Fundamental Topographic Information
Canada's Vision for 2000-05

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Canada during the Nineties

In the early nineties, Canada began digitizing its existing map data at the 1:50 000 and 1:250 000 scales. While certain digital files resulted from the stereodigitization process, the great majority of the information was extracted from original documents such as scribecoats or film overlays. The resultant product became the National Topographic Data Base (NTDB) of Canada.

Around 1995, Canada completed digitization of its coverage at the 1:250 000 scale, amounting to nearly 1000 files. Now in 2000, the NTDB also contains 7000 of its 14 000 files at the 1:50 000 scale. Although referred to as a database, the NTDB and all of its Canadian files are not stored in a database environment, but rather in a data bank. Each file digital corresponds to an equivalent topographic map and is simply stored on a disk.

All production of the digital files was financed through partnerships with the provinces and territories, or with the private sector.

By 1999, there was digital coverage for all of southern Canada, that is, for nearly all of the most economically active part of the country. In addition, it was becoming increasingly difficult to find new partners to finance production for the northern part of Canada. During these ten years of production, NTDB standards had reached their maturity, as evidenced by the facts that the products had been widely distributed in the community and the number of users hadn't stopped growing. Moreover, all production work had been outsourced to private-sector firms in the field of geomatics. This line of business therefore had also achieved maturity.

Customer Needs in 2000

More Up-to-date Digital Data

While Canada now has a digital database, little effort has been devoted to updating it. In fact, about 50% of NTDB data is almost 20 years old, and 25% dates from more than 40 years ago.

Furthermore, once the data have been updated, an increasing number of users will want to receive only the changes.

Faster, Easier Access

During the 1990s, most data were distributed on magnetic tape, diskette, and lately CD-ROM. Around 1995, 90% of users were satisfied if they received their data within 10 days of ordering. In 2000, the trend is towards real-time data access due to the growth in use of digital data, simplification of tools, and, obviously, the arrival of the Internet. Users now want to receive data that conform to specific divisions and often already integrated with other data.

More Accurate Data

NTDB files come from existing maps that were produced in the second half of the 20th century (since World War II). During this period, methods for determining photogrammetric control, aerotriangulation, and stereodigitization evolved greatly. Consequently, product quality varied and continually improved over time.

Users now want a product of more homogenous quality or, at least, homogenous in specific sectors (themes or territories). To illustrate, a user may want more accurate, high-resolution data in highly developed sectors and uniform quality for the same type of activity.

Consistency with External Data (other source or origin)

Although users generally use the NTDB as base data , they often add data from other sources. Now they want all these data to be integrated into a whole. For example, if a street is represented in three data sets, they want it to appear in the same location in each data set.

Technological Environment

The Internet

The Internet is now an integral part of all access and business activities. In the near future, high-speed lines will enable users to exchange and handle large volumes of topographic data very rapidly. It is quite probable that, before 2005, all of our topographic data will flow over the Internet. This will cause an increase in disparate data and aggravate the problem of alignment between data from different sources.

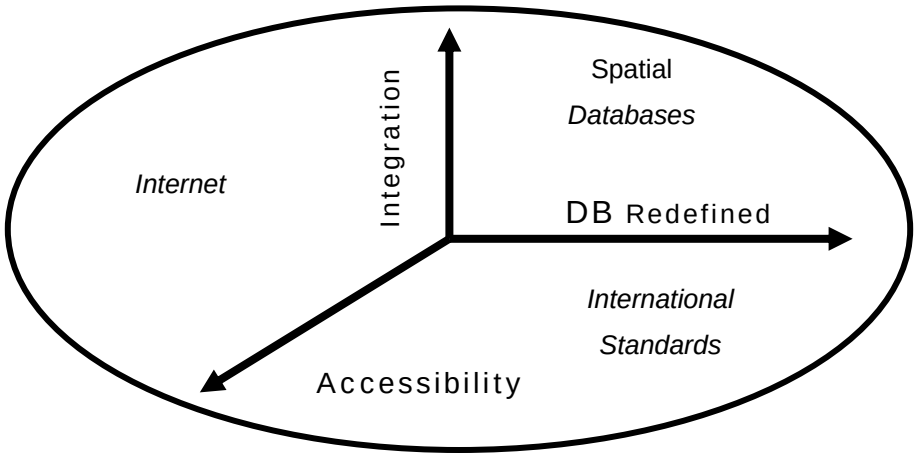
Increased Processing Speed

In recent years, computer processing speeds have doubled every two years. In the very near future, the development in performance will be phenomenal. In fact, people are saying that processing speeds will be thousands of times faster than today's computers, possibly millions of times. This will drive the development of real-time data.

