Electronic Maps

TomTom's vision

TOMTOM®

08 / 24 / 2007 Amsterdam

Introduction

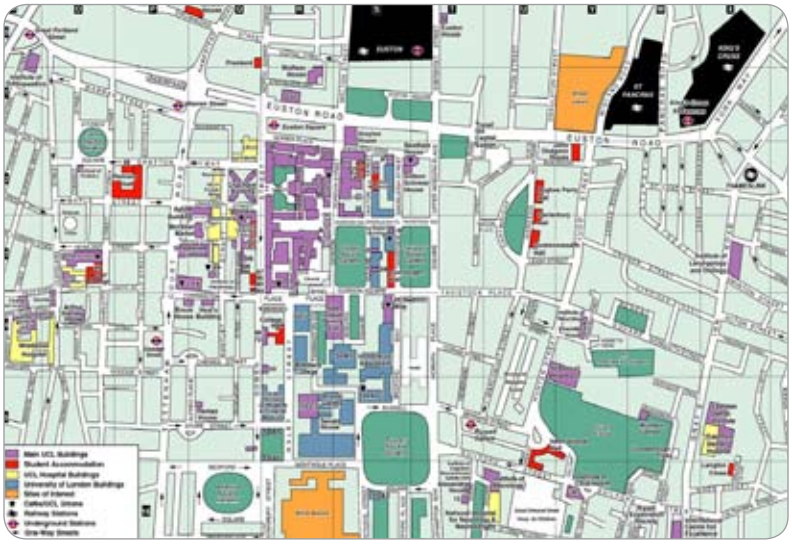
A navigation device is only as good as its maps. This briefing explains how electronic maps are developed and work, and how TomTom is launching a revolution in navigation mapping.

Electronic mapping—a brief history

Today most of us are familiar with browsing maps on-line or using them in a navigation device. But while many think of electronic maps as relatively new technology, in fact electronic mapping began on a commercial basis over 20 years ago, initially with TeleAtlas and later other map suppliers started. Map vendors were set up to produce vector maps (see “The two types of electronic map” below) for the automotive industry. Other companies have since sprung up, but TeleAtlas remains the foremost provider of worldwide navigable maps.

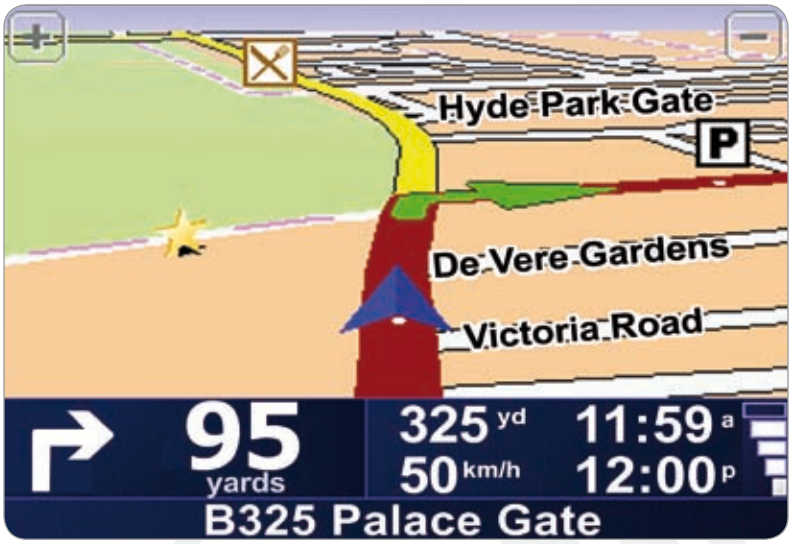
The two types of electronic map

Raster map: Simply an electronic picture of the equivalent paper map. It contains no 'intelligence', is not 'navigable' and can only be printed or viewed like a paper map.



Vector (or navigable) map: a structured database containing all sorts of data, including road geometry (the road's physical shape); road attributes (street name, traffic flow direction, turn restrictions, etc); city names; points of interest (POI's); postcodes, house numbers, etc.

