Working Committee of the
Surveying Authorities of the
States of the Federal Republic of Germany (AdV)

AdV

Official German Surveying and Mapping

National Report

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Geoinformation, i.e. information with a spatial reference about objects and facts, is a key resource of a modern society. Spatially referenced information from different subject areas is linked in digitally managed geographic information systems based on official surveying and mapping geospatial reference data. With these geoinformation systems, there is a potential available to the user which supports and enables numerous decision and development processes in the economy, politics and administration. A virtual merger of the distributed managed geoinformation is, however, only successful via the integrated structure of powerful geographic data information systems. Official surveying and mappingsupports this structure by its function in the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (AdV). They provide a wide range of basic information which is integrated in the geospatial reference data information system.

The creation of spatial data infrastructures locally, regionally and nationally is forced through by politics, economy and administration via joint committee work in order to use the added value produced for society from the virtual merger of distributed managed geographic core data. Official surveying and mapping provides the necessary spatial reference basics here. By providing standardised reference networks, geotopographical basic data and real estate cadastre data in standard-based data models, it creates an interoperable usage of geographic data.

The extensive total supply of matched Germany-wide geospatial reference data comes from the interaction of the Federal Government and its States coordinated by AdV. The challenges of a federally organised official survey are used as an opportunity, by the implementation of best practice solutions in the individual member authorities of the complete official surveying and mapping, to proceed customer-oriented, future proof and optimised in effectiveness and efficiency. The motto is: Strong in the regions and standardised in Germany - for Europe.

The needs of the economy, administration and thus of the citizens in the knowledge and information society promotes not only standard products and methods by AdV member authorities but also the creation of matched and modern sales structures. They are supported by standards for geographic data services and geographic data networks. The eGovernment organisation approach is starting to assert itself by means of the increased use of IT. The output transfer from the German official survey to the customer as „front office architecture“ must be designed as needs-oriented as possible independently from the organisation of the creation of the output in „back offices“ (data collection, processing and maintenance).

The Web-based geodata portals represent a way to do this which is becoming increasingly important. Their tasks are user information, the communication between the user and data provider and the transaction to the user. Many AdV member authorities have already developed powerful geodata portals for their territories. Networking the geographic data portals to the portal system with integrated Web Map Services (WMS) is being worked on hard.

AdV has created a second and proven over time reference path in the form of central contact points, mainly for nationally active users, via the geodata centre at the Federal Agency for Cartography and Geodesy and via the central SA*POS*® agency. Selected geospatial reference basic data of the States are physically merged, harmonised, stored and centrally disseminated here.

Thus the users can choose the appropriate route for them - matched to their needs. Both forms of provision absolutely require national standard geographic basic data and WMS services. This is the central challenge which official surveying and mapping has to face.

The following chapters give an insight into the organisation, the projects, the products, the services and the activities of the AdV. Under the roof of official surveying and mapping, it promotes the complete social decision and development processes in the national and European context.

Prof. Dr.-Ing. Klaus Kummer
President of AdV

Wilhelm Zeddies
AdV Secretary General

1 Organisation and performance of tasks

In Germany, the Federal States assume responsibility for the performance of tasks in field of official surveying and mapping. Since 1948, the specialist authorities of the Federal States and Federal Ministries of the Interior, Defence as well as for Traffic, Construction and City Development responsible for official surveying and mapping have been co-operating in the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (AdV), in order to handle technical issues of fundamental and national importance. The German Geodetic Commission (DGK) as representative of geodetic education and research and the Bund/Länder Working Committee for Sustainable Rural Development (ArgeLandentwicklung) responsible for land consolidation and rural development in Germany have guest status in the AdV.

Surveying and cadastral authorities of the Federal States

In most of the Federal States, the specialist authorities responsible for surveying, mapping and cadastral systems and geographic data information are assigned to the Ministry of the Interior of the respective Federal State. They usually have a three-level administrative structure. The administration of topographic geospatial reference data up to now has been the area of responsibility of the respective state surveying authorities. At regional level, there are still cadastral authorities for handling real estate cadastre tasks and providing large-scale geospatial reference data. In the course of the administration reform, some Federal States have merged their state surveying authority and their cadastral authority into an integrated geospatial information authority and are making use of the synergy effects produced from this.

The range of services offered by the surveying and cadastral authorities includes:

- the area-wide provision of spatial reference data via reference networks in the Authoritative Control Point Information System (AFIS®), consisting on the one hand of terrestrial control points and their proof and on the other hand based on the satellite supported positioning service SA*POS*®,
- the storage of an area-wide image of the earth surface using geotopographical products in the Authoritative Topographic-Cartographic Information System - (ATKIS®) using landscape and terrain models, the official topographical state maps and the aerial photographs,
- the area-wide digital proof of buildings and approx. 63 million land parcels in the official real estate cadastre for ownership rights in the land register (currently using the method of the automated real estate map - ALK and the automated real estate register - ALB, in the future with the Authoritative Real Estate Cadastre Information System - ALKIS®) and
- the integration of the real estate cadastre and state survey in a geospatial reference data system.

Federal Agency for Cartography and Geodesy

Bundesamt für Kartographie und Geodäsie

The Federal Agency for Cartography and Geodesy (BKG) is a federal authority responsible to the Federal Ministry of the Interior. In co-operation with the Federal States, the BKG fulfils the following tasks in the field of geographic information and geodesy.

- provision and representation of current analogue and digital topographic-cartographic information as well as the advancement of the procedures and methods required for this purpose;
- provision and updating of the geodetic reference networks of the Federal Republic of Germany including the required
  - services pertaining to surveying and mapping as well as the theoretical services for the acquisition and processing of measuring data and the participation in bi-lateral and multi-lateral works for determining and updating global reference systems,
  - advancement of the implemented measuring and observation technology;
- representation of interests of the Federal Republic of Germany in the field of geodesy and geographic information on an international level.

Geographic information service of the Bundeswehr

The task of the Bundeswehr Geoinformation Office (BGIO) is to merge all geosciences relevant to the Bundeswehr (geodesy, geography, geology, remote sensing, cartography, geoinformatics, meteorology, climatology, ecology, biology), so that under the slogan „Geographic information from one source“ the geoscientific basis for deployment of the armed forces can be created and the fulfilment of all spatial tasks of the Bundeswehr can be guaranteed. The BGIO closely co-operates with the surveying departments of the Federal States and other federal authorities.

Federal Ministry for Transport, Construction and City Development (BMVBS)

Bundesministerium für Verkehr, Bau und Stadtentwicklung

The BMVBS has been a member of the AdV since 1950. It has assigned the Federal Water and Shipping Authority (WSV) of the Federal Government as a specialist authority, which employs its own surveying personnel, with the operation and maintenance of the federal waterways stretching over 7,300 km. The surveying and real estate division has almost 500 employees. Throughout Germany, official surveying and mapping tasks are carried out that require close consultation with the AdV. The WSV maintains its own reference network (position and height control points) and is a constant user of the SA*POS*® stations. For the waterway network, a digital map system (1 : 2,000) is created and updated, the contents of which are used for advancement of the ATKIS®-Basic DLM. The BMVBS is represented in the AdV by the railways and waterways division.

The figure 1 shows the organisation of the AdV. Its organs are the President and the Plenum. The AdV uses your support of the working groups and the management.

