA Exhaust Mitigation

Canadian Interconnection Steering Committee (CISC)

Canadian Steering Committee on Numbering (CSCN)

TIF 112 Consensus Report **CNRE138B**

Non-Geographic 6YY NPA Exhaust Mitigation

Contents

[1. Scope 5](#_Toc162946382)

[2. Background 5](#_Toc162946383)

[2.1. North American Numbering Plan (NANP) 5](#_Toc162946384)

[2.2. Canadian Numbering Plan and Dialling Plan 6](#_Toc162946385)

[2.3. Numbering Resource Utilization Forecast (NRUF) 6](#_Toc162946386)

[2.4. North American Numbering Plan Expansion 7](#_Toc162946387)

[3. Introduction 8](#_Toc162946388)

[3.1. Internet of Things (IoT) / Machine to Machine (M2M) 8](#_Toc162946389)

[3.2. Non-Geographic Telephone Numbers 8](#_Toc162946390)

[3.3. IoT/M2M Numbers and Network Platforms 9](#_Toc162946391)

[3.4. IoT/M2M use of Alternative Addressing methods 9](#_Toc162946392)

[3.5. 2022 and 2023 6YY NPA NRUF 10](#_Toc162946393)

[4. Potential 6YY Exhaust Deferral Methods 11](#_Toc162946394)

[4.1. Option 1: Obtain Additional Non-Geographic NPAs 12](#_Toc162946395)

[4.2. Option 2: Utilize NPA 010 12](#_Toc162946396)

[4.3. Option 3: Utilize Alternative Addressing Formats 13](#_Toc162946397)

[4.4. Option 4: Partition NPA 600 13](#_Toc162946398)

[4.5. Option 5: Remove N11 and 555 NXX Restrictions in 6YY NPAs 14](#_Toc162946399)

[4.6. Option 6: New IoT/M2M Numbering Resource Standards 15](#_Toc162946400)

[4.7. Option 7: Extended 6YY NPAs 16](#_Toc162946401)

[4.7.1. Option 7A: Use 1+12-digit TNs in unused 6YY NPAs 16](#_Toc162946402)

[4.7.2. Option 7B: Use 1+14-digit TNs in unused 6YY NPAs 17](#_Toc162946403)

[5. Analysis 17](#_Toc162946404)

[5.1. Full Solutions 18](#_Toc162946405)

[5.2. Partial Solutions 18](#_Toc162946406)

[5.3. Other Remedies 19](#_Toc162946407)

[5.4. Calendar of Solutions 20](#_Toc162946408)

[6 Conclusions 24](#_Toc162946409)

[7 Recommendations 24](#_Toc162946410)

[8 Matters for Further Consideration 24](#_Toc162946411)

[9 Terms and Acronyms 25](#_Toc162946412)

[10 Contributions 28](#_Toc162946413)

[11 CSCN TIF 112 Participants 29](#_Toc162946414)

[12 NTWG TIF 43 Participants 30](#_Toc162946415)

List of Figures

[**Figure 1:** International ITU-T E.164-Number Structure for Geographic Areas 6](#_Toc162946416)

[**Figure 2:** July 2023 NRUF of 6YY NPA Consumption 10](#_Toc162946417)

[**Figure 3**: Comparison of NRUF values and current pool of 6YY NPAs 11](#_Toc162946418)

[**Figure 4**: Mitigation methods for 6YY NPAs 11](#_Toc162946419)

[**Figure 5**: Calendar of Solutions 21](#_Toc162946420)

[**Figure 6:** Graph of Extrapolated Demand and Supply 23](#_Toc162946421)

[**Figure 7**: Terms and Acronyms 25](#_Toc162946422)

[**Figure 8**: Contributions 28](#_Toc162946423)

[**Figure 9**: CSCN TIF 112 Participants 29](#_Toc162946424)

[**Figure 10**: NTWG Participants 30](#_Toc162946425)

 Executive Summary

In mid-2022, the Canadian Numbering Administrator (CNA) compiled an updated Non-Geographic (6YY) Numbering Resource Utilization Forecast (NRUF) based upon industry input. This NRUF indicated a significant acceleration of the rate of 6YY numbering block assignments which would exhaust the pool of available 6YY Area Codes or NPAs. The CNA proposed actions which CRTC Staff approved and CSCN TIF 112, “*Address assignment rate of Non-Geographic (6YY) CO Codes*,” was opened. The CSCN met frequently to review proposed solutions requested by TIF 112 and solicited technical input from the NTWG which opened TIF 43 and provided it. This report adopts information and recommendations from both CSCN TIF 112 and NTWG TIF 43.

The growth of IoT/M2M services is high and forecasts vary from year to year. This places a high demand on IoT/M2M numbering resources and requires that any recommendations consider the possibility that demand may increase beyond currently forecasted levels. In addition, fundamental changes to the entire North American Numbering Plan (NANP) are expected to take effect by 2051, to accommodate rapid demand for geographic and non-geographic numbers. Exactly what those changes will be and when they must be implemented are currently unknown.

The following options are discussed and analyzed:

|  |
| --- |
| 1. Obtain Additional Non-Geographic NPAs
 |
| 1. Utilize 010 NPAs
 |
| 1. Alternative numbering scheme
 |
| 1. Partition NPA 600
 |
| 1. Remove N11 and 555 NXX restrictions in 6YY NPAs
 |
| 1. New IoT/M2M Network Addressing Standards
 |
| 1. Extended 6YY NPAs
 |

There is consensus that Option 7 is the best solution for the long term, as it would increase supply sufficiently to comfortably meet demand until the anticipated NANP expansion (NANPE). However, further industry discussion is required before the various alternatives within Option 7 can be recommended. Nonetheless, consensus was reached to reserve NPA 677 and NPA 688 for extended digit formats and also to implement two partial solutions that will make additional 6YY NXXs available prior to the implementation of the long-term solution.

Given the technical and timing constraints of the above options and the CSCN’s intention to finalize a recommendation with respect a long-term solution using an extended digit format, the CSCN recommends that the CRTC direct the CNA to:

1. allocate 768 NXX codes in NPA 600 as non-geographic within 6 months of the CRTC’s directive;
2. eliminate the restriction on the assignment of NXXs 211, 311, 411, 511, 555, 611, 711 and 811 in all non-geographic NPAs within 6 months of the CRTC’s directive; and
3. reserve NPAs 677 and 688 for extended digit format.

In addition, it is recommended that the CRTC request that the CSCN amend the following guidelines as required to reflect (1) the allocation of 768 NXX codes in NPA 600 as non-geographic and (2) the elimination of restrictions on the assignment of NXXs 211, 311, 411, 511, 555, 611, 711 and 811 in all non-geographic NPAs within 6 months of the CRTC’s directive:

* Central Office Code (NXX) Assignment Guideline;
* Canadian Non-Geographic Code Assignment Guideline; and
* Canadian NPA 600 NXX Code Assignment Guideline.

TIF 112 will remain open and a follow-up report will be filed no later than 31 December 2024 to resolve the details of Option 7.

# Scope

For the purpose of this report, 6YY NXX codes are to be used for applications which are non-geographic in nature, are not assigned to Rate Centers and may or may not traverse the PSTN, but do require an E.164 addressing scheme. Calls to 6YY-NXX codes may not be dialable from the PSTN and route only within the assignee’s network. The use of this NANP numbering resource is to communicate with both fixed and mobile devices, some of which may be unattended. This resource may be used for applications enabling machines, which would include but not be limited to wireless devices and appliances, the ability to share information with back-office control and database systems and with the people that use these. Service is limited only by terminal and network capabilities and restrictions imposed by the service provider.

This report pertains to the assignment of 6YY resources and is not intended to constrain in any way how individual Carriers may implement the solutions within their own networks and systems.

