International Consortium of
Geological Surveys for Earth
Computing Sciences

ICGSECS-12

12th Annual Meeting
April 21-25, 1997
Geological Survey of Austria
Vienna, Austria

International Consortium of Geological Surveys for Earth Computing Sciences

April 21-25, 1997
Vienna, Austria

Proceedings

Programme and Abstracts

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Introduction and Background of the Twelfth International Consortium of Geological Surveys for Earth Computing Sciences
Vienna, Austria
April 21-25, 1997

Introduction

On April 21, the Geological Survey of Austria hosted the Twelfth International Consortium of Geological Surveys for Earth Computing Sciences (ICGSECS). The purpose of the ICGSECS is to exchange ideas, concepts, and successes among national geological surveys regarding the use of computer technology. Representatives from 18 nations participated in the April 21-25, 1997, meeting.

Background

The ICGSECS was organised in 1986 for the purpose of sharing information on uses of computer and telecommunications between national Geological Surveys of the participating nations.

At the closure of the ICGSECS-12 meeting, it was agreed that the 1998 meeting be held in Moscow, Russia.

The Participants of the 12th Meeting of the ICGSECS

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Monday 21 April

17:00-19.30+ **Welcome and conference registration.**

Reception at the Geological Survey of Austria

(Palais Rasumofsky, Rasumofskygasse 23, A-1031 Vienna)

Buffet

Wine Degustation

Tuesday 22 April

9:00-9:30 Opening address by Director, Geological Survey of Austria, **Hans-Peter Schönlaub**

9:30-9:45 Discussion on administration, chairings and consideration of draft Programme

Session I (IT and the Geological Surveys) CHAIR: David Ovadia

9:45-10:45 Discussion on issues arising from 1997 National Reports **(Moderator: Phyllis Charlesworth)**

10:45-11:15 COFFEE BREAK

11:15-12:15 Geo-Computing - The next five years, opportunities and threats; a personal perspective **(David Ovadia, United Kingdom)**

LUNCH

14:00-14:45 Information Management and the U.S. Geological Survey "An Institutional Commitment" **(Hedy Rossmeissl, United States)**

14:45-15:30 The Development of Spatial Geoscience Information Systems in Malaysia: A National Report **(Seet Chin Peng, Malaysia)**

15:30-15:45 COFFEE BREAK

15:45-17:00 ICGSECS Business Meeting (Core Members, Associate Members can attend as observers)

Evening Own arrangements

Wednesday 23 April

Session II (The World Wide Web) CHAIR: Hedy Rossmeissl

9:00-9:45	Publishing over the World Wide Web - an early Prototype **(Udo Strauss, Austria)**
9:45-10:30	The BASIS for very large Document Databases in Internet, Intranet and Extranet environments - A Focus on Visions and Real Projects **(Denys Lauwers, Information Dimensions, Paris)**
10:30-10:45	COFFEE BREAK
10:45-11:30	GIS goes Internet, even with very large databases **(Johannes Ertl, Datamed, Vienna)**
11:30-12:00	Integration of distributed Datasets with Desktop GIS **(Heinz Reitner, Austria)**
12:00-12:15	Multilingual Thesaurus for Geoscience **(Caj Kortman, Finland)**
	LUNCH

Session III (GIS and Mapping) CHAIR: Kalle Taipale

14:00-14:30	Geokarten 500 - An integrated GIS for earth science information **(Peter Heitzmann, Switzerland)**
14:30-14:45	An overview of MAFI´s digital map production **(Gabor Turczi, Hungary)**
14:45-15:15	The Digital Mapping Programme of the Geological Survey of Austria - a Status Report **(Günther Pascher, Austria)**
15:15-15:30	Experiments using Image Processing in our Quaternary Geological Mapping Programme **(Mary Carter, Ireland)**
15:30-15:45	COFFEE BREAK
15:45-16:15	The Canadian Geospatial Data Infrastructure Project **(Phyllis Charlesworth, Canada)**
16:15-16:30	Site selection for radioactive waste depositories using GIS **(Gabor Turczi, Hungary)**
16:30-17:00	How to get out more of a limited number of ARC/INFO licenses **(Jan Hultström, Sweden)**
Evening	Own arrangements