Our Vision

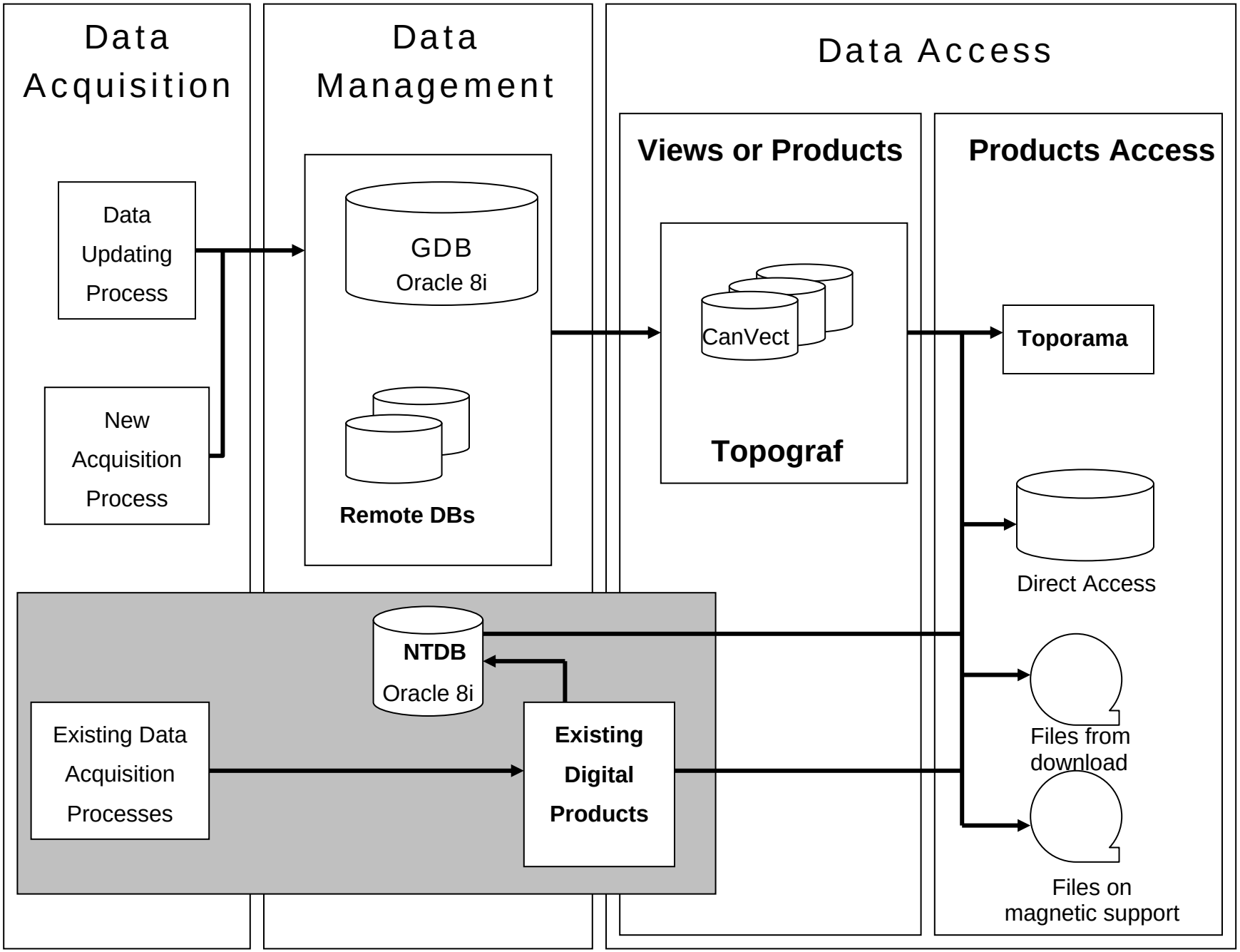
Canada has developed its vision for the next five years based on the information provided above. This planning is both realistic and sophisticated.

As illustrated in the chart below, this vision is based on two major strategic thrusts: increasing data accessibility and taking into account integration problems between the various representations of digital topographic data in Canada. The convergence of these two orientations will produce the third thrust, which will guide the definition of Canada's new topographic database.