# Background

# North American Numbering Plan (NANP)

Canada obtains its numbering resources from the North American Numbering Plan Administrator (NANPA). The NANPA provides telephone numbering resources to 20 North American countries[[1]](#footnote-2) and comprises international telephone dialing World Zone 1 (WZ1). The NANP numbering format complies with the International Telecommunication Union (ITU) Recommendation E.164, namely a framework for international numbering.

ITU Recommendation E.164 requires[[2]](#footnote-3) that telephone numbers be a maximum of 15 digits and be comprised of a country code (CC) of 1 to 3 digits and the remainder comprises the destination (DN) number. Canada is a member of WZ1 and has the country code 1.

The NANP destination network telephone number currently consists of ten digits in the format NPA-NXX-XXXX, where NPA is the regional Number Plan Area or Area Code, the NXX or Central Office Code (CO Code) is the 10,000 block of telephone numbers, and XXXX is the line number. In the last 7 digits of the number (NXX-XXXX), N represents a digit between 2 and 9 and X represents a digit between 0 and 9. Within each NPA, there are approximately 800 CO Codes available for assignment. (In geographic NPAs, certain NXXs are set aside for N-1-1 services, meaning only 791 are available for general use. Setting aside these codes may not be necessary in non-geographic NPAs.) In Canada, geographic telephone numbers are currently assigned to Carriers on a CO Code basis. Each CO Code provides 10,000 telephone numbers and is confined to an Incumbent Local Exchange Carrier (ILEC) geographic Exchange Area.

**Figure 1:** International ITU-T E.164-Number Structure for Geographic Areas



Canada is part of Country Code 1.

# Canadian Numbering Plan and Dialling Plan

The Canadian Numbering Plan and Dialling Plan[[3]](#footnote-4) is consistent with ITU E.164 and NANP. The numbering plan is recommended reading and the CSCN assumes that the reader is familiar with this document.

The Canadian numbering plan is best known by its area codes (national destination codes or NPAs) which are assigned to Canada. Area codes are assigned to geographic areas, such as 416 (Toronto), 613 (eastern Ontario), and 604 (Vancouver).

The default dialling plan in Canada is currently 1+10 digits, referring to the country code plus 3 digits for the NPA, 3 digits for the NXX and 4 digits for line number. The exceptions are for local calls where the country code, and possibly the NPA, are not required. Certain alternatives in this report contemplate using additional digits.

# Numbering Resource Utilization Forecast (NRUF)

The Canadian Numbering Administrator (CNA) conducts annual (or more frequent) telephone Numbering Resource Utilization Forecasts (NRUFs)[[4]](#footnote-5) to estimate the exhaust of numbering resources such as Numbering Plan Areas (NPAs) over a period of six years. The CNA extrapolates the aggregate forecast beyond six years to align with NANPA processes.[[5]](#footnote-6) This aggregate forecast allows the estimation of exhaust dates for various numbering resources to guide relief planning activities, which take years of preparation and implementation by the telecommunication industry.

The NRUF is a forward-looking forecast and the challenge with a forward-looking forecast is that the uncertainty increases as the time out from the forecast survey increases. In other words, there is no data that suggests that the forecast in six years will be accurate or higher or lower than predicted.

# North American Numbering Plan Expansion

The North American Numbering Plan Expansion (NANPE) is the anticipated expansion of the NANP dialing plan from 1+10 digits to 1+ more than 10 digits. It will be triggered by the projected exhaust of NANP area codes (NPAs) which is currently forecasted to happen in 2051[[6]](#footnote-7). This exhaust date is re-calculated regularly by the NANP Administrator (NANPA) from NRUF results from countries such as Canada and the US.

NANPE has been examined by the Alliance for Telecommunications Industry Solutions Inc. (ATIS) Industry Numbering Committee (INC) which published the NANP Expansion Plan and Reference Documents ATIS-0300071 and ATIS-0300072 in August 2002, 22 years ago. The documents assess important topics such as existing and future NANP Functionality, human factor needs, options analysis, transition strategies, trigger points and dependencies, and recommends a new format and numeric structure of the NANP to expand its capacity.

The recommended plan, ATIS-030071, states that the plan is, “intended to be a living document to be kept current by the industry through regularly scheduled updates or action trigger mechanisms which are identified and maintained in the document.”[[7]](#footnote-8) The CSCN is not aware of any updates to the plan since the August 2002 release of the plan.

In any event, the NANPE plan of record states that the NANP dial plan be extended from 1+10 digits to 1+12 digits. This would be compliant with ITU Recommendation E.164 that allows for a maximum length of fifteen digits. The transition to 1+12 digits would impact all areas of the PSTN and it was estimated to take approximately ten years to implement. The plan recommends introduction of more digits during phases such as “digit detection” and “digit unlocking.”[[8]](#footnote-9)

CSCN tracks issues such as this through INC updates presented by the CNA at CSCN plenary meetings.

# Introduction

The following sections discuss (1) the factors which affect the demand for non-geographic (6YY) NPA and their NXXs; (2) the forecast for 6YY NXX demand nationally; and (3) how service characteristics determine whether public telephone numbers (TNs) are required and how use of certain numbering schemes can defer the exhaust of the current supply of Canadian NPAs.

# Internet of Things (IoT) / Machine to Machine (M2M)

The Internet of Things (IoT), also known as Machine-to-Machine (M2M) communication, is the service category for autonomous devices. They are data-oriented devices, i.e., they utilize little or no human input. IoT/M2M devices communicate with each other or with centralized computing systems or edge computing to process commerce-related or control transactions. These include commercial transactions (e.g., for parking machines and retail dispensing machines), geographic tracking (e.g., truck or container real-time tracking), and control (e.g., machine monitoring or telemetry, and process monitoring). IoT/M2M is growing because it saves labour costs, is inexpensive, is available 24x7, and is further enabled by mobile wireless data access services such as Wi-Fi, Bluetooth, and 4G and 5G. The growth projection of IoT/M2M is extraordinary. The global IoT/M2M market was valued at US$ 478.36 billion in 2022 and is projected to become US$ 2,465.26 billion in 2027, which is a growth rate of 26.4%.[[9]](#footnote-10)

IoT/M2M devices may be found on wireline or wireless (mobile) networks. IoT/M2M devices require network addresses to send data from point to point. In many cases, IoT/M2M devices require NANP-based telephone numbers to be compatible with Carrier Network Elements (NEs) or platforms and Operational Support Systems (OSS) and Billing Support Systems (BSS) (collectively “support systems”). OSSs provide network provisioning, surveillance, alarms, and maintenance functions. BSS systems support assignment and billing functions and are often TN-centric. In some cases, IoT/M2M services utilize the mobile Short Message Service (SMS), and it is not inconceivable that they may support voice communications.

# Non-Geographic Telephone Numbers

Voice service telephone numbers must be assigned a geographic telephone number that is assigned to a specific ILEC exchange. This is required for calls to be completed and to support services such as the billing of long-distance services, local number portability, and call routing for N-1-1 services.[[10]](#footnote-11)

Data services such as IoT/M2M generally do not require geographic TNs that reflect the location of the devices or allow communication with the PSTN. Instead, they can use non-geographic numbers that only indicate which Carrier is providing the connectivity to the devices.

In 2015, the CRTC approved[[11]](#footnote-12) a Canadian Steering Committee on Numbering (CSCN) recommendation to deploy and administer six non-geographic “6YY” NPAs (namely: 622, 633, 644, 655, 677, and 688) for the purposes of supporting data services such as M2M.[[12]](#footnote-13) 6YY telephone numbers are described as being non-geographic because they are assigned to Canada but not to a specific geographical area within Canada. 6YY numbers are compatible with both NANP and E.164. In the United States, a number of NPA codes have been assigned for the same purpose. These are referred to as 5XX NPAs in this report. No communication between 6YY and 5XX devices is contemplated as part of this report.

