

## **Spatial Data on the Internet – The Use of Database Servers for Digital Cartography**

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For some years the internet has been used to distribute and visualize spatial data from databases of cartographic and geographic information to a broad audience. Maps are now delivered to the user in a fraction of the time being required to distribute paper maps. A wide range of distribution instruments exists: servers of raw data (e.g. DEM), maps on demand (Internet Map Servers), image maps, Web-GIS, animated maps, 3D-maps. There is a growing industry with many vendors and third-party companies developing software, that enables the widespread distribution and retrieval of spatial (geographic) data, especially on the Internet. The first real interactive application was the Map Server at Xerox's Palo Alto Research Center (PARC) which has been put online in June 1993. It just generated very simple maps from public domain data. However, this first application helped spreading other ideas for incorporating maps into the web. Within a few months many systems were online. In the meantime, the process of data distribution via Internet is characterized by increasing commercialization and professionalism, that has led to very user-friendly systems. These systems try to meet the user's multimedia orientated perception in transmitting spatial data. Multimedia components complete the usual map generation and show new ways of sharing spatial information. Since these systems have become more user-friendly, more and more enterprises and public organisations use this new technology. In contrast to non-digital maps, resp. ordinary HTML-pages Internet Map Servers are characterized by interactive features which make information more individual and specific. Therefore, such servers offer interesting perspectives for digital cartography in the context of presentation and exploration of spatial data.

But what about specific map design? Statistical data, geographical data and even meta information supplied by database servers show some opportunities for the creation of simple thematic maps, such as travel planning (routing) and localization. It is possible to create new raster-based maps by using static maps offered on webpages as well as vectormaps using freeware software. For non-commercial use, there are often no costs or copyright restrictions. Professional mapping is still limited by the lack of accuracy and reliability of accessible data.

Although a lot of organisations deliver real GIS data, e.g. the US Geological Survey, useful large-scale data sets are hard to find all over the world. In Europe, national mapping agencies have just started to develop comparable online data bases. As a meta information system, the so called *Geographic Data Description Directory, GDDD*, was created to establish a descriptive listing of all the principal geographical databases available from the official National Mapping Agencies of Europe (commercial information and technical information, search tools). In addition, some enterprises offer topographical data or digital elevation models for selected areas. A big problem is still the creation of a consistent dataset from the different country-specific data models which are in use.

Very important for modern cartography is an efficient access to satellite images. Especially the new generations of high resolution imaging satellites imply huge amounts of data, which have to be stored in large archives. Most of them are accessible by Internet. The archives allow queries by geographical position, time of acquisition or type of sensor. Meanwhile, intelligent satellite information mining systems are developed including tools for interactive value adding.