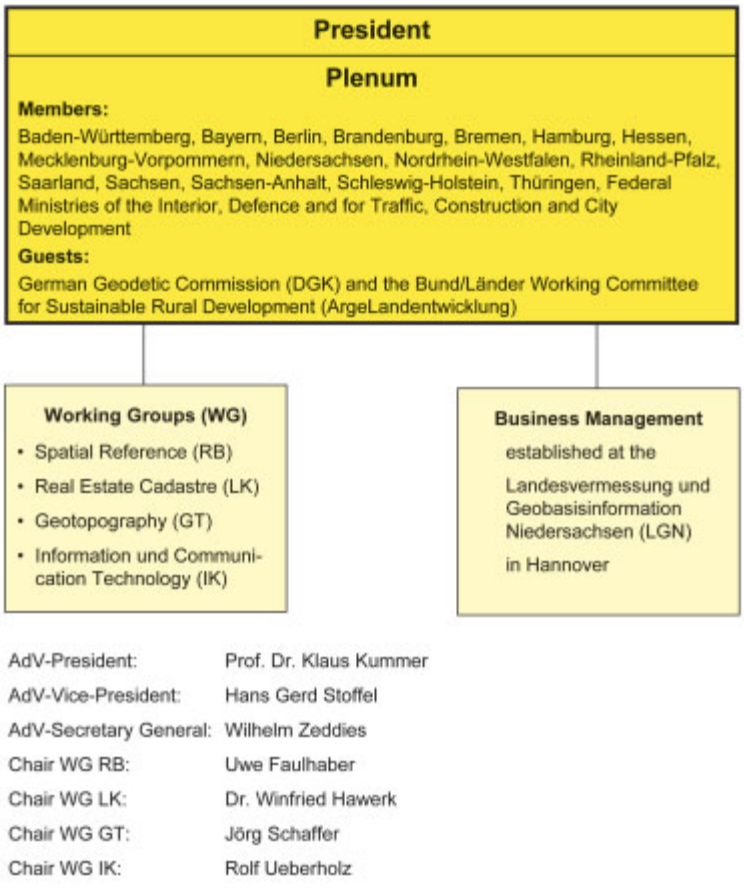

Fig. 1: Organisation of the AdV

Objectives and tasks of the AdV:

The member authorities collaborate in the AdV to

- regulate technical matters of basic and national importance for the official surveying and mapping in a standard way,
- to create a stock of standardised fundamental geospatial reference data oriented to the requirements of the information society and
- to provide the infrastructure for the geospatial reference data as an important component, particularly for modern eGovernment-architectures.

In order to achieve these objectives, the AdV performs the following tasks:

- creation and agreement of future-oriented joint concepts for the national standardisation of real estate cadastre, state survey and the geospatial reference data information system according to the needs of politics, economy and administration,
- advancement of the common execution of nationwide important plans,
- moderation and co-ordination of the standardisation for the recording and management of the geospatial reference data and the access and sales methods,
- support of the structure and further development of the national and European geographic data infrastructure and the corresponding electronic services,
- representation and presentation of the official German surveying and mapping to the outside world,
- participation in international technical organisations for advancing the transfer of know-how,
- co-operation with subject-related organisations and authorities as well as institutions of geodetic research and education and
- agreement for issues of technical training.

Statistics for official surveying and mapping

State	Inhabitants in thousands	Area in square kilometres	Land parcels in thousands	Number of authorities		Licensed surveyors (ÖbVI)
				State authorities	Regional authorities	
Baden-Württemberg	10,717	35,752	8,940	1	44	147
Bayern	12,444	70,549	10,425	1	79	-
Berlin	3,388	892	378	1	12	43
Brandenburg	2,568	29,478	2,978	1	18	156
Bremen	663	404	204	1	1	6
Hamburg	1,735	755	238	1	-	9
Hessen	6,098	21,115	4,945	1	7	83
Mecklenb.-Vorpommern	1,720	23,179	1,855	1	14	78
Niedersachsen	8,001	47,620	6,090	1	14	104
Nordrhein-Westfalen	18,075	34,084	9,178	1	54	487
Rheinland-Pfalz	4,061	19,853	6,364	1	20	87
Saarland	1,056	2,569	1,308	1	-	9
Sachsen	4,296	18,415	2,531	1	12	119
Sachsen-Anhalt	2,494	20,446	2,575	1	-	57
Schleswig-Holstein	2,829	15,763	1,823	1	8	41
Thüringen	2,355	16,172	3,016	1	-	79
Germany total	**82,500**	**357,046**	**62,848**	**16**	**283**	**1,505**

In the context of dealing with special, cross-state technical issues, the activity focuses of the AdV and the performance of tasks are in the areas of geodetic spatial reference, geotopography, real estate cadastres, and information and communication technology.

2 Spatial reference

The superordinate spatial reference for the position, the height and the gravity will be assured for the Federal Republic of Germany via the Federal Agency for Cartography and Geodesy (BKG) by the connection to the global, international reference systems. The satellite positioning service SAPOS® and densified fixed point fields in the States provide this. The central SAPOS® agency in Hannover is the contact for users across Germany of this correction data service. The repeat measurement of the German Main Height Network (DHHN) will be realised in the near future by the member authorities with the establishment of an integrated fixed point field. In addition, there is also the implementation of the Authoritative Control Point Information System AFIS®.

Connection to global reference systems

With its strong participation in the international services of the International Association for Geodesy (IAG), the BKG ensures the basic geodetic supply of Germany and simultaneously contributes to the advancement of geodesy.

Together with the Forschungseinrichtung Satellitengeodäsie (FESG) of the Munich Technical University, it operates the Fundamental Station Wettzell (FSW) within the scope of the Resarch Group Satellite Geodesy (FGS). Based on the „weekly solution, position and EOP“ project, the FGS regularly provides the International Laser Ranging Service (ILRS) with analysis results. In September 2005, the regular assessment of the FGS research programme was carried out by the scientific advisory board. Thereby, the planned work for the period 2006 to 2010 was seen as „international peak performance with exemplary character“. Since 2004, the VLBI analysis group has been preparing the time series „Troposphere Parameter“ (wet & total zenith delays, horizontal gradients) starting in 1984 as a new product for the International VLBI Service (IVS). By means of the ring laser G, a local procedure for the detection of rotation fluctuations of the earth is developed for the first time. The time system of Wettzell, likewise the TIGO system, is integrated in the generation of the international universal time scale UTC.

The BKG also contributes to the maintenance of a homogeneous, global reference system with the establishment and operation of a larger number of IGS stations equipped with GPS/ GLONASS receivers in Germany, Europe and other parts of the world. In the regional BKG data centre, mainly the European IGS stations are processed and managed.

The central office of the International Earth Rotation and Reference System Service (IERS), which has been managed by the BKG since 2001, is building a Data and Information Centre, that will transfer the IERS production information obtained from a complex system of measuring and evaluation procedures to the user professionally and on time (http://www.iers.org). Workshops are organised for the IERS to practically implement scientific findings, new definitions of standards and resolutions for the IERS product and research centres and other IAG services.

Possibilities for an online transformation of individual points are now also being created in the CRS-EU information system for European Coordinate Reference Systems.

The measuring data of the supra-conducting gravimeters at the Fundamental Stations Wettzell and Concepción (Chile) as well as at the stations Bad Homburg and Medicina (Italy) are available to the international „Global Geodynamics Project (GGP)“. A detailed analysis of these data aims at, for example, contributing to the validation of the current satellite-borne gravity field missions and to the improvement of the time-dependant gravity field components.

National geodetic spatial reference

The objective of the SA*POS*® satellite positioning service initiated by the AdV remains unchanged. With modern satellite and transmission technology, a standard, homogenous spatial reference system for numerous application areas in the economy, administration and science is available to the surveying and geographic information authorities of the States. SA*POS*® is based on a widespread network of more than

250 permanently operated GPS reference stations that have been determined based on a diagnostic adjustment in an homogenous, standard reference system of the European Terrestrial Reference System 1989 (ETRS89). SA*POS*® provides its customers with correction data in three service areas of different accuracies using agreed transfer media, data formats and fees, Real-time networking has been introduced to enhance the reliability and accuracy of the SA*POS*® HEPS real-time service. It solves the problem of residual errors caused by the influences of ionosphere and troposphere and errors in the orbital data.