6YY numbers can support inter-network communication, i.e., devices on one Carrier’s network can communicate (including by SMS or possibly voice over IP) with devices on another Carrier’s network by using the assigned TNs. In the case of wireless IoT devices this is particularly important because it will allow continuous connectivity even if the device roams to another Carrier’s network. Currently, inter-network communication arrangements are bilaterally negotiated.

# IoT/M2M Numbers and Network Platforms

The CSCN consulted the Network Working Group (NTWG) to obtain insight of the network address needs of IoT/M2M services. The NTWG opened TIF 43 and received and reviewed contributions and held discussions. The NTWG advised that many Carrier network infrastructure platforms, including support systems,[[13]](#footnote-14) require telephone numbers in a NANP format due to their software architecture. Support systems can be modified, but such changes would affect interoperability, billing, activation, maintenance and regression testing. Such extensive changes would be resource intensive and require years to implement. In some cases, devices require wireless Short Message Service (SMS) services to activate the device, which in turn require NANP-compatible TNs.

# IoT/M2M use of Alternative Addressing methods

Some IoT/M2M devices and systems do not require NANP or E.164-compatible TNs. In this case, the service provider may develop its own network address scheme that does not follow the NANP or E.164 TN format – referred to as Alternative Numbering Schemes. The schemes may be based upon almost anything, e.g., a derivative of a wireless device’s SIM card IMSI number. This report assumes that the use of alternative numbering schemes will be confined to the sponsoring Carrier’s network (i.e., intra-network communication only) because the absence of unique addresses would make inter-network communication difficult to arrange. This limitation is significant if there is a chance that connectivity with the PSTN or other Carriers’ IoT devices may be desired in the future.

# 2022 and 2023 6YY NPA NRUF

The CNA extrapolates the demand for non-geographic NPAs to the year 2045. The demand predicted by the July 2022 forecast was alarming and because of this, the CSCN initiated CSCN Task 112 to undertake the development of exhaust mitigation methods for the 6YY NPAs.

The CSCN has chosen to disregard the July 2022 NRUF, based on the consistency of the other three forecasts, including two subsequent forecasts. The analysis in this report will use the July 2023 forecast as the total demand.

The July 2023 NRUF of 6YY NPAs indicates that the last Canadian 6YY NPA will be assigned in 2029. Unless mitigation measures are taken, it will exhaust in 2030. The resulting exhaust date is not alarming but is nonetheless concerning.

As mentioned above, the current NANPA forecast identifies NANP exhaust in 2051. Before exhaust, NANP Expansion (NANPE) must be implemented. Early visions of NANPE involves a 4th NPA digit and a 4th NXX digit, which would severely impact Carrier network elements, end-user devices, support systems and the CNA’s number administration system.

The CSCN expects that NANPE will require a lengthy implementation period, the timing of which is driven largely by the anticipated NANP exhaust date. Since this implementation period has not yet begun, CSCN has no confidence that NANPE will provide relief for non-geographic numbers in Canada before 2030.

Figure 2 illustrates the approximate assignment of the 6YY NPAs reserved for Canada, under the assumptions that no mitigation measures are taken and that there are 800 assignable NXXs per NPA (some alternatives in this report use a different assumption).

Figure 2 also identifies the year in which each 6YY NPA will be activated. This is important in that certain measures discussed in this report may require industry activities before the NPA is activated. E.g., if a certain measure is to be applied to NPA 677 and it will take two years’ advance notice to make the necessary changes, the associated directive must be issued no later than 2025. This will allow the measure to be in place in the beginning of 2028, the year that 677 will need to be activated.

**Figure 2:** July 2023 NRUF of 6YY NPA Consumption

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Years** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** |
| **Total # of NPAs assigned by end of year** | **2** | **2** | **3** | **4** | **4** | **5** | **6** |
| **NPAs in service by end of year(new NPA bolded)** | 622 633 | 622 633 | 622 633 **644** | 622 633 644 **655**  | 622 633 644 655  | 622 633 644 655 **677** | 622 633 644 655 677 **688** |

The current and previous NRUFs are plotted in Figure 3 below.[[14]](#footnote-15) Also shown (the black line) is the current pool of 6YY NPAs, under the same assumptions as for Figure 2.

**Figure 3**: Comparison of NRUF values and current pool of 6YY NPAs

Where the NRUF forecast curve crosses the black pool line indicates when the last of the 6YY NPAs is opened for assignment.

# Potential 6YY Exhaust Deferral Methods

The CSCN has analyzed seven methods to defer 6YY exhaust. Due to complexities associated with already distributed SIM cards, contracts and network implementations, any methods adopted should be prospective (i.e., going forward). These methods may defer 6YY exhaust by expanding the number of 6YY NPAs, by using 6YY codes more efficiently or by using an addressing scheme that does not use TNs (i.e., alternative numbering scheme). More than one method may be chosen.

The methods are listed in Figure 4 and discussed below.

**Figure 4**: Mitigation methods for 6YY NPAs

|  |  |  |
| --- | --- | --- |
| Section | Option  | Method |
| 3.1 | 1 | Obtain Additional Non-Geographic NPAs |
| 3.2 | 2 | Utilize NPA 010  |
| 3.3 | 3 | Alternative numbering scheme  |
| 3.4 | 4 | Partition NPA 600 |
| 3.5 | 5 | Remove N11 and 555 NXX restrictions in 6YY NPAs |
| 3.6 | 6 | New IoT/M2M Network Addressing Standards |
| 3.7 | 7 | Extended 6YY NPA (more than 1+10 digits) |
| 3.7.1 | 7A | Apply NANP Expansion Plan of Record (1+12 digits) to Unused 6YY NPAs  |
| 3.7.2 | 7B | Expand Unused 6YY NPAs to Utilize Full ITU E.164 Number Range (15 digits) |

# Option 1: Obtain Additional Non-Geographic NPAs

Option 1 requires that NANPA assigns additional NPAs to Canada for use as non-geographic NPAs. Option 1 would delay the potential exhaust date by making more codes available for assignment in Canada. The CRTC would have to make a formal request to NANPA to request additional codes.

Option 1 involves no new processes nor would it require CNAC or the industry to make equipment or software upgrades. As a result, it would be simple and inexpensive to implement.

However, Option 1 does not improve numbering efficiency. As a result, each new NPA obtained would only add 791 NXXs to the current inventory (possibly more, subject to section 3.5).

The CSCN is not in a position to estimate how long it will take for the CRTC to obtain NANPA’s agreement to assign additional NPAs to Canada. Once these unused NPAs are reserved in the Canadian non-geographic NPA pool, the CSCN would expect the CNA to be able to have an NPA activated and available for assignment to Carriers as required in approximately one month.

There are limited NPAs left for NANPA to assign, and there is demand for these codes in the other countries within the NANP, most notably the United States.

# Option 2: Utilize NPA 010

Option 2 is for Carriers to activate NPA 010 within their own networks and use these numbers for IoT devices.

NPA 010 is currently available to each Carrier for intra-network data services and its use is limited only by the ability of a Carrier’s network to utilize NPA 010.[[15]](#footnote-16) Each Carrier can adopt NPA 010 independently of other Carriers and no resource code application to the CNA is required. The use of NPA 010 by Carriers for intra-network data services could divert demand of TNs away from 6YY NPAs. The entire NPA 010, if used with the current NANP 1+10-digit numbering format, would provide each Carrier choosing to utilize NPA 010 with 1,000 NXXs or 1,000 \* 10,000 = 10,000,000 TNs.

Further, the Carriers could unilaterally extend the length of their NPA 010 numbers to as many as 1+14 digits, providing even more available TNs. Different Carriers can choose different TN length approaches based on their network equipment. A 2-digit extension to the current NANP 1+10-digit TN format would yield up to 100 times the TNs for each Carrier using NPA 010. A 4-digit extension (to a total of 1+14 digits) would yield 100 times more TNs than a 2-digit extension.

