



National Vector Data – Identification Rules

Edition 3.0

2010-11

**Natural Resources Canada
Mapping and Information Branch
Centre for Topographic Information – Sherbrooke**
2144, King Street West, Suite 010
Sherbrooke, Quebec Canada
J1J 2E8

Telephone: +01-819-564-4857 / 1-800-661-2638 (Canada and USA)

Fax: +01-819-564-5698

E-mail: supportGeoBase@NRCan.gc.ca

URL: <http://www.geobase.ca>

Copyright Notice

© Her Majesty the Queen in Rights of Canada, Department of Natural Resources.
All rights reserved.

GeoBase®

REVISION HISTORY

Date	Version	Description
January 2006	1.0	Original version.
April 2007	2.0	NRNv2 updates.
June 2010	2.1	Minor grammatical updates and org. name change.
November 2010	3.0	Major restructuring of document and addition of Municipal Boundaries theme.

TABLE OF CONTENTS

ABBREVIATIONS 1

TERMS AND DEFINITIONS 1

 IEEE 802 ADDRESS 1

 NATIONAL IDENTIFIER (NID) 1

 NATIONAL VECTOR DATA (NVD) 1

 OBJECT 1

 UNIQUE UNIVERSAL IDENTIFIER (UUID) 1

1 BACKGROUND..... 1

2 INTRODUCTION 1

3 DEFINITION AND DESCRIPTION OF IDENTIFIERS 2

4 NVD IDENTIFIER GENERATION 3

REFERENCES..... 3

ABBREVIATIONS

GUID	Globally Unique Identifiers
ID	Identifier
IEEE	Institute of Electrical and Electronics Engineers – USA
MUNI	Municipal Boundaries
NHN	National Hydrographic Network
NID	National Identifier
NRCan	Natural Resources Canada
NRN	National Road Network
NSDI	National Spatial Data Infrastructure – USA
NVD	National Vector Data
UUID	Universal Unique Identifier

TERMS AND DEFINITIONS

IEEE 802 Address

Digital address proposed by Committee 802 of the Institute of Electrical and Electronics Engineers (USA) that is one basic component of UUIDs.

National Identifier (NID)

Unique national identifier attributed to each NVD object. Each NID is a 32 lower case character string (without blanks) representing a UUID generated at random.

National Vector Data (NVD)

The NVD is intended to be the best vector representation of interest phenomena that is broadly available across Canada. Changes occur when a more up-to-date or more accurate representation than the previous one becomes available. The National Road Network (NRN), the National Hydrographic Network (NHN), and the Municipal Boundaries (MUNI) are examples of NVD.

Object

Information technology model of a real world phenomenon.

Unique Universal Identifier (UUID)

Unique identifier within a universe defined in an application domain. UUIDs are those proposed by the *ISO 19118:2005 standard: Geographic information – Encoding*. They are represented by a 32-character hexadecimal string. The definition and method used for the generation of a UUID is defined in the current document.

1 BACKGROUND

This documentation is intended for National Vector Data (NVD) users and providers on GeoBase and aims at describing and standardizing data maintenance.

The NVD is intended to be the best vector representation of interest phenomena that is broadly available across Canada. These are vector data layers with common characteristics (such as a unique and permanent identifier for each of its basic constituent and the possibility to update data by numerous stakeholders) and therefore share the same data specifications.

NVD present the possibility to be updated on a regular basis by various actors. To allow this, we use update mechanisms among NVD partners. These mechanisms are founded on change management principles established on two basic concepts:

- Identification rules for objects composing NVD
- Change management rules for the data.

The **identification rules** for NVD are presented in the current document while the **change management rules** are presented in the *National Vector Data: Change Management* document available on the GeoBase portal (<http://www.geobase.ca>).

Objects are information technology models of real world phenomena. If the real world phenomenon of interest is considered to be a geographic entity, then the term feature is typically used to describe the model of the entity. In other words, a feature is a type of object.

2 INTRODUCTION

Objects that depict real-world phenomena vary over time, either by their description, by their precision, or by the instruments and methods involved in their initial acquisition. It is therefore possible that more than one representation of the same phenomena exist. Our goal is to build and maintain **only one** representation of each NVD product (the National Road Network, for instance) while allowing that the representations originate from multiple sources (the best source available). Identifiers play a fundamental role in ensuring proper sharing and exchange of objects that have been modified at the source and that have already been provided to users. The implementation of a standard for the permanent identification of a phenomenon and its application must achieve two primary objectives:

- Facilitate the management and distribution of object changes in an incremental manner;
- Facilitate the conflation process, if necessary.