For all SA*POS*® reference stations, a coordinate monitoring in accordance with national standardised principles is being introduced. It consists, on the one hand, of an online-monitoring within the scope of the networking of these stations and, on the other hand, of a monitoring with precise orbital data in post processing for controlling the highly precise coordinates in ETRS89.

The objective of the central SA*POS*® agency installed at the State Survey and Geospatial Basic Information Lower Saxony (LGN) in Hannover, is the provision of SA*POS*® data for nationally active users. As well as increase in the long-term acceptance of SA*POS*®, the AdV also promises an increase in the cost efficiency of the SA*POS*® services of the States installed with high financial expenditure by the member authorities.

To achieve this objective, all SA*POS*® data from the State centres across Germany will be merged and provided for users at the SA*POS*® central point. In addition, the granting of Germany wide usage rights and the setting of fees for this is being done. On request, the SA*POS*® data can be exchanged between the States via the central point. The central SA*POS*® agency also supports the AdV in the co-ordination of nationwide activities.

At the end of 2005, the member authorities of the States have prepared a national data record with identical grid points for a transformation from Gauß-Kruger according to ETRS89 in the decimetre range. From 2006, it can be made available to all interested customers for every federal State and referenced for the entire territory of the Federal Republic of Germany via the central SA*POS*® agency for a fee.

As an alternative to the US-American GPS, the European Union is developing the Galileo civil satellite positioning system. Thus there will be two satellite segments available in the future for SA*POS*®. On the one hand, the integration of GPS and Galileo in SA*POS*® increases the accuracy, but mainly the availability for positioning using spatial techniques. Therefore, the AdV is actively accompanying the development of Galileo. In 2004, the BKG, together with numerous partners has participated in three calls for tender in the context of the 6th framework programme of the European Commission. Fortunately, the evaluations in the course of the year 2005 resulted in all three applications being approved. The object of the largest and with the longest running time project „Implementation of Galileo Geodetic Service Provider Prototype (GGSP)“, where the overall control is at the Georesearch Centre in Potsdam, is the development of scientific, technical and organisational principles for the realisation of the Galileo geodetic reference system and the development of a model for performing all work by a service provider for geodetic assurance of the operation of the satellite positioning system. The object of the „Galileo Integrated Georeference Applicati-ons (GIGA)“ project is to analyse and demonstrate the benefits of Galileo and EGNOS in the area of extremely accurate positioning for the area of energy generation and supply. EON Ruhrgas AG is leading this project. In the third project, „Galileo Local Element Augmentation System (GALILEA)“, station integrity information and ionosphere and troposphere corrections should be calculated in practically real-time and provided to the users in various ways, e.g. via the World Wide Web.

The GREF national reference network of the BKG has been further extended to an integrated real-time network. This extension consists of supplementing and/or replacing the observation stations with combined GPS/GLONASS receivers and implementing the data transmission in real-time. It has been started to create local security networks for the GREF stations with terrestrial measurements. The extension of GREF also includes the combination of the geometric satellite positioning process with dynamic methods of height determination and/or gravity measurements. Therefore, there are also some stations located close to level measuring stations, geophysical observatories or stations of the German gravity reference network. Figure 2 shows the current status of GREF.

The trend, diagnosed for some years, that the traditional, terrestrial marked fixed point fields are becoming less and less important, has been confirmed. Despite the satellite measuring technology, they still cannot be completely dispensed with. Therefore, based on the possibility of providing a major part of the spatial reference via SA*POS*® in the future, the AdV decided in 2004 on a strategy for a nationally uniform spatial reference of the official surveying and mapping in the Federal Republic of Germany. In the future, there will be a standard, national, homogeneous, geodetic basic network which can be densified by State-specific required control point fields. Based on this, a guideline recommendation for control point fields has been developed which is currently expanding into the member authorities administration regulations.

Fig. 2: National reference network GREF

As the German Main Height Network DHHN92 is based on observations from the eighties of the past century, the AdV decided in 2005 to repeat the measurements of the DHHN92 for the years 2006 to 2011. In parallel, modern, highly accurate GNSS measurements and absolute gravity measurements are planned. These actions support the expansion of the integrated control point field. Standard, national specifications have been developed for uniform implementation of the repeat measurements. The planned structure for the repeat measurements can be seen in figure 3.

To safeguard the gravity reference system of the Federal Republic of Germany as regards level and scale in the long term, the BKG conducts regular absolute gravity measurements in combination with continuous recordings from the supra-conducting gravimeters in Wettzell, Bad Homburg and Moxa (station at the University of Jena). The BKG participated at the international comparison of the absolute gravimeter at the international calibration authority BIPM in Paris. Furthermore, interconnection possibilities between the gravity component, the height determination with spatial geodetic tech-

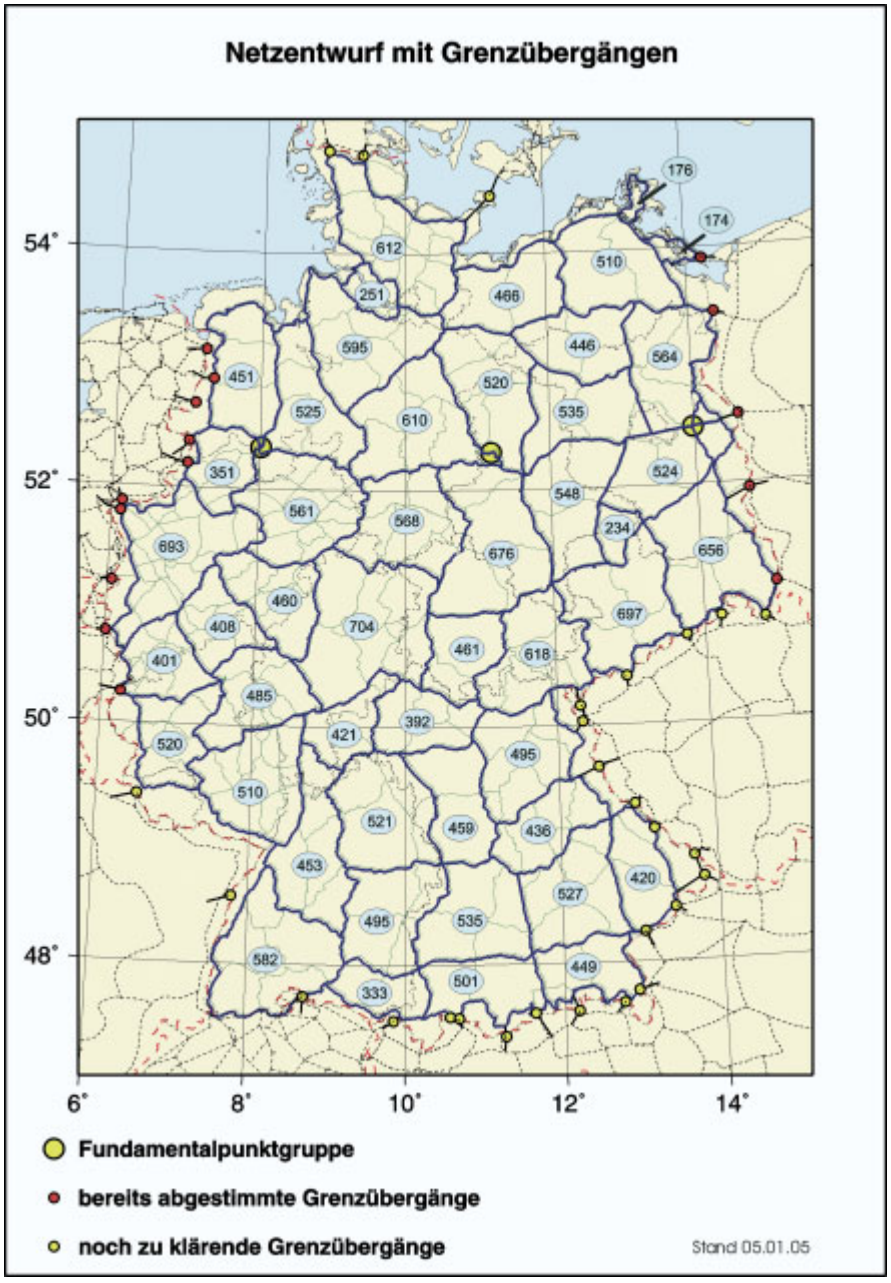

Fig. 3: Draft network for the repeat measurements with loop sizes

niques, the precision levellings and selected coastal level points have been created on the basis of absolute gravity measurements on the GPS stations of the GREF network and on points of the integrated „European Combined Geodetic Network (ECGN)“. The repeat measurement on points of the German gravity reference network 1994 (DSGN94) has been continued. The successful testing of the new A10 field absolute gravimeter on outdoor stations showed the possibilities of this method for stabilisation of the gravimetric reference networks.

