

UPDATE OF THE CANADIAN ROAD NETWORK IN A DISTRIBUTED GEOSPATIAL DATA FRAMEWORK

D. Boutin, M. Sabourin

Natural Resources Canada, Centre for Topographic Information
Dboutin@nrcc.gc.ca, Msabouri@nrcc.gc.ca

Commission IV, WG IV/2

KEY WORDS: Distributed databases, data modeling, federated databases, road network

ABSTRACT:

For some time now, the Centre for Topographic Information (CTI), part of Natural Resources Canada (NRCan), has wanted to implement a network of partners for capturing and managing geospatial data. These partner organizations, selected for their specific interests (for example, the road network) or for their ease in offering adequate, up-to-date representations of particular phenomena, would make it possible to better serve Canadian community with respect to geospatial data. This new vision has met with the approval of provincial partners and represents a growing trend in the geospatial data infrastructure in most industrialized countries.

These data must be the product of a homogenous, standardized view of the entire Canadian landmass. The approach sought must, to the greatest degree possible, allow each organization to pursue its activities and develop according to its respective needs. Many problems stand in the way of bringing about this theoretical vision of managing spatial data. In recent years, a number of projects have attempted to resolve similar problems, most of which have only been partially successful. One of the main success indicators of cooperative initiatives relates directly to the level of involvement of the participating organizations and individuals. The levels of participation and interest across the board have never been higher. Managing and updating the Canadian Road Network is the first topographic information theme targeted by this new environment for distributed geospatial data.

Sharing geospatial data has been and remains a topic of research and of many large-scale projects. The issue of data heterogeneity in a distributed environment has two distinct but complementary aspects: system architecture and data modeling. [Bishr,1997]. Many private- and public-sector organizations have attempted, through the *Open GIS Consortium* (OGC), to resolve the issues related to system interoperability in particular. This article deals with the issue of data modeling.

Many different models have been developed to manage road network geospatial data. These models attempt to resolve specific aspects such as vehicle navigation, addressing, and 911 emergencies. The main models that attracted our attention are ISO-TC204 GDF [ISO/TC,2000], the data

model for Unified Network Transportation (UNETRANS) [Curtin *et al.*,2001], Enterprise GIS-T [Dueker and

Butler,1997], the identification standards of the FGDC [FGDC,2000], and NCHRP 20-27(2). [NCHRP,1997].

This article looks at the use of many data models. Each of these models must provide a response to a specific problem. Each specific field of application (transportation, addressing, or navigation) uses a slightly different abstraction in order to respond to its own particular needs. Many levels of models should be developed (local model, common or federated model, application model). The set of models must be organized and put in hierarchical order. The use of the federated model for establishing data homogeneity will be analyzed. The advantages and disadvantages of the associated variants will be discussed.

We also discuss the use of the Linear Referencing System (LRS) to convey the descriptive part of the data. This technique will make it easier to develop a more compact common model. We will also discuss the relevance of specifications of ISO TC-204's Geographic Data Files (GDF) within the purview of this architecture. Moreover, we will provide a brief analysis of the use of Geographic Markup Language (GML) [Lake,2001]. The article ends with a description of the state of work underway.

References

- Bishr, Y. (1997). *Semantic Aspects of Interoperable GIS*.
- Curtin, K., V. Noronha, et al. (2001). *ArcGIS Transportation Data Model (Draft), UNETRANS Data Model: 37*.
- Dueker, K. J. and J. A. Butler (1997). *GIS-T Enterprise Data Model with Suggested Implementation Choices*, Center for Urban Studies School of Urban and Public Affairs Portland State University: 46.
- FGDC (2000). *NSDI FRAMEWORK TRANSPORTATION IDENTIFICATION STANDARD -- Public Review Draft*. Reston, U.S. Geological Survey: 126.
- ISO/TC (2000). *GDF - Geographic Data Files - Version 4.0: 651*.
- Lake, R. (2001). *Location-Based Services & GML: 8*.
- NCHRP (1997). *A Generic Data Model for Linear Referencing System*. Washington, National Cooperative Highway Research Program: 28.