Thursday 24 April

Session IV (GIS and Databases) CHAIR: Phyllis Charlesworth

9:00-9:30	Demo over Internet - Subsurface Database **(Denis Bonneyfoy, France)**
9:30-9:45	Decision Support System in Java **(Jan Jellema, The Netherlands)**
9:45-10:15	WELLMASTER - an ARC/INFO - based Well Management System **(Piotr Lipiarski, Austria)**
10:15-10:30	Strategy and Practice of Development - Databases and GIS **(Julius Belickas, Lithuania)**
10:30-10:45	COFFEE BREAK
10:45-11:15	Geology and Databases in Iceland **(Helgi Torfason, Iceland)**
11:15-11:45	Geodata processing for regional land-use planning **(Sebastian Pfleiderer, Austria)**
11:45-12:15	Problems of Terminology connected with data banks on economic geology **(Rem Karpov, Russia)**
	LUNCH

Session V (3D, Databases, Neural Nets) CHAIR: Horst Preuss

14:00-14:45	Hydrological Database **(Jan Jellema, The Netherlands)**
14:45-15:00	Three dimensional modelling for geology **(Denis Bonneyfoy, France)**
15:00-15:30	Solutions for 3D-Modelling in Lower Saxony **(Horst Preuss, Germany)**
15:30-15:45	COFFEE BREAK
15:45-16:30	Inversion of airborne electromagnetic data using neural networks **(Edmund Winkler, Austria)**

Evening (19:00) Official Conference Dinner at the *"BASTEI - Beisl"*

Friday 25 April

Session VI (Co-operation and International Activities) CHAIR: Denis Bonneyfoy

9:00-9:30	GEIXS - Report on progress of this EU initiative and how it could become a Model for wider, international activities **(David Ovadia, United Kingdom)**
9:30-10:15	Discussion on International IT Activities - The surveys abroad **(Moderator: Hedy Rossmeissl)**
10:15-11:00	An Overview of ICGSECS-12 **(Moderator: David Ovadia)**
	Plans for the Next Meeting
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CHARTER OF THE INTERNATIONAL CONSORTIUM OF GEOLOGICAL SURVEYS FOR EARTH COMPUTER SCIENCES

1. AIMS

1.1 The aims of the International Consortium of Geological Surveys for Earth Computer Sciences are

1.1.1 to exchange information related to the use and management of computer and telecommunications systems in support of the earth sciences;

1.1.2 to provide a forum whereby individual geological survey solutions to problems commonly experienced by each organisation, including but not limited to data capture, construction of databases, evaluation methods and presentations, can be presented and discussed;

1.1.3 to provide opportunity for discussion and promulgation of data standards, data exchange formats for the sharing of global data bases and solutions to operational problems;

1.1.4 to act as a leverage group to influence the commercial design and cost of hardware, software and telecommunications systems;

1.1.5 to provide opportunities to establish cooperative projects that demonstrate data sharing and problem solving techniques among the member surveys;

1.1.6 to establish telecommunications links for the member surveys to facilitate the exchange of data and ideas.

2. MEMBERSHIP

Membership is open to national geological surveys which are able to make a valuable contribution to the understanding of the earth computer sciences.

2.1 There are two types of membership, core and associate.

2.1.1 An up to date list of members is kept by the Executive Secretary.

2.1.2 After three successive annual meetings of ICGSECS, non-participation by a member will result in its membership of ICGSECS being terminated automatically.

2.2 Application for associate membership is made through the Executive Secretary who will put the application to a vote of core members at the annual meeting. At least two thirds of the core members voting must be in favour before an application is accepted.

2.3 Associate members are invited to attend the annual meeting of ICGSECS and to contribute a national report and to participate in other ways whilst not having a voting right. Conditional on valuable contributions and on a minimum of three years regular attendance, associate members may request that their status be changed to that of core

membership. Such a request will be put to a vote of existing core members by the Executive Secretary. At least two thirds of the core members voting must be in favour before an application is accepted.

3. MEETINGS

3.1 The meetings are normally hosted by a different member each year and are open to core and associate members and contributors invited by the host.

3.2 Each member should normally send a maximum of two delegates to the meeting. The delegates will normally be senior staff of the geological survey who are responsible for information technology / information systems. The host country may participate as needed.