Version 2.0 of the AdV quasi geoid has been provided since August 2005. A clear increase in the accuracy in the low and high mountain range as compared with the first version provided since 2003 has been achieved by the introduction of significantly improved and expanded gravity measurements, particularly in the Alpine region, by using a significantly more accurate digital terrain model (DGM25) for the model construction and by a further development of the process with regard to a reduction of the observations by topographical influences. Furthermore, the adaptation of the quasi geoid at the level of the SA*POS*® reference stations decided by the spatial reference working group was carried out. Overall the number of GPS points or levelling points has increased from 675 to 895 points. The gravity reference data as compared with 2003 could be further expanded. Within Germany, data from the Federal Maritime and Hydrographic Agency and the Crude Oil and Natural Gas Industry Association has been added. An improvement of the data sources in the border areas has also been achieved with new data from Belgium, Switzerland and Austria and open-air anomalies in the coastal area.

With the implementation of the Authoritative Control Point Information System AFIS®, there is the possibility of providing the official spatial reference data future and object oriented for modelling and via a standards based data exchange interface for all users. Mandatory geospatial core data for all federal States has been defined and standard outputs specified for the users of position, height and gravity control points, geodetic reference network points and the SA*POS*® reference station points. In the course of the Spatial Data Infrastructure Germany (GDI-DE), a register will be created in 2006 which will contain all information about the co-ordinate reference systems used in Germany. The international standardisation of this register will be aimed for.

3 Real estate cadastre

The real estate cadastre is currently in an upheaval phase. On the one hand, some States are still working hard on completing the ALK data. On the other hand, all States have started the implementation of ALKIS® according to the agreement. The first experiences in the context of developing the ALKIS® software modules also had the consequence that the GeoInfoDok has been and is being subjected to constant development. The logo for the AFIS®-ALKIS®-ATKIS® model, the AAA model in short, has been registered as a word and image trademark. A presentation at the scale of 1:5,000 has been derived from the ALKIS® and ATKIS® geospatial reference data.

Implementation of ALKIS®

The member authorities of the AdV had committed themselves to start the implementation of ALKIS® from 2005. In the meantime, all federal States have started this work. The status of the conversion work is adapted to the prevailing conditions in the federal States.

Strategies have been and are being developed as to how the introduction of ALKIS® can be performed in the most practical way under the prevailing framework conditions. Thereby, special attention is being paid to the complex reconditioning of the available ALK and ALB databases so that the data can be transferred to the new system. In doing so, it must be guaranteed by all federal States that the agreed geographic core data can be realised in ALKIS®.

The GIS industry is working on the different components of the ALKIS® software solutions based on the GeoInfoDok. The States have made contractual commitments with these companies, partly in co-operation with other federal States, in order to quickly drive forward the realisation of ALKIS®. The experience gained in the course of the implementation resulted in a series of necessary modification work in the ALKIS® technical schema which have been recorded in a revision list and processed by the Revision Committee in close technical collaboration with the real estate cadastre working group.

In parallel to the implementation work of ALKIS®, the transfer with the ALK process has been / is still being worked on hard in some federal States. With only a few exceptions, the federal States are reporting a complete conversion or are very nearly complete. In 2005, the degree of completion considered nationally is approx. 95%.

In order to meet the requirements of the customers for provision of the data, a real estate cadastre working group project team is developing key points for fees for analogue and digital standard products from ALKIS®. Results are expected shortly.

AFIS®, ALKIS® and ATKIS®, AAA in short have been registered as a word and image trademark (figure 4). The AdV member authorities should use the AAA word trademark and word and image trademark. It is published on the home page of the AdV.

Fig. 4: AAA word and image trademark

Presentation of real estate cadastre and geotopography at the scale 1:5,000

Under the control of the real estate cadastre working group and in collaboration with the geotopography working group, principles for creating a common presentation of the real estate cadastre and geotopography data at the scale of 1:5,000 based on the AAA model (see information and communication technology section) have been developed. The recommendations are based on a common usage of the data from ALKIS® and the data from the ATKIS® basic DLM and the ATKIS® DGM5. The content and geometric basis form the real estate cadastre database. The recommended minimum content of the presentation is aligned to the ALKIS® geographic core data and is expanded by the height information from the ATKIS® DGM5.

The result is a compiled presentation of the data from the States' member authorities. It is made clear with these recommendations that the unified view of the geospatial reference data of the surveying authorities is achieved for the first time with the AAA model.

The presentation of these selected databases is based on the ALKIS® portrayal catalogue whereby the individual portrayals are adapted to the 1:5,000 scale with simple magnification factors. A colour version is recommended as standard. However, black and white presentations or a reduced colour version are also possible. For example figure 5 shows the colour version.

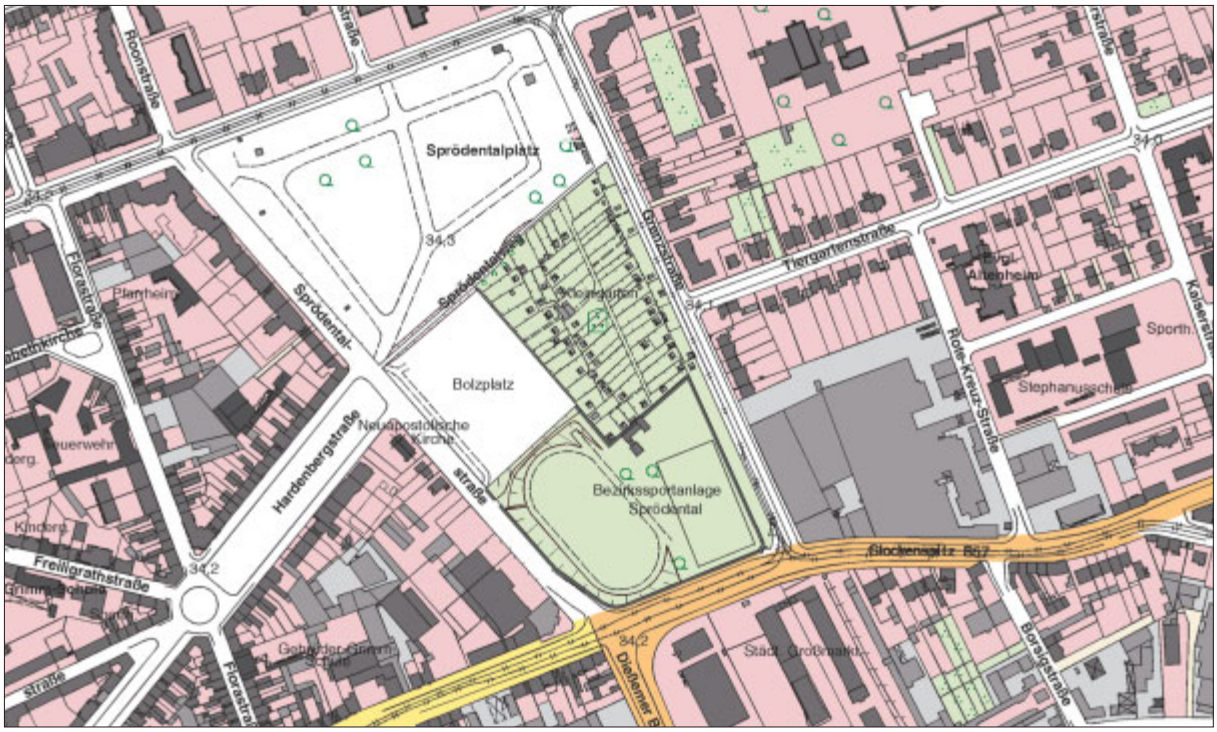

Fig. 5: Colour version of the presentation at the scale 1:5000

Community for the distribution of house coordinates (GVHK)

