

Urgences-santé uses GIS to save lives



The Corporation of Urgences-santé is the largest emergency pre-hospital services provider in the Province of Québec serving a population of more than 2.24 million and covering a territory that includes the cities of Laval and Montreal (744 square kilometres). With nearly 1,300 employees and 160 ambulances, Urgences-santé responds to more than 900 calls and carries out more than 530 ambulance transports per day. In North America Urgences-santé is regarded as a pioneer for their use of a computer aided dispatch (CAD) system for emergency ambulance routing.

Urgences-santé tracks their ambulances using GPS in conjunction with ArcGIS and the Network Analyst extension, which provides them with the ability to perform network-based spatial analysis. GPS data is synchronized with the Network Analyst extension to display the status of each vehicle on a map. Vehicles are assigned a colour that changes as the status of each vehicle changes. Call origination points (geocoded addresses) are automatically located and, in an instant, the most appropriate vehicle to respond is dispatched. The shortest route/distance to travel is then displayed on a map within a mobile data terminal located within each vehicle and accessed by the driver.

“The Network Analyst extension allows us to deploy a number of pre-calculated impedance factors such as volume of traffic during peak periods, evenings, and weekends in order to anticipate response times during the course of any given day,” said François Robitaille, Spécialiste en géomatique et statistiques, Urgences-santé. “This is essential for routing emergency response crews to incidents.”

Updating road data (geometrical and descriptive) regularly is vital to providing emergency response. Obsolete and/or erroneous data can result in longer response times, which can literally mean the difference between life and death. For this reason it was essential for Urgences-santé to take steps to ensure the integrity of their data. Urgences-santé uses a combination of road data from the Cities of Laval and Montreal. Each of the Cities use their own unique data structures and conventions which are specifically suited to their requirements. As a result, it was necessary for Urgences-santé to carry out a series of operations each time they revised new road data to make it suitable for integration into their system. The process of updating and integrating the road

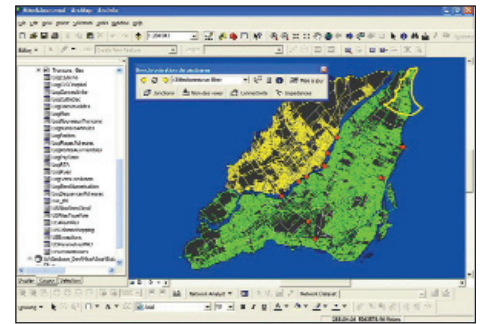
data proved to be a long and difficult one resulting in Urgences-santé performing more than 100 steps. Adding to their concerns was their liability in the event that they sent an emergency vehicle to the wrong location. In order to improve the quality of the digital road network, simplify the process of updating and integrating road data, and reduce liability, Urgences-santé began work on a project in the fall of 2005 to develop what is now called the Digital Road Network Synchronization Module.

The Digital Road Network Synchronization Module is an ArcMap project (MXD file) featuring a series of data layers comprised of three digital road network datasets and more than 20 tables (alias tables, parameters, modification logs, etc). Urgences-santé also created a toolbar using ArcObjects and Visual Basic to display the dozen or so controls that make it possible to launch different procedures encoded within the project.

The principle of data synchronization is based on a number of conventions (guidelines) developed in conjunction with both of the road data suppliers. The most significant convention is the attribution of a unique, non-reusable primary key for each road section. This non-reusable primary key is used to analyze Urgences-santé’s digital road network data and supplier data simultaneously. When changes are detected in the suppliers’ data (such as geometry, new sections, addresses, street names, street direction, and other descriptive information) they are carefully integrated into Urgences-santé’s Digital Road Network.

The data synchronization process, which is performed on a regular basis, is comprised of three major elements:

1. A pre-analysis of suppliers’ data is conducted to make sure it is valid. Careful attention is paid to the addresses segments (parity, order, and overlappings), street types, and city names. Any invalid data is documented in a log table.
2. Synchronization and analysis: Data is compared and updated in Urgences-santé’s road network. The street names are dissected and integrated while making sure not to overwrite the names of expressways which are the subject of a special nomenclature managed by Urgences-santé. Various spatial analyses are also performed, with emphasis on road network connectivity. All changes are documented in any one of 17 log tables.
3. Final revision: All log tables generated during



Digital Road Network Synchronization Module / Le Module de Synchronisation de Géobases

the synchronization process are consulted using advanced navigation tools that allow users to automatically zoom in on individual sections of the map where a change was detected. The logs are also used to “feed” several specially developed revision tools. The three most important revision tools are the “one ways changes detector”, the “expressways nomenclature changes detector” and the “connectivity conflict resolution wizard”, which validate the connectivity between the three different digital road networks used in the process.

“The Digital Road Network Synchronization Module provides significant productivity gains since we spend much less time converting data manually,” added Mr. Robitaille, “The Module has also greatly increased the degree of confidence we have in our data.”

It used to take two to three weeks on average to integrate supplier data and now the process takes less than a day. The synchronization module works day and night to perform the work. As a result of the collaborative efforts between Urgences-santé and their data suppliers, customers of Urgences-santé can take comfort in knowing that their calls will be responded to very quickly and accurately in the event of an emergency.

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