TomTom navigation devices use vector maps, with a raster map overlaid at some zoom levels to enhance the map's visual appearance.

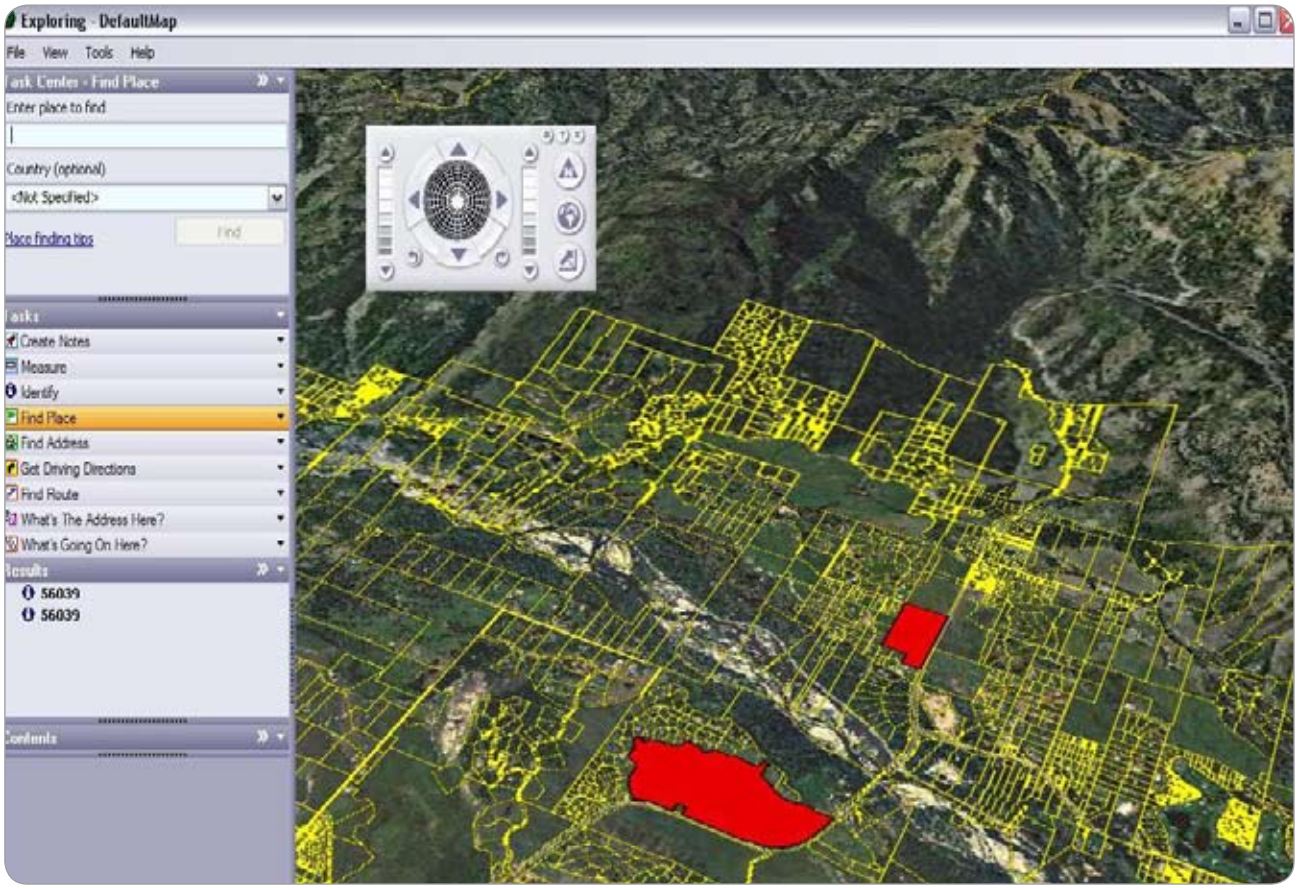


Creating an electronic map

Vector map creation is a long and complex process that combines desk-based map processing and in-the-field surveying:

1. The paper or raster map is first digitised by a data-processing team. This involves 'tracing' all the roads.
2. All points on the map are then geo-coded (i.e. converted into longitude and latitude).
3. The data base is then 'attributed' by adding details of each road: its street name, traffic flow directions, etc.