For many users, official house coordinates are the key to open up new markets and identify and exploit customer potentials. In connection with additional information and own customer data, the wholesale and retail sector, banks, publishing houses, insurance or power supply companies are able to gain more information on their customers and their respective requirements and to control sales and promotion campaigns in a more efficient way. A wide application range is also given in the fields of vehicle navigation, location based services and municipal environments. The house coordinates are generated from the real estate cadastre and are therefore precise and very reliable. Since the beginning of 2006, all States have been represented in the GVHK. The state survey office of North Rhine Westphalia takes over the central provision of house coordinates for national customer desires.

4 Geotopography

Ensuring the up-to-dateness for essential topographical objects in the sub-year area and the customer oriented distribution of geospatial reference data is the focus of the surveying authorities' activities. With the Geodata Centre at the Federal Agency for Cartography and Geodesy (BKG) and the further expansion of State-specific „geodata portals", data and metadata can be offered to a wider circle of users. Access conditions and extended usage conditions are permanently matched. The ATKIS® migration to the AFIS®-ALKIS®-ATKIS® data model represents a new challenge for the surveying authorities

Digital landscape models

One of the core tasks of state survey is the establishment of the Digital Basic-Landscape Model in ATKIS® (Basic-DLM). The ATKIS® Basic-DLM database is the basis for the derivation of the small scale digital landscape model with the ATKIS® DLM50, DLM250 and DLM1000 expressions and for the derivation of official digital topographic maps.

In the course of the „ATKIS® generalisation" AdV project, under the control of seven of the state survey authorities supporting the project, the prerequisites have been created to be able to derive the automation supported ATKIS® DLM50.1 using model generalisation from the ATKIS® Basic-DLM and strictly according to the feature catalogue for the scale 1:50,000 (OK50). With this basic database, the AdV is providing a area-wide and standard for Germany digital landscape model as a free-standing product until the end of 2006 which is particularly suitable for computer-supported applications. Compared with the AKTIS® Basic-DLM, its requirements for geometric accuracy and content differentiation enable a simplified data principle. In addition to these technical aspects, the ATKIS® DLM50.1, as compared with the ATKIS® Basic-DLM, shows a simpler structure and a smaller amount of data so that it is also particularly suited, especially as the basis of computer supported applications, for example for location related services (Location Based Services - LBS), for calculating routes or for applications at the national authorities level. The national availability of the ATKIS® DLM50.1 is decided until the end of 2006.

The DLM250 and the DLM1000 processed in the BKG are available in the first area-wide realisation phase and are annually updated. The contents are continually extended for the production of the EuroGeographics products EuroRegionalMap and EuroGlobalMap and for the linking of technical data. After the preconditions for linking hydrological technical data with the water network based on the EU water framework directive had been created in previous years in the DLM1000 in close collaboration with the Federal Environmental Agency, the Federal Agency for Hydrology and the responsible federal State authorities for water, the improvement of the water network in the DLM250 was carried out analogously in 2005.

The digital landscape models can only meet the requirements if a high up-to-dateness of information can be ensured. The state survey authorities and the BKG constantly endeavour to improve the currency of the topographic data. In doing so, they are primarily setting up a close co-operation with the parties responsible for the topographical changes and also using photogrammetric and computer-controlled terrestrial reconnaissance systems.

Implementation of the continuous object structuring of the real estate cadastre and topography data as part of the AFIS®-ALKIS®-ATKIS® concept is crucial to the further development of

the digital landscape model as part of the ATKIS® project. For the ATKIS® technical concept, the feature catalogue for all ATKIS® -DLM has been available since the beginning of 2006 with the version 5.1 of the GeoInfoDok.

Digital terrain model (DTM)

The state survey authorities provide digital terrain models (DTM) with varying levels of accuracy. For the ATKIS® technical concept within the scope of the AFIS®-ALKIS®-ATKIS® concept, the DGM feature catalogue is also ready with the publication of version 5.1 of the GeoInfoDok.

As a result of the computerised merger of the State survey authorities' DTM in the BKG, an homogeneous DTM with a terrain-type dependant height accuracy of ± 1 to ± 3 m and a grid width of 25 m is available for the Federal Republic of Germany which is provided by the geodata centre.

Digital topographic maps

On the basis of the already available digital landscape and terrain models, the state survey authorities have started the derivation of the official topographic map series on the basis of new map graphics, documented in the ATKIS® portrayal catalogues. Digital topographic maps (DTK) on scales of 1:10,000 and 1:25,000 are already achieving a high profile in the product range of the state surveying authorities. First map sheets of the DTK50, a future joint official civil-military topographic map series, are available for the 1:50,000 scale. Processes for a computer-supported generalisation must be developed for a short tern national availability of the DTK50.

For the 1:100,000 scale, the map graphics for the future DTK100, also as a joint official civil-military topographic map series, have been agreed (figure 6). The year 2005 started with the integration of the portrayal catalogues in the ATKIS® technical concept within the scope of the AFIS®-ALKIS®-ATKIS® project.

Until the official topographic map series to be created on the basis of the ATKIS® portrayal catalogues are available, the Federal Government and its States will update the conventional analogue topographic map series within the required scope, keep them ready for printing and store them as map print and raster data record for diverse applications.