3.3 The programmes of the meetings will normally last for 3 to 5 days.

4. ADMINISTRATION

4.1 The Executive Secretary is a representative of a core member country and is elected by the core members to serve for a period of 3 years. This person is responsible for long term administration, for assisting the host country in the organisation of the meeting and acts as a focal point on all other ICGSECS matters. The host country is responsible for the organisation of the annual meeting it is hosting.

4.2 A business meeting of core members may be held as part of the programme.

4.3 The host country for the next meeting will be chosen by consensus of the core members.

4.4 The host country is responsible for

4.4.1 preparing and distributing to members, in advance, a programme for the meeting;

4.4.2 facilitating the annual meeting in terms of making logistical arrangements for members and the provision of meeting rooms.

4.4.3 preparing and distributing to members a volume of Proceedings of the programme as soon as practicable after its conclusion.

5. GENERAL PROVISIONS

5.1 Participants at annual meetings are responsible for their expenses which may include, at the request of the host country and provided it is declared at the time of the bid to host a meeting, all or part of their share of the costs of incidental expenses of the annual meeting.

5.2 Changes to the Charter require a majority of two thirds of the core members to vote for approval.

Core membership is comprised of the geological surveys of Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Netherlands, Norway, Russia, Spain, Sweden, Switzerland, Portugal, United Kingdom and United States of America.

Associate membership is comprised of the geological surveys of Hungary, Iceland, Lithuania, Malaysia and South Africa.

ICGSECS 12 - Tuesday April 22
Minutes of discussion

Morning - Session I

Themes common to national reports

a Upgrading PC's and software (Windows NT or Windows 95 as operating system?)
b JAVA programming, world wide web
c Relevance of the output from Geological Surveys, meeting the public needs, outsourcing.
d Reorganisation
e Converting from mainframe to desktop. Increased bandwidth of networks - moving away from VAXes
f Long term licensing
g Internet management

a: The IT services division has the task of guaranteeing proper and reliable functioning of computer machines, of the operating systems, and of database access. These services can best be given by experts trained on only one system. Therefore the question of what system to use is very important and the Geological Surveys have to decide on one system. This will improve the support users get from IT services division concerning both PC's and work stations.
The choice of the operating system could, however, be left to the users, who decide depending on the system's user-friendliness.
Modern web technology may finally take over and the choice of the operating system may become irrelevant.

b: The question remains whether a Geological Survey webserver is profitable because the cost for development of JAVA scripts and for maintenance of data must be recovered. The installation of Internet homepages, however, increases the information of the public as well as the awareness and consequently the demand for geological data. A Geological Survey info-server should at least contain metadata. Germany is legally obliged by the environmental information act to make such data available to the public.

c: It must be the responsibility of a state Geological Survey to archive data and to maintain old data sets. Their interpretation by private enterprises or by the Geological Survey relies on geological knowledge and expertise. The value added to IT must be the linking of data with knowledge. Furthermore, the role of a state Geological Survey is to provide the infrastructure for data access. In addition to the dissemination of data the Geological Survey must focus on the public's needs and adjust their products to the market's demands.

Afternoon - Session I

Addition to the Presentation of the USGS, Hedy Rossmeissl

The USGS charges for the replication and distribution of data. The costs of satellite data are set by the companies producing the data.

Until now all data have been archived, however, decisions will have to be made at the beginning of the next century on what data will be archived.

The USGS uses FGDC (Federal Geographic Data Committee) as metadata standard for data documentation, SDTS (Spatial Data Transfer Standard) for data transfer.

Addition to the Presentation of the Geological Survey of Malaysia, Seet Chin Peng

The Mineral Information Database (MIND) contains information of corporate interest. Although there is legal obligation for mining companies to supply data, there is little enforcement and mining companies now provide data on a volunteering basis.

The objective of the Multimedia Super Corridor (MSC) is to spur economic growth by means of IT. By installing IT infrastructure, the government is encouraging the development of digital economy.

The population of Malaysia is just less than 20 Million people. The Geological Survey employs about 600 staff members, 200 of which are professionals.

Although Malaysia has a lot of catching up to do, Germany pointed out that it might be easier to start with new ideas than getting rid of old concepts.