Description of the New System

The basic objective of the new vision is to implement a new system for producing topographic digital information that makes maximum use of new technologies and that enables users to obtain a product that is better suited to their needs and delivered within the time frame that they want. The system is illustrated in the diagram below. It comprises the following three subsystems: data acquisition, management, and use. The following description of these components referred to the diagram.


Data Acquisition
Data Management
Data Access
Views or Products
Products Access
Data Updating Process
New Acquisition Process
GDB
Oracle 8i
Remote DBs
CanVect
Topograf
Toporama
Direct Access
NTDB
Oracle 8i
Existing Data Acquisition Processes
Existing Digital Products
Files from download
Files on magnetic support

Existing Products

Although our new strategy will lead us to create new products, our existing ones must remain available for our users. These include NTDB files as well as specific themes such as the Digital Elevation Model (CDED), administrative boundaries, and so on. Users will be able to order these data directly over the Internet for delivery electronically or on digital media.

The NTDB Migrates to Oracle 8i

A copy of all the data in the NTDB has been transferred into the Oracle 8i environment. These files are now available over the Internet and can be used to the fullest making use of the potential offered by DBMSs.

The Geospatial Database

The geospatial database (GDB) will replace the NTDB. It will be a true database, implemented in Oracle 8i. The new infrastructure is already in place and the data acquired using new acquisition processes are gradually being entered. We believe that it will at least contain the information on the transportation network, hydrographic network, vegetation, and digital elevation model by 2005. Its modeling and implementation take into account the international standards developed by ISO Technical Committee 211. The technological solutions comply with the latest developments approved by the Open GIS Consortium with respect to interoperability.

The model is based on an object-oriented approach. This innovative model was designed and described using Preceptory software, a dedicated data modeling tool developed by Laval University in Québec. This software is comprised of a graphic interface and a database.

The GDB can manage the history of topographic features. As a result, the user may only receive, for example, modifications instead of a whole new data set.

All these developments have now been completed and database loading tests carried out with NTDB data. The results have been extremely good, exceeding our expectations in most cases.

External Databases

Initially, a number of themes will reside in the new GDB. We believe, however, that various organizations in Canada will assume responsibility for certain themes that appeared on our topographic maps. To illustrate, toponymy, administrative boundaries, and the transportation network are examples of themes that will be managed by partners. Moreover, some provinces are ready to assume responsibility for all the topographic data in a given territory.

None of this will be apparent to the user. Whenever a user opens a window on the GDB, all these data will seamlessly appear, despite the fact that they will be stored at different locations in Canada. This is what is meant by "distributed database."

Various trials are already underway with quasi-public organizations and provinces to test technological aspects of this concept. We believe that five themes or regions will be connected to the GDB by 2005.

Topograf Products

Topograf products are products that will be based on the GDB. Initially, these will be vector-based products according to themes (Canvect) and raster products. Later, users may be able to select the themes or entities that they want, enabling them to design their own product for a specific area.

Toporama

Toporama is a Web site that currently contains a low-resolution raster view of a portion of NTDB data in GIF raster format. This site, designed for the general public, allows users to view and directly print a map of the sector that interests them. Users may also copy these products and use them for simple applications or as geographic references to their own sites.

Communication

Users can communicate with the Centre for Topographic Information in a number of ways. The main ones are described below.

TRADITIONAL: The user orders his files by telephone, fax, or email, and receives delivery of the data by FTP or on magnetic media.

E-COMMERCE: The user connects to our site, selects the files that are of interest to him, makes payment, and downloads the files.

ANNUAL SUBSCRIPTION: In return for payment of an annual fee, the user can connect to our site whenever he wants and download all the topographic data available.

We believe that, by 2005, communication will be in the opposite direction, that is, from the user to the database, without necessarily transferring data. Consequently, the subscriber could have a direct link to the GDB data, view data, superimpose his own data, and use certain services. As a result, the user could always have the most up-to-date data without having to import them into his system.

The Acquisition Process

Unlike practice over the last 60 years, updating will be increasingly done on an entity basis. For example, we think that the theme Vegetation does not require accuracy needed by the theme Road Network. Consequently, vegetation could be automatically extracted from satellite imagery, whereas the road network would be positioned using GPS sensors. The hydrographic features and certain other phenomena could be updated using Landsat 7 ortho-images.