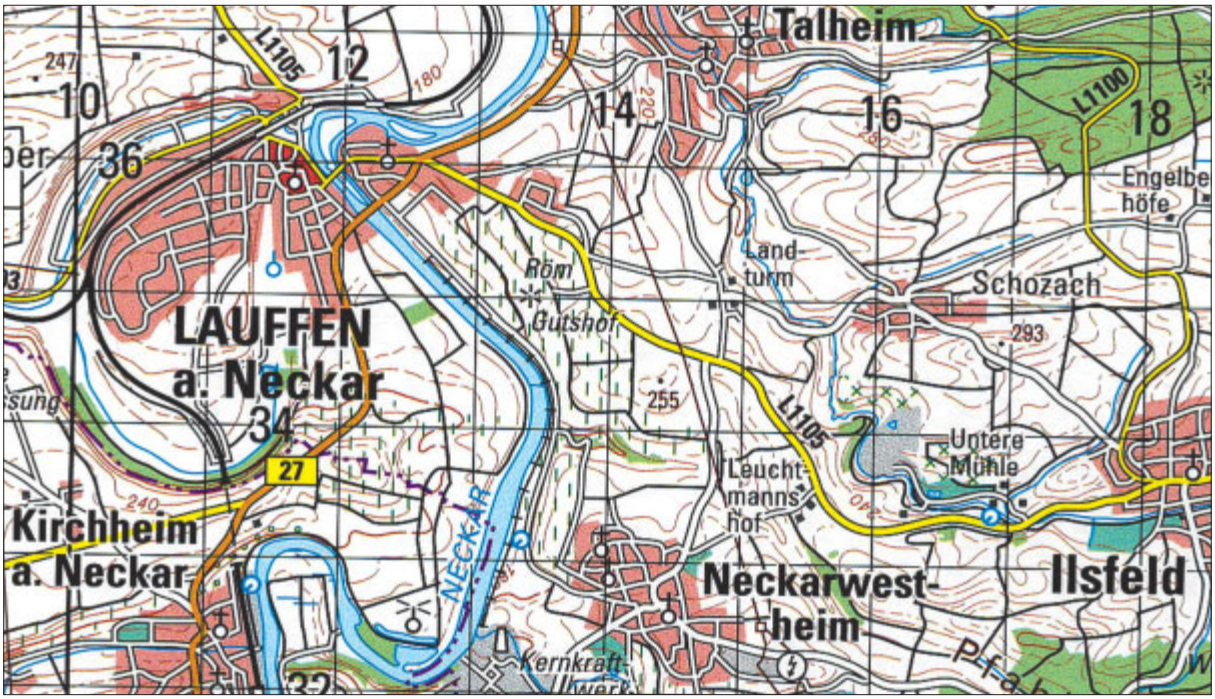

Fig. 6: Map graphics for the future DTK100

Interactive topographic maps on CD-ROM

The CD-ROM series published for the whole of Germany by the Federal Government and its states which presents the raster-formatted topographic map 1:50,000 „Top50“ and the topographic overview map 1:200,000 „Top200“ as software, is completely available in the version 4.0. A virtual flight across Germany is made possible with this version.

Toponymy

Different enquiries from administrative offices (e.g. WHO, European Commission translation service, Federal Agency for Agriculture and Food) for rough structuring of Europe, regional names for origin of agricultural products according to EU regulations, administration units, landscapes, nature areas and tourism regions often showed uncertainties for names and borders of regions for official purposes. The Permanent Committee for Geographic Names (StAGN), which has its business office at the Federal Agency for Cartography and Geodesy (BKG), and which primarily focuses on the standardisation of the official and private use of geographic names in the German-speaking zone provides the necessary advisory opinions for this. These activities are taking place in close collaboration with the United Nations Expert Group for Geographic Names (UNGEGN). Information about the StAGN and also an information sheet about the activities and objectives of UNGEGN are available at www.stagn.de.

The integration of geographic name data of the German coastal waters in DLM250 were agreed between the BKG, the StAGN and the Federal Agency for Water Engineering in December 2005. The prerequisite for this was the creation of the „Geographic names in the German coastal waters 1:200,000“ map series. With the publication of sheet 3 - Schleswig-Holstein East Coast, West Mecklenburg Coast - by the Schleswig-Holstein surveying authority and the sheet 4 - East Mecklenburg Coast and West Pomeranian Coast - by the Mecklenburg-Pomeranian State survey authorities, this map series is now complete. Together with sheet 1 - Lower Saxony Coast - and sheet 2 - Schleswig-Holstein West coast - published by the Lower Saxony State surveying authority and geospatial reference data information, the four sheets together document a total of 1377 names in the German coastal waters (figure 7).

Fig. 7: Geographic names in the German coastal waters 1:200,000 map series

In the 1990s, the „Historical place names directory series for areas formerly belonging to Germany - Period 1914 to 1945“ was created in the IfAG/BKG. A search feature in the associated database has been installed and is available at www.geodatenzentrum.de. Click on „Search historical names“.

Copyright and sales

Together with the traditional provision of official geotopographical information via printed media, the use of digital topographical data has established itself in administration and the economy. Modification of the data and sales structure in the state surveying authorities has also been set up. Together with the provision of geotopographical data on data media, web-based applications are achieving a high profile and geoportals, geoservices and geoviewers are being provided gradually (figure 8).

The geodata centre, established in the BKG, distributes the digital ATKIS® landscape and terrain models and the digital topographic maps throughout Germany in a harmonised forma in collaboration with the States. Via the Web portal of the Geodata Centre www.geodatenzentrum.de, interactive maps for direct access to the database, standardised map services, online coordinate transformations, test data for download as well as technical information and aids are available. An online ordering system

enables geodata to be requested via the Web and federal institutions can obtain the data online immediately. Linked with the Web portals and Web shops of the federal states, the meta information system gives information about the availability, features and contact persons of the products. Its conversion to the ISO standard 19115 was completed in the middle of 2005. The release to the World Wide Web took place at the INTERGEO® 2005 in Düsseldorf jointly with North Rhine Westphalia, the first data provider in the new system. The automatic migration of all data was performed in January 2006 and its reworking by all federal States should be finished by May 2006 at the latest. At this time, the new system will have completely replaced the old presentation. Data research and networking of different meta information systems using international data exchange standards and services will then be even better supported.

Public relations work, trade fairs and exhibitions

Within the scope of the development of geospatial data infrastructures in the Federal Republic of Germany, the AdV is endeavouring to raise the level of awareness for products offered by the state surveying authorities (geospatial reference data). As in previous years, the German state survey, represented by the AdV, appeared on stands in Düsseldorf at INTERGEO® 2005 - the international trade fair for surveying - (figure 9), at the book fair in Frankfurt am Main and at the Leipzig book fair (figure 10). Besides the presentation of state survey products, accompanying lectures and discussions were also held.

Fig. 8: Geoportals, geoservices and geoviewers of the federal States

Fig. 9: Joint stand of the AdV at the INTERGEO® 2005 in Düsseldorf

Fig. 10: Participation of the AdV member authorities at the Leipzig book fair

5 Information and communication technology

Information and communication technology forms the technical interface between operations in the field of spatial reference, real estate cadastre and geotopography. The task of the AdV is to ensure the uniformity of geospatial reference data and their provision from the point of view of information and communication technology in the context of a geospatial data infrastructure and to co-ordinate the information technology GDI activities within the AdV and for the AdV on a national level. In the period covered by this report, the activities of the AdV have focussed on information technology work as part of the maintenance and further development of the AFIS®-ALKIS®-ATKIS® concept for the modelling of the official surveying authority geoinformation and co-ordinating the information technology GDI activities for the AdV on a national level (GDI-Germany). The key activities are the further development of the subject-neutral AFIS®-ALKIS®-ATKIS®-basic schema (AAA basic schema), the validation of the standards-based data exchange interface (NAS) and the submission of proposals for the specification of standardised services for geospatial reference data and geotechnical data (application profiles for geoservices). Version 5.1 of „Documentation for modelling the geoinformation of official surveying and mapping - GeoInfoDok", the result of a comprehensive revision management with GIS manufacturers and users, has been published on the World Wide Web under www.adv-online.de since the beginning of April 2006.

AAA basic schema

The AAA basic schema forms the basis for the technical application schema for modelling the AFIS®, ALKIS® and ATKIS® objects and for data exchange. Being a neutral entity, other technical information systems can also use the classes defined in the AAA basic schema for modelling and reference the contents of the AAA basic schema by inheritance (figure 11).

The AdV has rewritten the „Modelling technical information using GeoInfoDok" guideline for compatibility with Version 5.1 and published it at www.adv-online.de. The guideline contains general modelling principles for technical information and selected application examples for modelling technical information in the areas of state development, earth reference values and municipal applications. As a basis and recommendation, the guidelines have been widely accepted among modelling experts.

During the reporting period, the AAA basic schema was further developed based on the knowledge gained from the implementation in the sates and in co-ordination with the GIS manufacturers. This particularly refers to the standard-conforming adaptation of the geometry classes to the ISO standards as well as to the modelling of selection criteria for the AAA outputs using the OGC filter encoding specification.

