National Vector Data - Identification Rules

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REVISION HISTORY

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January – 2006	1.0	Original Version
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ABBREVIATIONS

GUID	Globally Unique Identifiers
ID	Identifier
IEEE	Institute of Electrical and Electronics Engineers
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 Identifiers

TERMS AND DEFINITIONS

Network Linear Element

Several layers of vector data, referred to as National Vector Data (NVD), will share the same specification. The National Road Network (NRN) and National Hydrographic Network (NHN) are examples of NVD.

1 Overview

The objective is to update the NVD product on a regular basis as soon as mechanisms have been established between NRN partners. One of the update mechanisms is by establishing change management principles. The establishment of change management principles is founded on two basic concepts: identification rules and definition / classification of change.

The concept of Identification is based on objects that depict real-world phenomena that 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 may exist. To illustrate this fact, as part of this initiative, the goal is to build and maintain a ***single*** representation of the National Road Network. Identifiers play a fundamental role in ensuring long-term distributed data management and for implementing update mechanisms of Objects modified at the source and already 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 identified: As an example, each geometric object in the NRN: *Road Elemen*t, *Ferry Connection*, and *Junctio*n that describe specific characteristics of the linear network must also be uniquely identified.

2 Identification standard

The Identifiers must be permanently assigned or persistent. To ensure their stability, the assigned IDs must be insignificant (inconsequential) in their expression [1]. 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.

Several standards have dealt with the Road Network. Most of them point to the importance of using Identifiers without ever specifying the manner, format, or method of application. GDF [2], GIS-T (GIS in transportation data standards) [3] and CEN TC 278 [4] documentation have no specifications related to Identifiers. National Spatial Data Infrastructure – USA (NSDI) Framework Transportation Identification Standard was the only document that clearly defined and described an Identifier code [5]. However, within the ISO TC 211/SC: Geographic Information Standard - Encoding [6] the UUID definition did comply to the fundamental requirements sought after:

> “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.”

This ISO definition is thus adopted for the “Identifier”. A UUID generation mechanism is presented in the following section.

3 NVD Identification Standard

ID uniqueness is one of the fundamental characteristics that must be maintained. Two techniques for making IDs unique were studied.

- The first consists of mandating a firm to generate and manage ID ranges depending on data producers.
- The second consists of using a unique ID generation algorithm[1] that could be used by data producers with no particular management of range and domain.

The ***second*** method is best suited and was the one retained.

A UUID is an identifier that is unique across both space and time, with respect to the space of all UUIDs. UUID generation does not require a registration authority for each single identifier. Instead, it requires a unique value over space for each UUID generator. This spatially unique 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. This UUID specification assumes the availability of an IEEE 802 address.

The UUID consists of a 16-byte record and must 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: http://www.opengroup.org/onlinepubs/9629399/apdxa.htm#tagcjh_20

The assignation and persistence rules of the UUID are further explained in the "*National Vector Data – Change Management*"[2] document.

4 NID Values

The algorithm described in the previous section 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***. 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 NID's would render them useless for data synchronization.

[1] 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

[2] This document can be found at: http://www.geobase.ca/geobase/en/data/nrn/nrnv2.html

5 References

1 Bédard Y, Larrivé S et Proulx M-J. "*Travaux de modélisation pour la mise en place de la base de données géospatiale*" *ISIS*, Laval University, March 2000

2 ISO Technical Committee 204, Working group 3, "*ISO/TR 14825 GDF – Geographic Data Files – Version 4.0*," ISO/TC 204 N629, October 12, 2000

3 Dueker, Kenneth J. and Butler, J. Allison, "*GIS-T Enterprise Data Model* with Suggested Implementation Choices",Center for Urban Studies School of Urban and Public Affairs Portland State University, October 1, 1997

4 http://www.nen.nl/cen278

5 National Spatial Data Infrastructure, "*NSDI FRAMEWORK TRANSPORTATION IDENTIFICATION STANDARD -- Public Review Draft*," FGDC-STD-999.1-2000, Ground Transportation Subcommittee Federal Geographic Data Committee, December, 2000

6 ISO Technical Committee 211, Working Group 4, "*Geographic Information – Encoding*," ISO/CD 19118.3, June 15, 2001