A barrier to inter-Carrier utilization of NPA 010 numbers could be Carrier support systems. This barrier could be significant and could vary by Carrier. Additionally, an application for fixed-location devices could eventually evolve to include a requirement for mobility. There is no centralized mechanism to coordinate the sharing of NPA 010 resources for communication between different Carriers’ networks.

#  Option 3: Utilize Alternative Addressing Formats

Option 3 is for Carriers to use another addressing scheme instead of TNs.

Option 3 is available today and involves Carriers developing their own numbering scheme for IoT/M2M outside the PSTN. Non-dialable numbering schemes exist today, for example wireless Emergency Service Routing Digits (ESRD).[[16]](#footnote-17) Non-dialable IoT/M2M telephone numbers may be based upon SIM card IMSI codes, serial numbers or upon any method that the Carrier desires. Carriers must design and implement their own numbering system, which their network elements and support systems must accommodate.

The quantity of available numbers depends on the number of digits in the addressing scheme. A Carrier could conceivably create a billion numbers for its own use using IMSIs.

As with Option 2, Option 3 is easily applied for devices that are always serviced by a single Carrier and have no reason to communicate with another Carrier’s devices or devices with geographic numbers. If the application may eventually evolve to include any of these requirements, then Carriers will view Option 3 as less desirable.

When Carriers implement alternative numbering schemes (e.g., IMSI-based), they are responsible to ensure that there are no conflicts with NANP numbering resources.

#  Option 4: Partition NPA 600

Option 4 is to re-purpose most of the unused NXXs in NPA 600 as non-geographic NXXs. NPA 600 is in service today as a Service Access Code (SAC) in accordance with the *Canadian NPA 600 NXX Code Assignment Guideline*.[[17]](#footnote-18) NXX Codes in NPA 600 may be assigned to Carriers for the provision of non-geographic services, i.e., TNs in NPA 600 are assignable anywhere in Canada.

Non-geographic services are defined in the *Canadian NPA 600 NXX Code Assignment Guideline* as services that:

a) are provided by Canadian [Carriers],

b) are made available to customers located in Canada,

c) use telephone numbers in NPA 600 NXX Codes,

d) are accessible from public networks that have arranged to route calls to the NPA 600 NXX numbers used for the non-geographic services, and

e) are approved by the CRTC, where the CRTC determines that such approval is necessary.

NPA 600 currently has 16 NXXs assigned (to six different Carriers)[[18]](#footnote-19) out of a possible total of 798 available NXXs.[[19]](#footnote-20) Option 4 contemplates reserving 14 additional NXXs for future use for SAC services and making the remaining 768 NXXs available for IoT.[[20]](#footnote-21)

Given the limited forecasted demand for NPA 600 SACs under the current guidelines, and the relatively large number of unassigned NPA 600 NXXs, then Option 4 would make almost an entire NPA (96%) available for use by IoT devices in a manner identical to that permitted for *Canadian Non-Geographic Code Assignment Guideline[[21]](#footnote-22)*.

Revisions to the applicable guidelines and changes to CNA processes to enable a partitioned portion of NPA 600 to be assigned pursuant to the *Canadian Non-Geographic Code Assignment Guideline* could be implemented within 12 months of the release of a Commission determination to partition NPA 600.

# Option 5: Remove N11 and 555 NXX Restrictions in 6YY NPAs

Option 5 is to make eight NXXs (i.e., 211, 311, 411, 511, 555, 611, 711 and 811 but not 911) available for assignment within 6YY NPAs.

Telecom Decision CRTC 2018-51 states in paragraph 8:

Since the rest of the countries that are members of the NANP, i.e., the United States and many Caribbean countries, do not use these N11 codes as NXXs, it would be unreasonable to request that they modify the database system to accommodate such use by Canadian TSPs only. Therefore, the Commission considers it appropriate to identify all N11 codes as unassignable in the Guideline consistent with the rest of the NANP.

However, the services associated with these NXX codes have no relevance to non-geographic IoT devices and assigning these codes in non-geographic NXXs would not interfere with geographic 555[[22]](#footnote-23) or N11 services. In light of this, the assignment of these codes for IoT devices is now permitted in the US and the BIRRDS database has since been modified accordingly.

If assignment of 555 and seven N11 NXX codes were permitted in Canada, eight incremental NXXs would be made available for assignment in each 6YY NPA. Consistency with the updated BIRRDS database would also be achieved.

Option 5 would require amendments to the *Canadian Non-Geographic Code Assignment Guideline*, for which the CSCN would recommend new language regarding the reservation of NXX codes.

# Option 6: New IoT/M2M Numbering Resource Standards

Option 6 is to use new IoT/M2M numbering resource standards for IoT, when they become available.

New standards from Standards Development Organizations (SDOs) such as ITU, 3GPP or guidelines from organizations such as GSMA or IETF would accommodate the need for many numbering resources for IoT.[[23]](#footnote-24) However, the standards would not be realized nor implemented in network infrastructure and IT systems for several years.

The North American Numbering Council (NANC) is establishing a new "Internet of Things” numbering usage working group[[24]](#footnote-25) to investigate why and how IoT devices use NANP numbering resources. The working group will consider whether there may be preferable alternatives to using NANP numbering resources for IoT device needs. This may present an opportunity to track the development of IoT numbering resource standards development.

In any event, the CSCN estimates that it would take 2 to 5 years for SDOs to develop a new numbering scheme. The commercial availability of network equipment supporting these standards could be several years later, which may be beyond the current Canadian projected exhaust.

# Option 7: Extended 6YY NPAs

Option 7 makes more TNs available in unassigned 6YY NPAs by extending the number of digits from 1+10 to 1+12 (Option 7A) or 1+14 (Option 7B). Several European countries have adopted a form of this method for IoT/M2M services.[[25]](#footnote-26)

Both Options 7A and 7B would require at least two to three years to implement. This is due to required upgrades to Carrier network elements and support systems, and the CNA’s number administration system. During this time period, more 6YY NPAs will be assigned, leaving fewer available 6YY NPAs for extension. However, the quantity of additional TNs that can be made available by extending the unused 6YY NPAs would be very high.

Both Options 7A and 7B would require that the CSCN consider the optimum block size for assignment.[[26]](#footnote-27) Also, NRUFs would have to be adjusted to accommodate the large volume of TNs that would become available.

# Option 7A: Use 1+12-digit TNs in unused 6YY NPAs

Option 7A makes more TNs available in unused 6YY NPAs by expanding the number of digits from 1+10 to 1+12 (i.e., 1-688**X-X**NXX-XXXX.) Option 7A uses the fourth digit excluding the Country Code (the D-digit) to identify an extended number format. This option aligns with the 2002 NANPE plan.

Option 7A would be implemented in two phases. Phase 1 would be applied only to unassigned NPAs (i.e, 1-688**0**-XNXX-XXXX). The “0” in the D-digit (the fourth digit in a TN, excluding the Country Code) would allow for the ready detection of an expanded TN across any expanded-digit 6YY NPAs. Phase 1 would increase the number of phone numbers in an NPA by a factor of 10 (i.e., from 8,000,000 TNs to 80,000,000 TNs).

Phase 2 would unlock the D-digit to be any number from 0 to 9. The resulting format would be 1-688**X**-XNXX-XXXX. This is, in effect, implementation of the NANPE solution and would increase the quantity of telephone numbers by a factor of 10 compared to Phase 1, or a factor of 100 (i.e. from 8,000,000 TNs to 800,000,000 TNs) compared to 1+10. However, phase 2 can only be implemented after a 1+12-digit dialling plan has been implemented across all 6YY NPAs including assigned 6YY NPAs, thus implementation of phase 2 would entail extensive industry coordination and expense. Since the NANPE solution could be changed upon the next industry review, it would be prudent to defer the implementation of phase 2 to avoid unnecessary expenditure of resources.