In order to make it possible for technical information modelling experts to comfortably and economically „dock" to the GeoInfoDok, the following AAA modelling tools are available for download from the AdV Website after the user has registered online: These are

- the AAA catalogue tool (derivation of catalogues from an AAA-compliant UML model),
- the NAS schema generator (generation of NAS files from an UML model) and
- the AAA profile tool (determination and import of profiles into an AAA-compliant UML application schema).

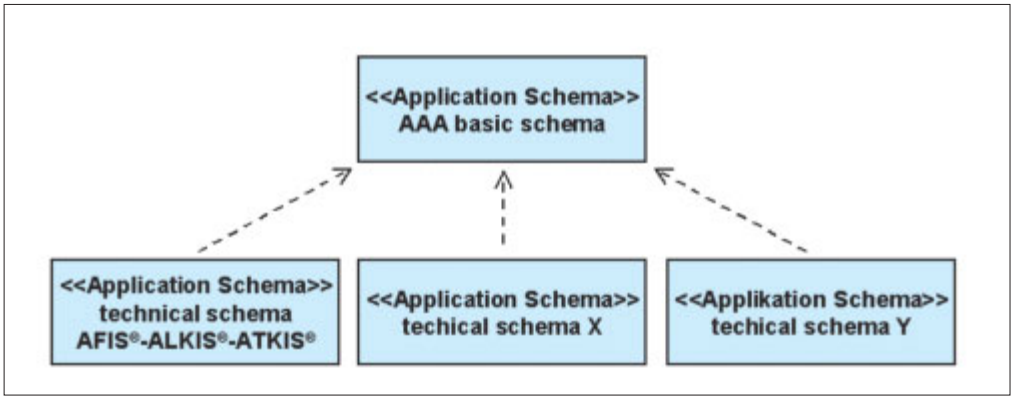

Fig. 11: Connection of technical schema to the AAA basic schema

The AAA basic schema has been consistently modelled on the basis of the international ISO and OGC geographic information standards. Compliance with international standards facilitates the use of standard software components which have also been implemented on the basis of these standards.

The objective of a geospatial data infrastructure is the description of different technical systems in accordance with standardised rules. This is why the standardisation does not refer to the technical contents but to the methodology and the formal description thereof. The basic schema provides exactly this framework methodology for the structuring of geographic information and thus forms a basic module for the establishment of a geospatial data infrastructure in Germany (figure 12).

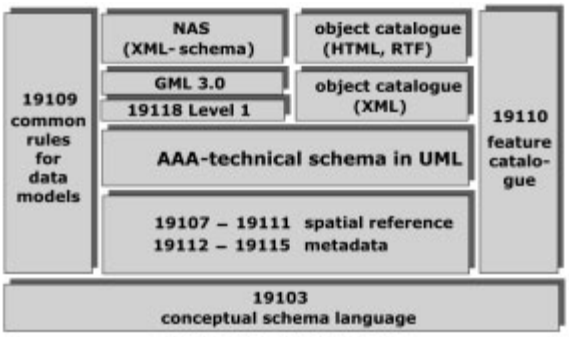

Fig. 12: AAA technical standard

Standards-based data exchange interface NAS

The NAS is used whenever the application emphasis is put on the originality of data, the full evaluation capability and the differentiated continuance. The NAS of the AAA application schema consists of two essential components: on the one hand, of the technical contents being derived from an AAA branch schema and, on the other hand, of the syntax for data encoding using XML schema. The NAS is therefore only applicable with regard to the AAA branch schema. A different „branch NAS“ uses the same syntax for data encoding, but contains and transports different technical contents.

The NAS is based on the XML standards developed by the World Wide Web Consortium (W3C). The Geography Markup Language (GML) Version 3.0 is used for the description of feature types. GML is an OpenGIS standard and is currently also integrated into the ISO 19100 standard series. The published NAS 5.1 will be adapted in 2006/2007 to the by then discontinued Version 3.2 of the Geography Markup Language (GML 3.2) and continued with the GeoInfoDok Version 6.0. Filter encoding in combination with a small number of AdV-specific updates is used in consultation with the GIS manufacturers for the formulation of selection criteria. The representation of the conceptual model in the NAS is specified by the NAS encoding rules, which control the automatic derivation using the NAS schema generator (Rose Script). The control parameters are formally specified additional rules for representing the UML data model in the XML schema file.

Geoservices application profiles for the establishment of the geospatial data infrastructure Germany

The establishment of the geospatial data infrastructure Germany (GDI-DE) requires an information technology co-ordination. The AdV contributes its expert knowledge in the fields of data modelling, data exchange and standardised geoservices (application profiles for geoservices) to this co-ordination process.

This includes participation in a cross-subject working group for a functional architecture specification for the provision of geographic data. The objective and purpose of the architecture concept is to give clear guidelines about data, services, networks and standards. In many cases, this is a matter of very special technical issues which are related to the evaluation of established and developing standards.

The AdV has jointly participated with other institutions responsible for geotechnical data in a synopsis of the available WMS specifications for geographic data as part of the development work for GDI-DE. In this context, further application profiles for access to object-structured geographical data, with Web Feature Service (WFS) and Web Map Service (WMS) among others, including the OGC Styled Layer Descriptor (SLD) symbolisation specification should be developed as the next step. The implementation and further development of the German application profile for metadata interfaces (CSW 1.01 DE) are being continued. For specifying existing ISO, OGC and W3C standards, such an application profile is crucial for a trouble-free communication of metadata between different interfaces. The jointly developed ISO application profile for the current Web Catalogue Specification, has been filed with the OGC and adopted as a Recommendation Paper. The linking of metadata with geographic data should be carried out via services (ISO 19119) in the future. This should also make it

possible to directly access the web services of the geodata (digital maps) in the hit lists of the geodata catalogue (formerly:GeoMIS.Bund).

The standards of the Open GIS Consortium and de-jure standards of the ISO/TC211 must be applied in order to guarantee interoperability of geospatial data infrastructure projects. The "Infrastructure for Spatial Information in Europe (INSPIRE)" initiative is bound to have considerable effects on the GDI developments in Germany (figure 13).