Every occurrence of NVD basic features must be uniquely and permanently identified. As an example, each geometric object in the NRN: *Road Element*, *Ferry Connection*, and *Junction* that describes specific characteristics of the linear network must also be uniquely identified.

The following section presents the definition and description of NVD identifiers and the section after that presents how NVD identifiers are generated.

3 DEFINITION AND DESCRIPTION OF IDENTIFIERS

According to [Bédard *et al.*, 2000], the identifiers must be permanently assigned or persistent. To ensure their stability, the assigned IDs must be insignificant (inconsequential) in their expression [1] (free translation). In other words, the IDs must not contain any information relative to the data. Past experience has demonstrated that encapsulating information within the ID can cause ID modification without any real change ever having occurred in the data.

Within the *ISO TC 211/SC: Geographic Information – Encoding* [2] standard, there is a definition for UUIDs that corresponds exactly to the fundamental requirements sought after for NVD:

“An application domain defines a universe and an identification scheme called universal unique identifiers (UUIDs). A UUID is assigned to an object when it is created and is stable over the object's entire life span. The UUID of a deleted object cannot be used again. UUIDs are required for long-term distributed data management and for implementing update mechanisms. These identifiers are also called persistent identifiers. A special name server may be used to resolve persistent identifiers. The identifiers are unique within a well-defined limited universe defined by an application domain.”

The UUID consists of a 16-byte record and must be void of padding between fields. The hexadecimal values “a” to “f” must be lower case. The total size is 128 bits. For use as human-readable text, a UUID string representation (32 characters) is specified as a sequence of fields. The following string is a UUID example:

- 378a3917e824422cb25f268b8295da51

For more information on UUIDs: http://www.opengroup.org/onlinepubs/9629399/apdx.htm#tagcjh_20

This ISO definition for identifiers has been adopted for “National Identifier (NID)” of the NVD. In other words, a NID is a 32 character lower case string representing a UUID generated randomly and void of padding between fields. The NID (and therefore UUID) generation mechanism is presented in the following section.

4 NVD IDENTIFIER GENERATION

ID uniqueness is one of the fundamental characteristics of NVD. The method retained for unique ID generation consists of using a unique ID generation algorithmⁱ that can be used by data producers with no particular management of range and domain.

NID (and therefore UUID) generation does not require a registration authority for each single identifier. Instead, it requires a unique time value for each UUID generator (computer). This unique time value is specified as an IEEE 802 address, which is usually already applied to network-connected systems. This 48-bit address can be assigned based on an address block obtained through the IEEE registration authority (incorporated into the equipment). This UUID specification assumes the availability of an IEEE 802 address within all equipments that generate a UUID.

The algorithm described above provides producers the needed flexibility while working within a network of partners. The algorithm can be used by all closest to source data producers to modify the data and add a new NID when needed. **NIDs should only be generated and assigned by authorized organizations** (these include those who provide the data or the changes at the source). Specific care must be given to the management of NIDs. These NIDs will eventually allow for data synchronization between organizations. Data users must ensure that they make **no alterations whatsoever to these NIDs** value in order to ensure synchronization. Modifications to NIDs would render them useless for data synchronization.

The assignment and persistence rules of the NID are further explained in the document *National Vector Data: Change Management* available on the GeoBase portal (<http://www.geobase.ca>).

REFERENCES

- 1 Bédard, Y., Larrivée, S. et Proulx, M.-J. “*Travaux de modélisation pour la mise en place de la base de données géospatiales ISIS*”, Laval University, March 2000.
- 2 ISO Technical Committee 211, Working Group 4, “*Geographic Information – Encoding*,” ISO/CD 19118, July 15, 2005.

ⁱ Readers wishing to use a standards-body definition of UUIDs/GUIDs should refer to: ISO/IEC 11578:1996 Information technology -- Open Systems Interconnection -- Remote Procedure Call
<http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=2229&ICS1=35&ICS2=100&ICS3=70> or DCE 1.1: Remote Procedure Call Open Group Technical Standard Document Number C706, August 1997, 737 pages. (Supersedes C309 DCE: Remote Procedure Call 8/94, which was the basis for the ISO specification)
<http://www.opengroup.org/publications/catalog/c706.htm>