# Option 7B: Use 1+14-digit TNs in unused 6YY NPAs

Option 7B makes more TNs available in unused 6YY NPAs by expanding the number of digits from 1+10 to 1+14 (i.e., 1-6YY-**N**XX-XXXX-XXXX). This is compliant with ITU-T E.164 standard. This would increase the quantity of telephone numbers by a factor of 10,000, so each 1+14 digit 6YY NPA would have about 80 billion TNs.

Even more TNs can be made available by unlocking the D-digit so that it can be any value from 0 to 9 (i.e., 1-6YY-**X**XX-XXXX-XXXX). This is compliant with ITU-T E.164 standard. This would increase the quantity of telephone numbers by an incremental 20 billion so each affected 6YY NPA would have about 100 billion TNs.

# Analysis

The following analysis estimates by how much each of the various options presented above will delay the exhaust date of current Canadian non-geographic 6YY NPAs (the last 6YY NPA is forecast to be assigned in 2029 based on the July 2023 NRUF) and, in particular, whether they would delay the exhaust until 2051. This is the predicted exhaust date of the entire NANP, by which time some sort of relief is expected for the entire NANP. Although relief of the NANP will be planned for an effective date before 2051, the following analysis assumes that it will not be ready by 2030, which is the current exhaust date for the Canadian 6YY NPAs.

This analysis categorizes each option by one of the following solution types.

* **Full solutions** are those that are expected to provide sufficient non-geographic numbers for Canada’s needs until the NANPE relief date, that support inter-network communication between non-geographic IoT applications and that can be achieved by the Commission and the Canadian industry independently (i.e., with no reliance on NANPA).
* **Partial solutions** are those that support inter-network communication; but that cannot necessarily be achieved by the Commission and the Canadian industry independently and/or that provide only limited relief. Partial solutions may be quicker to implement, giving them the potential to delay the exhaust of the 6YY NPAs until a full solution can be implemented.
* **Other remedies** are those options that make TNs available for IoT, but either are risky due to an uncertainty in implementation or timing such that they cannot be considered reliable options (at least without further exploration); or do not support inter-network communication, which limits their utility. Nonetheless, to the extent that they are implemented by Carriers, they would defer the exhaust of 6YY NPAs.

# Full Solutions

Option 7 (Extended 6YY NPAs) is the only full solution identified, and as discussed above in section 3, provides for the following 2 sub-options: (a) use of 1+12-digit telephone numbers in one or more unused 6YY NPAs or (b):  use of 1+14-digit telephone numbers in an unused 6YY NPA. As further discussed below both Options 7A and 7B would extend the life of 6YY non-geographic NPAs to beyond 2050. Applying Option 7B to a single NPA would provide 100 times more numbers than Option 7A, many more than forecasted demand. The salient question in choosing one over the other is whether the uncertainty in forecasting and the date of relief through NANPE can justify any additional time, resources or risk associated with Option 7B.

Option 7A (one or more NPAs using 1+12 digits) is compatible with the 2002 NANPE plan and would provide 100 times more TNs per 6YY NPA than 1+10 digits. It also provides a standard way to detect expanded non-geographic TNs. Alternatively, Option 7B provides 100 times more numbers than Option 7A but is not compatible with the 2002 NANPE plan. NANPE has not been reviewed for over 20 years and it is not known if the format of the solution will remain at 1+12 digits the next time it is reviewed. Therefore, NANPE compliance is considered but is not heavily weighted in this analysis.

Options 7A and Option 7B are expected to require similar levels of investment and effort in network infrastructure, support systems and the CNA’s number administration system, but there is some risk that Option 7B will be more difficult to implement for some Carriers, and some consideration should be given to its incompatibility with the 2002 NANPE plan. It is expected that it would take Carriers 2-3 years from the date of a CRTC directive to implement either option.

Applying Option 7A to a single 6YY NPA would extend the life of the non-geographic resources to beyond 2050.  Applying it to a second 6YY NPA would provide a generous safety margin without any additional costs or resources. However, if the costs and timing of implementing Option 7B are comparable, it may be a preferable solution, even if it is not justified by the current forecast.

Given the importance of this recommendation, the CSCN has chosen to examine Options 7A and 7B in greater detail. Accordingly, the CSCN proposes:

* that NPAs 677 and 688 be reserved for extended digits; and
* to continue to work toward a recommendation regarding the implementation of Option 7A or Option 7B.

# Partial Solutions

Implementation of Option 7A will provide relief when NPA 677 is implemented, and this can optimistically be expected in 2027. (See Figure 5, below.) However, should this relief be delayed or should demand for 6YY NXXs increase beyond current forecasts, Canada could face a temporary unavailability of 6YY NXXs. (See Figure 6, below.) For this reason, partial solutions should be considered as a means of providing short-term relief.

Three partial solutions have been identified. They are:

* Option 1: Obtain Additional Non-Geographic NPAs
* Option 4: Partition NPA 600
* Option 5: Remove N11 and 555 NXX restrictions in 6YY NPAs

Option 1 is the simplest and likely the least expensive. If even a single additional NPA is obtained, it will provide more relief (791 NXXs) than either Option 4 or Option 5. NANPA’s position is uncertain, but asking would not present any apparent risk. Should additional NPAs be obtained, it will reduce the risk of exhaust being reached in the event of implementation problems for the full solution.

Option 4 would provide nearly a full NPA (768 NXXs) of relief with a straightforward implementation. Option 5 would provide much less relief (8x6=48 NXXs if the N11 NXXs and 555 are assigned), but also has a straightforward implementation and has the additional benefit of aligning Canada’s 6YY assignment guideline more closely with that for the USA’s 5XX guideline. Since both require changes to the *Canadian Non-Geographic Code Assignment Guideline* and within the Canadian networks, there would be an efficiency to doing both at once, and obtaining more than the equivalent of an additional NPA through more efficient use of the NPAs currently available.

The CSCN estimates that Options 4 and 5 could be implemented within 1 year from the date of CRTC approval of the recommendations in this report. With implementation of partial solutions, the CSCN does not expect that 6YY NPAs will exhaust before relief comes in the form of a full solution.

Accordingly, the CSCN proposes that:

* Options 4 & 5 be implemented; and
* the CRTC pursue Option 1.

# Other Remedies

Three other remedies have been identified by the CSCN. They are:

* Option 2: Utilize NPA 010
* Option 3: Utilize alternative numbering scheme
* Option 6: New IoT/M2M Network Addressing Standards

Option 2 is for Carriers to activate NPA 010 within their own networks if their support systems can support NPA 010. Some Carriers could potentially implement NPA 010 in a very short time while others may encounter internal issues relating to their own support systems.

Use of NPA 010 is suitable for IoT/M2M devices that operate only on that Carrier’s network unless there are bi-lateral agreements between Carriers to share a single NPA 010 number plan. Sharing a NPA 010 number plan would likely be difficult to implement. As a result, many IOT/M2M applications may not be candidates for use of NPA 010 because they are required to function across Carrier network boundaries (e.g., tracking devices, or devices that require SMS messaging).

Due to varying implementation periods by Carriers, and the limitation of NPA 010 to intra-Carrier applications, it is not possible to estimate the possible 6YY NXX savings. However, the use of NPA 010 by all Carriers wherever possible is recommended. Such implementations can involve 1+10 digits to up to 1+14 digits depending on individual Carrier preference.

Option 3 is for Carriers to use another addressing scheme instead of TNs. This option is available today and includes mechanisms such as the use of IMSIs or IP addresses. The use of alternate numbering schemes can operate across networks if there is a carrier identification component to address scheme (e.g., the unique Mobile Network Code forming part of an IMSI or the mechanisms for IP address administration). It is not known to what extent the use of alternative addressing schemes is currently relieving pressure on 6YY NXXs, and how it will impact future demand for 6YY NXXs. Use of alternative addressing schemes should be encouraged where suitable for the IoT/M2M application and some Carriers have already begun doing so.