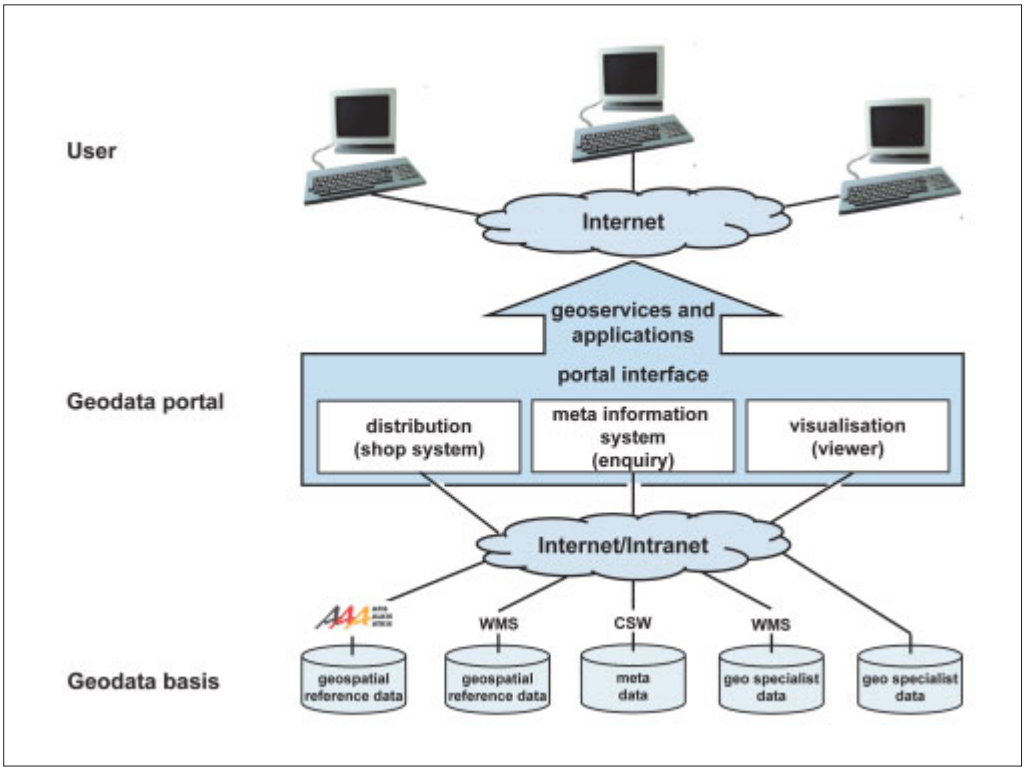

Fig. 13: Components of the GDI

6 Involvement in national and international organisations

EuroGeographics

EuroGeographics (EG), the association of the national authorities for geodesy, cartography and cadastre has set itself the primary objective of setting up the reference data geodetic reference data) for a European geographic data infrastructure and creating its interoperability. EuroSpec has been set up for this purpose as a strategic programme with the intention of advancing the harmonisation of the specification of data and services needed for the European geographic data infrastructure and thereby also preparing the later implementation of the EU INSPIRE Directive. The EuroSpec programme is being actively implemented by various expert groups (see www.eurographics.org/eng/05_groups.asp) in which experts from the BKG are also participating. Two expert groups, Geodesy and Information and Data Specifications are managed by employees of the BKG. The new Information and Data Specifications and Distributed Service Architecture expert groups started their work in the period covered by this report.

Within the context of EuroGeographics, the BKG participated mainly on the creation of the products EuroBoundaryMap (EBM, formerly SABE) as project manager, EuroGlobalMap (EGM) as Regional Co-ordinator and Euro RegionalMap (ERM) as partner. The BKG is also represented in the working groups of the EuroBoundaries project.

EuroBoundaryMap, a Europe-wide vector data set of the administrative boundaries from the States to the local council level, came into being in 1993 based on a specification developed in the BKG and since then has been continuously continued by the BKG based on data deliveries from the European countries involved. All published versions to date are provided in the

1:100,000 and 1:1,000,000 application scales and in various GIS formats.

The SABE2004 product with July 2003 update date for all EU countries up to then and May 2004 update date for all new EU countries and all other countries represented by SABE was initially completed for the 1:100,000 scale. Since August 2005, this version has also been available in the 1:1,000,000 scale and in various user friendly types of product.

The European Commission published a call for tender jointly with EUROSTAT in the Summer of 2005. The BKG participated in a tender by EuroGeographics for supplying a Europe-wide geographic database of the administrative regions and statistical territorial units which contains the further development and continuation of the SABE product. EuroGeographics won the tender and signed a licence agreement with EUROSTAT at the end of December 2005, based on which the BKG will continue and supply the required geospatial reference data.

The SABE2004/NUTS product was provided by the BKG in December 2005 which contains a reference to the NUTS classification updated in January 2004 by the European Commission and EUROSTAT for the local administrative units of all EU countries and thus ensures the interoperability between this Europe-wide geographic database of administrative units and statistical information.

As well as the provision of data and metadata, the BKG also provides technical advice to all customers and interested parties, a current user manual and a specimen data record for download on the EuroGeographics Website http://www.eurogeographics.org/eng/04_sabe.asp.

After the EuroRegionalMap (ERM) and EuroGlobalMap (EGM) projects commissioned by the EU were successfully completed in the years 2003 and 2004 with the completion of the first versions of the 1:250,000 and 1:1,000,000 reference databases, these continued in 2005 with the continuation and expansion phase. The ERM and EGM were harmonised in 2004 so that the now ISO-compliant specifications and the technical guidelines could be adapted and expanded in the period covered by this report. The BKG experts were decisively involved, particularly for the specification of the geographic database structure for both databases and in the process development for sustainable maintenance and the solution of data exchange problems. The BKG also functioned as regional coordinator for 10 countries in the EGM project and is thereby responsible for the organisation, supervision and technical support of the data production in the region. The new continued, improved and widely expanded databases should be completed in 2006.

The online ordering and sales system (see www.eurogeographics.org/eng/04_buying.asp) for the European products was also further developed by the BKG in the period covered by this report.

The BKG is also cooperating in both working groups of the EuroBoundaries project managed by EuroGeographics. A EuroBoundaries data model was developed by the first group in 2005 and made available for discussion while the second group carried out a questionnaire survey for analysis of the compilation status of the national borders in the individual European countries and summarised the results in a report.

European infrastructure for geographic name data - EuroGeoNames (EGN)

The EuroGeoNames (EGN) was initiated by the BKG in 2004 and has been integrated in the work programme of EuroGeographics. An infrastructure for official, multilanguage geographic names in Europe is being established by EGN. The access to the decentralised national name databases should be realised via a Web service which supports all official European languages for the first time. Thereby, the BKG has taken over the conception and project co-ordination. As a first step, an inventory analysis (SI-EGN - Survey/Inventory on European Geographical Names) was carried out in Europe in 2005 which shows information about availability, quality, access conditions and the responsibilities for name data in Europe. As a second step, EU grants have been applied for in the context of the European Commission eContententplus research programme for the project in November 2005. Expert evaluation of the EuroGeoNames project has been very positive. The BKG project coordinator has thus been invited to contract negotiations with the European Commission which will start in May 2006. The final report on the SI-EGN inventory analysis and other information about the EuroGeoNames project are available at: www.eurogeonames.com

Reference Information Specifications for Europe (RISE)

RISE is a project in the 6th Framework Programme of the European Union. It is being financially supported for two years from September 2005 by the European Union. The project consortium comprises the organisations EuroGeographics (project co-ordinator), OGC-Europe, Qinetiq Ltd, Lantmäteriet (Swedish survey) and the Federal Agency for Cartography and Geodesy. The project objective is the development of guidelines for creating harmonised specifications for European geographic data. Thereby, RISE is building on the ISO and OGC standards. The task is matched with the strategic objectives of the INSPIRE and GMES European plans. The project partners will test their guidelines and methods using water pollution as an example. Thereby, the BKG is taking over the specification of the application in a conceptional schema.

Working Party on Land Administration (WPLA)

Even during the previous reporting period, the AdV was making an active contribution to the activities of the Working Party on Land Administration of the United Nations Economic Commission for Europe (WPLA). The AdV representative was elected Chairman of the WPLA in November for the official term until November 2007. As well as the WPLA Workshops held twice a year, a number of other activities will be carried out and supported by the AdV. These activities will focus on a number of studies regarding fundamental and current specialist subjects of land registration and the real estate cadastre. These will be handed by the relevant Working Groups (Task Forces).

Permanent Committee on Cadastre (PCC)

Austria took over the presidency of the PCC from Great Britain on January 1st, 2006. Finland will take over the presidency for the second half of the year. The presidency goes to Germany in the first half of 2007. It will then be performed by the AdV. A joint expert group from PCC and EuroGeographics has been involved in the land parcel role since Spring 2005 in the context of providing the data for INSPIRE. A survey about available land parcel data has been responded to by 26 member authorities. The results of this survey have been directly incorporated in the work of the INSPIRE „Data Specification“ drafting team. In a second step, the expert group will involve itself with the integration of cadastre data into the national geographic data infrastructures. The AdV will be represented in the expert group by the Secretary General.

Echtzeit-Vernetzung

SAPOS®

Satellitenpositionierungsdienst der deutschen Landesvermessung

BB BE BW BY HB HE HH LSA MV NI NW RP SH SL SN TH sowie Elbe in Betrieb

Küste in Betrieb

Stand: Mai 2005