   More attributes are added from desk-based research into governmental and other data.
4. Finally the roads are surveyed. This involves someone actually driving each road and recording - usually by differential GPS which pinpoints locations to within 50 centimetres and video camera - the road restrictions, traffic flow, signs, speed limits, turn offs, etc.



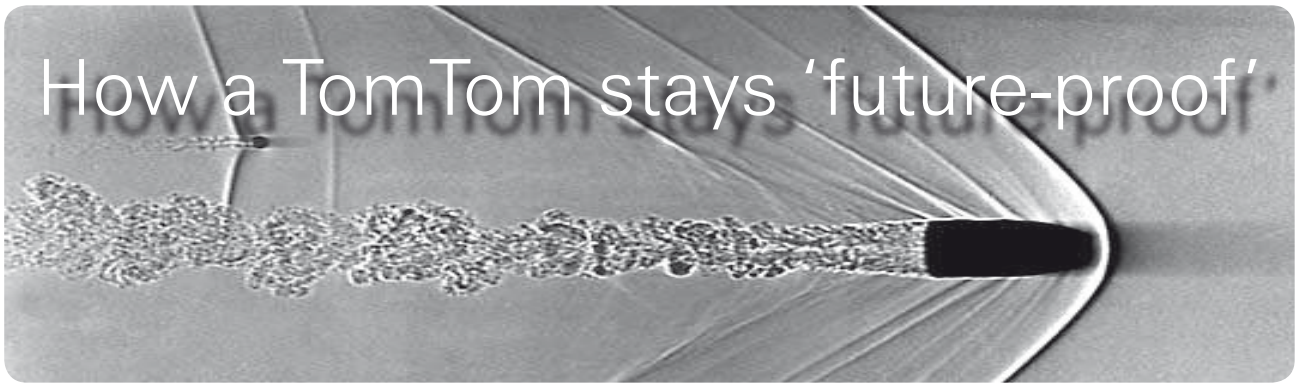
Map maintenance and Map releases

It is estimated that 10–15% of the road network changes every year and POI at a higher rate of 20% per year. There is also inevitably some human error/subjectivity in the creation of a digital map. All of which means that maps must be constantly maintained to keep the level of map errors as low as possible.

TeleAtlas has extensive survey teams constantly out surveying new roads, changed roads, POI positioning and accuracy, map errors, etc. Each change and fix is then checked before being built into the next map release.

TomTom predominently uses TeleAtlas maps, then compiles the map vendor release (i.e. compresses it into a TomTom proprietary and specific format) and has it error-checked by TomTom's own Quality Assurance team. This complex and labour-intensive process can mean it is several months before a map vendor's new release is ready and fit for use in a TomTom product.

How a TomTom stays 'future-proof'



Upgradable navigation devices

TomTom publishes four new map releases for customers per year, and by only using the latest available map releases from map vendors, TomTom ensures its customers always have the most recent map release in their newly purchased product. But with 10–15% of the road network and POI (at a faster rate) changing every year, those maps become increasingly out of date. This matter is solved because TomTom makes all its products upgradable. That is, their maps can be replaced with later map releases or added to with additional map regions.

Downloadable maps

New map releases are available to customers through TomTom's on-line map web store. When you buy a new map on-line (be it a new release of your existing map or a map of a different region), the map is automatically downloaded onto your TomTom device via TomTom HOME, unique content synchronisation software that is compatible with most current PCs and Macs.

Latest map guarantee

Due to the high frequency of new map releases, there's a small chance that a new map is released between the production of the TomTom and the date that it is sold in retail. TomTom therefore offers latest map guarantee to allow a user to check whether there is a more recent map release available. If a more recent map is available, the user can download it once at no charge via TomTom HOME.