Option 6 is to use new IoT/M2M network addressing standards for IoT/M2M when they become available. New standards for addressing IoT/M2M addressing have yet to be finalized by SDOs, and once finalized would take several years for commercial deployment. As a result, waiting for the availability of new IoT/M2M addressing standards and commercial implementation will not happen before the requirement for 6YY NPA relief. As a result, waiting for new standards to be implemented is not a viable option.

Options 2 and 3 should be encouraged, so that Carriers are aware of these alternatives which not only save public numbering resources but give Carriers more freedom to implement IoT services without dependence on the availability of industry codes. The current forecast already takes into account the use of NPA 010 and alternative numbering schemes. Accordingly, the numerical analysis that follows assumes that Options 2 and 3 will offer no additional relief beyond what may already be reflected in the demand (which would otherwise be higher).

The CSCN proposes that Options 2 and 3 be encouraged when inter-network communication is not an anticipated requirement.

# Calendar of Solutions

In Figure 5, the forecasted demand for non-geographic NPAs and estimated activations dates of the remaining 6YY NPAs are mapped onto calendar years up to 2030. The effect of the recommended solutions on the supply of NPAs (or equivalent NPAs) is shown. Figure 5 includes the expected relief from Phase 1 of Option 7A, for the CRTC’s information. If either Phase 2 of Option 7A or Option 7B is selected, additional supply would be made available.

Figure 6 shows the supply of NPAs (or equivalent NPAs) assuming the implementation of the recommended solutions versus forecasted demand up to 2044. Figure 6 also assumes Phase 1 of Option 7A will be implemented.

**Figure 5**: Calendar of Solutions

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Years | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | NOTES |
|   |   |   |   |   |   |   |   |   |  |
| “Demand” Total # of NPAs assigned by end of year from July 2023 NRUF | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | Note A |
| “Existing Pool” NPAs in service by end of year(new NPAs bolded) | 622 633 | 622 633 | 622 633 **644** | 622 633 644 **655**  | 622 633 644 655  | 622 633 644 655 **677** | 622 633 644 655 677 **688** | Need an incremental NPA | Note B |
| Industry Actions from this report |   |   | Implement Partial Measures (NPA 600 etc.) |   | Extended digit NPAs 677 and 688 ready for deployment  |   |   |  | Note C |
| “Expanded Pool” Equivalent number of 1+10 digit NPAs available | 6 | 6 | 7 | 7 | 25 or more | 25 or more | 25 or more | 25 or more | Note D |
| “New view of in-service NPAs” NPAs in service by end of year(new NPAs bolded) | 622 633 | 622 633 | **600** 622 633  | 600 622 633 **644** | 600 622 633 644 | 600 622 633 644 **655** | 600 622 633 644 655 & **extended digit 677** | 600 622 633 644 655 & extended digit 677  | Note E |

Notes to Figure 5

1. “Demand” row: This forecast is based upon the July 2023 NRUF. In any event, the 6YY NPA rollout plan (or, “roadmap”) must be flexible and reflect the most current NRUF because the NRUF is an extrapolated forecast and when time from the present increases, extrapolated forecasts decline in accuracy.
2. “Existing Pool”: Newly deployed NPAs are **bolded**. The existing six 6YY NPAs will exhaust in 2030.
3. “Industry Actions from this report”: the recommended timing of new measures is listed. They include the introduction of a partitioned NPA 600 and Option 7 (extended digit 677 and 688)
4. “Expanded pool of in-service NPAs,” is the equivalent number of phone numbers expressed in quantity of 1+10-digit NPAs. Initially, there are six 6YY NPAs, namely 622, 633, 644, 655, 677, and 688. The introduction of a partitioned NPA 600 and other interim measures provides approximately another NPA’s worth of telephone numbers which we name “NPA 600.” NPAs 677 and 688, when expanded, will each provision the equivalent of ten or more 1+10-digit NPAs. Therefore, the number of equivalent 1+10-digit NPAs in the 6YY pool becomes 7 NPAs – 2 NPAs + equivalent of 20 = equivalent of twenty-five or more 1+10-digit NPAs.
5. “New view of in-service NPAs” is the implementation estimates of the various NPAs resulting from implementation of the interim and long-term measures described in this report. We note that there is some flexibility in the 2027+ time frame for the implementation of NPAs 677 and 688 to accommodate any changes in the NRUF.

Extrapolating the NRUF forecast out to 2044 and plotting this forecast and supply of non-geographic NPAs yields the following graph (see figure 6). The blue curve is the extrapolated NRUF, the orange line is the current pool of six 6YY NPAs and the grey curve reflects the expanded pool assuming implementation of Options 4, 5 and Option 7 for 2 NPAs (which would bring the Non-Geographic pool size to 25 or more NPAs.

**Figure 6:** Graph of Extrapolated Demand and Supply

# Conclusions

The CSCN concludes that IoT/M2M services are growing at a significant rate that will exceed current supply. The supply of non-geographic TNs must be increased to meet this demand for IoT/M2M network addresses.

NANPE should be considered and accommodated in ongoing CSCN analysis.

# Recommendations

In consideration of all the above, the CSCN recommends that the CRTC direct the CNA to:

1. allocate 768 NXX codes in NPA 600 as non-geographic within 6 months of the CRTC’s directive;
2. eliminate the restriction on the assignment of NXXs 211, 311, 411, 511, 555, 611, 711 and 811 in all non-geographic NPAs within 6 months of the CRTC’s directive; and
3. reserve NPAs 677 and 688 for extended digit format.

In addition, it is recommended that the CRTC request that the CSCN amend the following guidelines as required to reflect (1) the allocation of 768 NXX codes in NPA 600 as non-geographic and (2) the elimination of restrictions on the assignment of NXXs 211, 311, 411, 511, 555, 611, 711 and 811 in all non-geographic NPAs within 6 months of the CRTC’s directive:

* Central Office Code (NXX) Assignment Guideline;
* Canadian Non-Geographic Code Assignment Guideline; and
* Canadian NPA 600 NXX Code Assignment Guideline

# Matters for Further Consideration

TIF 112 will continue working on this task to resolve the particulars of the Extended 6YY NPAs solution (Option 7). Another report will be filed no later than 31 December 2024. This new report will include a recommendation for the implementation of 1+12 digits (with or without digit locking) or 1+14 digits.

