MEETING URBAN GEOSPATIAL CUSTOMER REQUIREMENTS

Geo-Service Provision in Hamburg

The Metropolitan Region of Hamburg (Hamburg and its surrounding fourteen districts) is a strong, dynamic and prospering urban centre in Northern Germany where developments are advanced by the political programme â€˜Hamburg â€“ the growing cityâ€™. A state enterprise, Geoinformation and Surveying Hamburg (LGV), provides up-to date geodata and services for this. To cope with the dynamics of an expanding area and a competitive private sector LGV has initiated many innovations, including creation of a geo-portal: an overview.

The aims of Hamburgâ€™s development project (see text-box) are ambitious: expansion of the cityâ€™s role as a metropolis, reinforcement of its international appeal, promotion of economic growth, support for a growing number of inhabitants, and securing quality of life and sustainability of high-level geo-services and related geo-infrastructures. Located in Northern Germany on both banks of the River Elbe, Hamburg is a â€˜City Stateâ€™ (Stadtstaate) within the Federal Republic of Germany (FRG), a status shared with Berlin and Bremen.

LGV
Up-to-date geodata and services are a prerequisite for all planning and building purposes. Geoinformation and Surveying Hamburg (LGV), a state enterprise under the supervision of the Ministry of Urban Development and Environment, provides these services. With about four hundred employees working in four sections (administration, geoinformation, surveying and geodata services) LGV has annual expenses of e28M and is financed by e11M income and e17M state subsidies. The subsidies finance a substantial portion of LGV tasks representing part of Hamburgâ€™s infrastructure (not income-oriented), such as provision of a Spatial Data Infrastructure (SDI) and the Metropolitan Area (GDI-MRH), and maintenance of cadastral data.

Cadastre
Cadastre and Grundbuch guarantee secure tenure of land in Germany. Running the cadastre for the entire city and state of Hamburg is a major task for LGV. The digital archive of all survey documents, the basis for all cadastral surveys carried out by surveyors either privately licenced or public-sector, will be accessible via internet by the end of 2007. Todayâ€™s largest cadastral project originates in the harbour development plan; parcels have to be redesigned as a result of privatisation of the Hamburg Port Authority. The definition of new boundaries without field surveying is done using LGV internet mapping services. These include provision of cadastral maps and records, boundary points and coordinates, orthophotos, land-use planning and topographic maps.

GPS Service
A GPS service called SAPOS has been established throughout FRG for differential GPS measurements. A network of over 250 GPS reference stations based on the European reference system ETRS89 guarantees accurate referencing. Hamburgâ€™s four reference stations, embedded throughout the network, allow highly accurate survey using GPS, even in urban areas. ETRS89 is also the standard for the cadastre, so that over one million boundary points can be reproduced with GPS and total stations. This means maintenance of the classical infrastructure of survey control points is no longer needed. Nevertheless, the transformation from GauÃŸ-KrÃ¼ger-coordinates to ETRS89 has to be maintained over coming years because the many old plans and maps have to match ETRS89. SAPOS correction data is available via mobile phone, 2m band and internet.

Municipal Surveying
Besides cadastral surveying, LGV is also responsible for municipal surveying. This includes services for govern-mentdepartments within the planning and construction sector supporting civil engineering works, urban and regional planning and disaster protection management. The latter includes the EU project FLOWS, for running-water models and periodic monitoring of dikes and bridges in conjunction with civil works. LGVâ€™s catalogue of standardised elements is accepted and used by all private and public stakeholders involved in the production of the large-scale maps which form the basis for planning authorities. The use of contact-less and satellite-based tachymeters and digitâ€“al levelling instruments guarantees a standardised and efficient workflow. LGV runs a large deformation monitoring programme for dikes, two thousand bridges and (under-river) tunnels. Supporting these works are consulting engineers contracted either by private or government client or by LGV itself.

SDI and Geo-server
Spatial information is fundamental for the support of political and economic decisions. Wherever people have to test, plan and build, the basic conditions must be known; geodata can thus be used by many. Geo-data is registered in various forms but not yet appropriately bundled and accessible. Within the context of FRG efforts to create a SDI, the Metropolitan Region of Hamburg has created a new geo-

portal to present all regional geo-information. The goal is to offer data, services and solutions to the public and the private-sector via a common service. Since data supply should also not end at state borders, neighbouring states are co-operating with Hamburg in establishing and running the project â€˜geo-serverâ€™ as part of German and European SDI projects. The following requirements are intended for implementation:
-promotion of the common use of geodata
-collection and integration of metadata
-generation of a geo-portal on internet and intranet
-realisation of man-to-machine and machine-to-machine communication
-data and service standardisation
-data protection at high level of safety
-e-payment functionality.

3D-City Model
Since 2001 Hamburg has kept and maintained a 3D-city model. According to customer requirements, the 3D-city model was developed at two Levels of Detail (LoD). LoD1 is derived from 1:1,000 digital cadastral maps. The 2D-geometry of about 330,000 buildings covering 755km2, number of floors and land-use as generated from the property register via an interface program are converted into a â€˜building blockâ€™, while other information can be attached. Each building is accessible as an object via the local address, consisting of street code, house number and building number. Added to the building blocks are textures for roads, water bodies and green areas. LoD2 augments LoD1 by adding detailed shapes of roofs, including roof elements, using aerial-photo maps as source. By projecting roof edges external building walls are reconstructed and combined with a Digital Terrain Model (DTM) generated from laser-scanning data with 560,000 key model points. The result is a realistic model of the buildings that meets architectural requirements. Around 130,000 models of buildings in the city centre and the centres of Harburg and Bergedorf district covering 300km2have been created up to LoD2 level.

Partnership
Three-dimensional data can be useful for many purposes in the public and private sector. To widen use of the 3D-city model LGV in June 2006 established a public-private partnership with Swiss company CyberCity. In a first step, this company generated building textures of the city on top of LGVâ€™s 3D-model and DTM; an example is shown in Figure 3. The resulting product was then offered to customers not part of the administration of Hamburg, especially big national and international customers. Indeed, it is a good Hanse tradition that there should be no economic shortfalls, while customer satisfaction is a balance of good services for reasonable prices.

Developing Hamburg

The expansion of the European Union has had a positive impact on Hamburgâ€™s seaport. Container turnover will be over 8 Million TEU (Twenty-foot Equivalent Unit, an ISO standard for containers) by 2020. An, even in European terms, comprehensive urban development project has been set in place which will dramatically change the structure of the harbour area; parts will be transformed into an urban district for mixed use, residential, commercial, leisure, retail and cultural. Restructuring is planned for completion by 2020 and, accessible by a new subway line, expected to provide over 40,000 workplaces and 5,500 residential units for over 12,000 people. Construction will start this year and the Elbe embankment has already become an attractive area for housing and offices. A series of projects have or will be carried out here in which modern architecture plays an important role. Hamburgâ€™s Airbus plant is responsible for major steps in the production of most Airbus output, including the A380. The production area and runway have both been enlarged. Editorâ€™s Note It is said that Hamburg, once part of the famous Hanse merchant guild, is the richest European town but one. None other in Germany accommodates so many millionaires. Furthermore, no other European city has within its boundaries so many freshwater bodies. The number of bridges exceeds those of London, Amsterdam and Venice together. Hamburg is also Germanyâ€™s centre for Information and Communication Technology, and a centre for publishers and insurance companies. Recent research has shown that people living in Hamburg are significantly happier than those living in other German cities.