TomTom Map Share™

Map corrections and Map Share™

The mapping revolution

The problem

The fundamental problem of inaccuracies and errors inevitable in all electronic maps is to some extent addressed by having regular new map releases and ensuring products can incorporate these new releases.

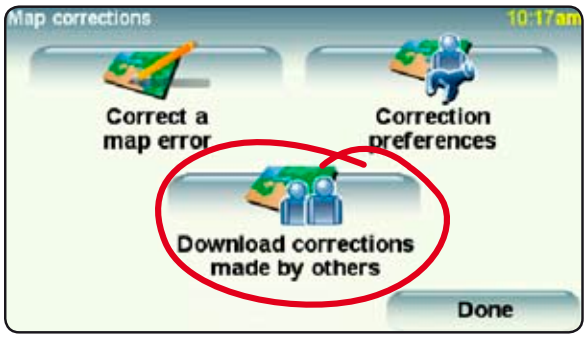
However, the map creation and distribution processes limit map releases to four per year in Europe and North America but even less in other countries. So the consumer has to tolerate any errors between new map releases. Furthermore, there can be no guarantee that the next map release will have fixed a specific local error important to that consumer, potentially leading to frustration and their reluctance to invest in further map releases.

The solution that's a revolution

TomTom has addressed this key issue by introducing its unique and patented TomTom Map Share™ technology. Map Share™ revolutionizes electronic mapping in two ways:

- First, a mechanism allows the user of a TomTom navigator to correct their map instantly on their own device – rather than altering the main map data base, a unique map correction overlay is stored locally on the navigation device.
- Other errors and feedback can be reported directly from the device. These reports do not have immediate effect on the user's map.
- But the real innovation is that these map corrections can then be shared with all other TomTom users, simply by connecting your device to TomTom HOME via a PC or Mac. The process is of course reciprocal, so the user can simultaneously upload changes and corrections submitted by other users (at the time of writing, some 10 million people worldwide).

These corrections will in turn reduce the level of map errors, so improving the accuracy and reliability of the maps.

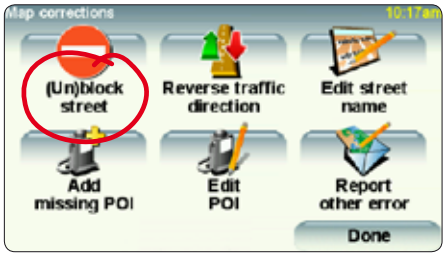


It is not just the technology in Map Share™ that is ground-breaking. What that technology facilitates is in many ways a turning point in the history of the satellite navigation industry. The moment when a company – TomTom – first harnessed the local knowledge of its millions of users and applied it on a global scale, to the benefit of those same users. In many ways, Map Share™ heralds the democratization of map-making.

Trust Levels

To prevent erroneous or malicious map corrections being shared amongst all users, TomTom has an editorial team who check every map correction that is uploaded for sharing, only processing corrections consistently reported by more than a set number of people. They then use special in-house tools that can pinpoint the correction and check it against aerial photography, government and other mapping web sites, and trace log data.

Individual users then select the level of trust they wish to receive. The most common trust level involves downloading and applying only those changes "verified by TomTom".



Map Share's 12-month limitation

Over time, the number and rate of corrections uploaded to Map Share™ increases dramatically. Particularly with new map releases, which each bring with them a mass of new changes. Eventually, the job of validating all these corrections would become so technically complex that TomTom would no longer be able to offer this service at no charge. TomTom will therefore update map errors for map releases up to one year old. Though the users own changes remain valid indefinitely, and when they buy a new map they can access Map Share™ for another 12 months.

Summary

A navigation device is only as good as the maps it uses.
TomTom navigation devices contain the best maps currently available anywhere.

This is achieved by:

- Regular map releases which ensures TomTom's have the most up-to-date maps preloaded.
- A 30-day free latest map guarantee
- TomTom's unique and revolutionary Map Share™ technology
- Upgradable TomTom navigation devices that can easily accommodate new map releases.