# Terms and Acronyms

**Figure 7**: Terms and Acronyms

|  |  |
| --- | --- |
| Term | Definition |
| 5G | Fifth-generation technology standard for broadband cellular networks. 5G has faster download speeds than 4G. |
| 6YY | A Canadian non-geographic area code, i.e., 622, 633, 644, 633, 677, 688. |
| BIRRDS | Business Integrated Routing and Rating Database System |
| BLIF | Basic Listing Interchange File |
| BSS | Billing Support Systems |
| Carrier | A Canadian carrier as defined by the Telecommunications Act |
| CC | Country Code |
| CISC | CRTC Interconnection Steering Committee |
| CLIF | Complex Listing Interchange File |
| CNA  | Canadian Numbering Administrator |
| CNAC | Canadian Numbering Administration Consortium[[27]](#footnote-28) |
| CO | Central Office. Usually used in the context of “Central Office Code.” see NXX. |
| CRTC | Canadian Radio-television and Telecommunications Commission |
| CSCN | Canadian Steering Committee on Numbering |
| D-digit | The fourth digit in a TN, excluding the Country Code, e.g. 1-ABC-**D**EF-GHIJ or 1-ABC**D**-EFGH-IJKLMN. |
| DA | Directory Assistance |
| DN | Destination Network |
| E.164 | ITU numbering plan that ensures that each device on the PSTN has a globally unique number with a maximum 15 digits |
| ESRD | Emergency Service Routing Digits |
| GPSI | Generic Public Subscription Identifier |
| GSMA | Global System for Mobile Communications Association |
| IETF | Internet Engineering Task Force |
| ILEC | Incumbent Local Exchange Carrier |
| IMSI | International Mobile Subscriber Identity |
| INC | NANP Industry Numbering Committee |
| IoT | Internet of Things (also, M2M) |
| IMSI | International Mobile Subscriber Identity |
| IP | Internet Protocol |
| IS | Information System |
| IT | Information Technology |
| ITU | International Telecommunications Union |
| LERG | Local Exchange Routing Guide |
| LNP | Local telephone Number Portability |
| M2M | Machine to Machine |
| MSISDN | Mobile Station International Subscriber Directory Number |
| N | A digit in a telephone number where N = 2 to 9. |
| NANP | North American Numbering Plan |
| NANPA | NANP Administrator |
| NANPE | NANP Expansion project |
| NDC | National Destination Code (area code) |
| NE | Network Element |
| NPA | Number Plan Area or area code |
| NTWG | CISC Network Working Group |
| NoC | Notice of Consultation |
| NPA | Number Plan Area or Area Code. Its format is NNX. |
| NRUF | Numbering Resource Utilization Forecast |
| NXX | The 4th, 5th, and 6th digit of a telephone number. It is sometimes called a Central Office (CO) code and refers to a 10,000 number block.  |
| OSS | Operational Support Systems |
| OTT | Over The Top |
| SAC | Service Access Code[[28]](#footnote-29) |
| SDO | Standards Development Organization |
| SIM | Subscriber Identity Module |
| SMS | Wireless Short Message Service |
| SN | Subscriber Number (7-digit TN) |
| SP | Service Provider |
| TIF | CISC Task Identification Form |
| TN | Telephone number sourced from the North American Numbering Plan. |
| UDP | Uniform Dialing Plan |
| VoIP | Voice over Internet Protocol |
| WZ1 | World Zone 1 (the NANP is identified as WZ1) |
| X | A digit in a telephone number where X = 0 to 9.  |

# Contributions

**Figure 8**: Contributions

|  |  |  |
| --- | --- | --- |
| **Contribution Name** | **Submitter** | **Date Posted** |
| (Proposed) CNTF112A - Address assignment rate of Non-Geographic (6YY) CO Codes | CSCN | 2022-08-25 |
| CNCO198A - CNA contribution - January 2023 NRUF contribution | CNA | 2022-08-30 |
| CNCO199A - Rogers contribution - TIF 112 - Initial thoughts | Rogers | 2022-09-07 |
| CNCO201A - Rogers contribution - TIF 112 - Chronology and Proposal for Services Grouping | Rogers | 2022-11-04 |
| CNCO202A - CSCN contribution - TIF 112 - Letter from CSCN to NTWG | CSCN | 2022-12-01 |
| CNCO203A - CNA contribution - TIF 112 - Comparison between January 2022 and July 2022 Non-Geographic NRUF forecasts | CNA | 2022-12-07 |
| CNCO202B - CSCN contribution - TIF 112 - Letter from CSCN to NTWG  | CSCN | 2022-12-07 |
| CNCO203B - CNA contribution - TIF 112 - Comparison between January 2022 and July 2022 Non-Geographic NRUF forecasts | CNA | 2022-12-15 |
| CNCO204A - Rogers contribution - TIF 112 - Draft TIF report for TIF 112 | Rogers | 2022-12-15 |
| CNCO204B - CSCN contribution - TIF 112 - Draft TIF report for TIF 112 | CSCN | 2023-01-12 |
| NTCO0736 - NTWG contribution from COMsolve - Request from CSCN regarding assistance with CSCN TIF 112 | COMsolve | 2023-02-08 |
| CNCO205A - Comparison between 11-digit numbering and 15-digit numbering pools | CNA | 2023-03-06 |
| CNCO206A - TIF 112 – report planning | Rogers | 2023-03-16 |
| CNCO207A - TIF 112 Request from CSCN regarding assistance with CSCN TIF 112 Part 2 | COMsolve | 2023-03-16 |
| CNCO208A - CNA contribution - TIF 112 – Comparison of Non-Geographic NRUF from January 2022 through January 2023 | CNA | 2023-03-29 |
| CNCO204C - Rogers contribution - TIF 112 – Draft TIF report for TIF 112 | Rogers | 2023-04-03 |
| CNA Contribution - April 2023 North American Numbering Plan (NANP)Exhaust Analysis | CNA | 2023-05-10 |
| CNTF112F - Address Assignment rate of Non-Geographic (6YY) CO Codes - REVISED | CSCN | 2023-06-21 |
| CNCO204D - Rogers contribution - TIF 112 – Draft TIF report for TIF 112 | CSCN | 2023-06-27 |
| CNCO204E - Rogers contribution - TIF 112 – Draft TIF report for TIF 112 | CSCN | 2023-06-30 |
| CNCO204F - Rogers contribution - TIF 112 – Draft TIF report for TIF 112 | CSCN | 2023-07-10 |
| CNCO204G - CSCN contribution - TIF 112 – Draft TIF report for TIF 112 | CSCN | 2023-07-19 |
| CNCO220A - CNA contribution - TIF 112 – Non-Geographic NRUF comparisons up to July 2023 | CNA | 2023-08-18 |

# CSCN TIF 112 Participants

The CSCN recognizes the participation and contributions from the following participants:

**Figure 9**: CSCN TIF 112 Participants

|  |  |
| --- | --- |
| Organization | Name & Specific Roles |
| Bell Canada | Joey-Lynn Abdulkader – Writing CommitteeMarie-Christine Hudon Mohammad TabariFrancis Fernandes |
| CNA | Kelly T. Walsh – CSCN Chair – CNCO203A/B, CNCO206ADavid Comrie – Writing Committee, CSCN Secretary – CNCO197A, CNCO202B, CNCO205A, CNCO208AFiona Clegg – Writing Committee Suresh Khare – Writing Committee, NRUF Forecasting – CNCO198A/C/DJohn Jennings  |
| CNAC | Glenn PilleyBill Barsley |
| COMSolve | Edward Antecol – Writing Committee |
| CRTC | Alexander PittmanMichel MurrayÉtienne Robelin |
| Eastlink | Lindsay Thorne |
| Freedom Mobile | Dilraj Suri |
| Quadro Communications | Darryl Evans – Writing Committee |
| Railway Association of Canada | Enzo De Benitti |
| Rogers | Arturo Arreaga |
| SaskTel | Tammy Wilson |
| Shaw | Graham LeGeyt |
| TELUS | John MacKenzie – Writing CommitteeMartin Laroche Olena BilozerskaPeter Szabo |
| Independent | Gerry Thompson – TIF 112 co-sponsor, Writing Committee Lead, CNCO199A, CNCO201A, CNCO204A/B/C, CNCO206A/B/C/DKaren Robinson – TIF 112 co-sponsor, Writing Committee |

# NTWG TIF 43 Participants

The NTWG recognizes the participation and contributions from the following participants:

**Figure 10**: NTWG Participants

|  |  |
| --- | --- |
| Organization | Name & Specific Roles |
| AT&T | Martin Dolly  |
| Bell Canada | Joey-Lynn Abdulkader Sefiu IbikunleJake HwangMohammad TabariThomas RumballMohanraj Sivagnanasundaram (“Siv”)  |
| CityWest | Paul Fleming |
| CNA | Kelly T. Walsh – CSCN Chair David Comrie – CSCN SecretaryFiona Clegg Suresh Khare  |
| CNAC | Glenn PilleyBill Barsley |
| COMSolve | Edward Antecol – NTCO0736, NOCO0741 |
| CRTC | Sebastien GarsuaultImran GillVish IyerNilesh JoshiJames Ndirangu |
| Eastlink | Russel DeLong |
| Freedom Mobile | Muhammad Uppal |
| Neustar | Marcel Champagne |
| Rogers | Arturo ArreagaPavlo NebesnyJennifer Mack  |
| SaskTel | Garey SchlecterMark Miles |
| Shaw | Graham LeGeyt |
| TELUS | Martin Laroche Richard Polishak |
| TekSavvy | Diane Dolan  |
| Independent | Karen RobinsonGerry Thompson – TIF 43 sponsor, NTCO0729 |

**\*\*\* END OF DOCUMENT \*\*\***

1. [NANPA : North American Numbering Plan Administration - About Us (nationalnanpa.com)](https://www.nationalnanpa.com/about_us/#:~:text=These%20countries%20include%20the%20United,Lucia%2C%20St.) [↑](#footnote-ref-2)
2. [E.164 : The international public telecommunication numbering plan (itu.int)](https://www.itu.int/rec/T-REC-E.164-201011-I/en) [↑](#footnote-ref-3)
3. [Microsoft Word - Canadian\_Numbering\_and\_Dialling\_Plan\_2022-04-13.doc (cnac.ca)](https://www.cnac.ca/canadian_dial_plan/Canadian_Numbering_and_Dialling_Plan.pdf) [↑](#footnote-ref-4)
4. [CNA - Numbering Resource Utilization Forecast (cnac.ca)](https://cnac.ca/NRUF/NRUF.htm) [↑](#footnote-ref-5)
5. NANPA 2022 Annual Report: <https://nationalnanpa.com/reports/2022_NANPA_Annual_Report.pdf> [↑](#footnote-ref-6)
6. [April 2022 NANP Exhaust Analysis (nationalnanpa.com)](https://www.nationalnanpa.com/reports/October_2022_NANP_Exhaust_Analysis_Final.pdf) The analysis predicts exhaust between 2045 and 2051. This report uses 2051 as a latest relief date expected from NANPE. [↑](#footnote-ref-7)
7. <https://www.atis.org/committees-forums/inc/documents/> [↑](#footnote-ref-8)
8. “Digit detection” is the act of assigning a specific number to a specific position in the numbering sequence, e.g., zero in the fourth or “D” digit, to indicate to telecommunications systems that the numbering sequence is other than the standard NANP 1+10 digits. “Digit unlocking” is the act of removing the specific number restriction from a specific position in the numbering sequence. With respect to NANPE, unlocking the D digit would mean permitting any number from 0-9 in the 4th digit. [↑](#footnote-ref-9)
9. [Internet of Things [IoT] Market Size, Share & Trends, 2029 (fortunebusinessinsights.com)](https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307) [↑](#footnote-ref-10)
10. Some Voice over IP (VoIP) technology-based voice services are assigned geographic telephone numbers however they may be located far from the telephone number’s geographic ILEC exchange assignment due to the reach of IP networks such as the Internet. In this case of distant VoIP, the service provider must make special accommodations to provide location-based services such as 9-1-1 to the distant VoIP subscriber. [↑](#footnote-ref-11)
11. [Telecom Decision CRTC 2015-4 | CRTC](https://crtc.gc.ca/eng/archive/2015/2015-4.htm) [↑](#footnote-ref-12)
12. See “Non-Geographic Code Assignment Guideline” and other related information at [CNA - Non-Geographic (6YY) Code Assignment Guideline (cnac.ca)](https://www.cnac.ca/other_codes/nongeo/nongeo_codes.htm). [↑](#footnote-ref-13)
13. See section 3.1. [↑](#footnote-ref-14)
14. CNCO208A can be found at [CRTC – CSCN Contributions](https://crtc.gc.ca/cisc/eng/cisf3ft.htm) [↑](#footnote-ref-15)
15. The Canadian Non-Geographic (6YY) Code Assignment Guideline states that, “Intra-network TNs are TNs that are “not-dialable” from the PSTN and are routed only within the Carrier’s network, e.g., telephone numbers that use NPA 010.” [CNA - Non-Geographic (6YY) Code Assignment Guideline (crtc.gc.ca)](https://crtc.gc.ca/cisc/eng/cisf3fg.htm) [↑](#footnote-ref-16)
16. [CNA - ESRD Assignment Guideline](https://cnac.ca/esrd_codes/esrd_codes.htm) (https://cnac.ca/esrd\_codes/esrd\_codes.htm) [↑](#footnote-ref-17)
17. [Canadian NPA 600 NXX Code Assignment Guideline](https://crtc.gc.ca/cisc/eng/cisf3fg.htm) ([crtc.gc.ca](https://crtc.gc.ca/cisc/eng/cisf3fg.htm)) [↑](#footnote-ref-18)
18. [600 NXX Service Access Code (SAC)](https://cnac.ca/data/ServiceAccessCode_600.htm)  (<https://cnac.ca/data/ServiceAccessCode_600.htm>) [↑](#footnote-ref-19)
19. 800 NXXs minus “600-555” and “600-911” yields 798 NXXs. [↑](#footnote-ref-20)
20. In the last 20 years there has only been 1 600 NPA NXX assignment, which took place in 2016. There has been no demand since then. (The 600 NXX assignment listings for Ligado Networks Corp. indicate a date in 2023, but the date is the result of corporate merger and acquisition activity for NPA 600 resources originally assigned in 1994.) [↑](#footnote-ref-21)
21. [*Canadian Non-Geographic Code Assignment Guideline* (crtc.gc.ca)](https://crtc.gc.ca/cisc/eng/cisf3fg.htm) [↑](#footnote-ref-22)
22. “555 line numbers (LNs) were a unique resource assigned on a national or non-national basis for

public information services.” A subset (555-0100 to 555-0199) is reserved for use by the television/movie industry and 555-1212 is used for long distance directory assistance. All other 555 line numbers have been reclaimed and the 555 assignment guidelines in Canada and the US have been sunset. | [*Canadian Adjunct to the 555 NXX Line Number Reference Document* (crtc.gc.ca)](https://crtc.gc.ca/cisc/eng/cisf3fg.htm) [↑](#footnote-ref-23)
23. Generic Public Subscription Identifier (GPSI) is a public identifier that can take different formats and it is used both inside and outside of a 3GPP system. It is needed for addressing a 3GPP subscription in different data networks outside of the 3GPP system. Ref. 3GPP TS 23.003, 3GPP TS 23.501, TS 23.682, IETF RFC 4282 and shows promise for Option 6. [↑](#footnote-ref-24)
24. [Working Group Membership Directories | Federal Communications Commission (fcc.gov)](https://www.fcc.gov/wireline-competition/competition-policy-division/numbering-resources/north-american-numbering-council/nanc-working) [↑](#footnote-ref-25)
25. CSCN TIF 112 Serial 6 (2022-Oct-11) and [Numbering: The IoT SIM move to 15 digits](https://www.orange-business.com/en/numbering-iot-sim-move-15-digits) (<https://www.orange-business.com/en/numbering-iot-sim-move-15-digits>) [↑](#footnote-ref-26)
26. Too long a block would be wasteful for Carriers with few devices to support. Too short a block would be inefficient in terms of assignment and would make it difficult to find large blocks of numbers for very large IoT applications. Further, it would be desirable for an extended 6YY code to align with the anticipated NANP Expansion (NANPE) format (e.g., phase 1: 1-688(0 or 1)-XNXX-XXXX phase 2: 1-688X-XNXX-XXXX). [↑](#footnote-ref-27)
27. [CNA - CNA Consortium](https://www.cnac.ca/cnac/cna_consortium.htm) [↑](#footnote-ref-28)
28. [600 NXX Service Access Code (SAC)](https://cnac.ca/other_codes/600/600-nxx_codes.htm) (cnac.ca) [↑](#footnote-ref-29)