ICGSECS 12 - Wednesday April 23
Minutes of discussion

Morning - Session II

Addition to the Presentation of the Geological Survey of Austria, Udo Strauss

For the conversion of documents into HTML texts, scanning and optical character recognition (OCR) are fast and automated processes whereas the time consuming step is the training of the OCR program and checking its output for conversion errors.
Decoding of the publishing format of the documents is not feasible for the EPS format and impossible for the internal MacIntosh format. Besides, only recent publications exist digitally and older publications need to be scanned page by page.
An English version of www frames can be easily generated.
Visualisation of corner co-ordinates stored in the map data base GEOKART exists for ARC/VIEW; other www applications to use these data are planned.

Addition to the Presentation of Information Dimensions, Paris, Denys Lauwers

Because the technology develops faster than legislation on copyright issues, legal complications arise when a downloaded text is edited and/or printed. So far the copyright for a book equally applies to a text in the Internet. The Austrian Printing Office allows selected users to download text in BDF format, thus making texts readable but not editable.
Management of different versions of documents is possible within the BASIS document management program.
Fuzzy keywords are not used. Instead Thesaurus searching for indexed words as well as morphological (linguistic) searches are possible.

Addition to the Presentation of Datamed, Vienna, Johannes Ertl

ArcView is related to netscape through an Internet extension added to ArcView. An Internet extension for ARC/INFO on Windows NT is under development by ESRI. So far, for connecting a GIS application to the Internet one needs ArcView or MapObjects, the extension, and a web browser, although it is possible to write C interfaces to access SDE data directly. Image Engine also allows access to image files.
HTML is only capable of simple text layouts. For more sophisticated presentations ESRI has developed Java and ActiveX scripts, the latter unfortunately requiring a Windows NT platform.
However, platform dependence should be resisted.
The Geological Survey of Malaysia together with ESRI is developing a prototype program for handling catastral information through MapObjects with which one can design customised GIS applications on the Internet.

Addition to the Presentation of the Geological Survey of Austria, Heinz Reitner

Raster images can be stored on Oracle, however, the ArcView version used at the Geological Survey in Austria is not able to access these image data.
Redrawing shape files is faster than redrawing coverages in ArcView. The time needed for converting a coverage to a shape file is minimal compared to the time gained when redrawing shape files of finalised coverages repeatedly.

Addition to the Presentation of the Geological Survey of Finland, C. Kortman

For reasons of easy data exchange between countries the project was carried out using the US character set. While all French and Spanish characters are included in the set, German Umlaut characters are missing.

Beside the published book, an interface with the underlying data base is planned. Copyright issues prohibit a publication on CD-ROM.

Addition to the Presentation of the Geological Survey of Switzerland, Peter Heitzmann

Geology is made up of lithostratigraphic units belonging to tectonic units, i.e. polygons are attributed with lithology, tectonic unit and chronostratigraphic age.

The maps are produced by a geological consulting bureau mandated by the Geological Survey. The data and copyrights rest with the survey.

Autodigitization of line drawings, even on separate layers, is still too difficult a task, making manual digitisation unavoidable.

The third dimension cannot easily be handled by ARC/INFO. The Malaysian Geological Survey displays subsurface information showing bore hole data as text and isopach maps.

Addition to the Presentation of the Geological Survey of Hungary, Gabor Turczi

The MAFI has no negative experience with Intergraph and MGE but is using ARC/INFO at the same time.

Addition to the Presentation of the Geological Survey of Austria, Günther Pascher

Austrian geologists have tested GPS in the field but don't regard it as necessary since topo- graphic maps exist in sufficient quality.

Problems with edge matching exist particularly with older maps as they are incorporated into the new data base without modification. Similar problems will occur when merging different leg- ends into one general legend.

Layer separation for geological maps is done by cartographers, not geologists.

Cromalin true colour plots are used for colour proofing. At that stage final editing takes place. In case of modification corrections must be done in the data base and new films produced. Usually two cycles lead to the final product.

Addition to the Presentation of the Geological Survey of Ireland, Mary Carter

It is planned to use various landsat TM bands to identify areas of bog so that we can concentrate on mapping other subsoil types such as gravel and boulder clay. We hope to develop a system which can be used by geologists who are not image analysis experts

Similar endeavours exist in Lower Saxony, Germany. The question arises if all the effort of image processing pays off, and whether field work still consists of mapping or can be reduced to verifying image classification. So far the results from the Irish project are promising and field checks positive. It is expected that higher quality and standards can be achieved

Europe wide data sets on agricultural land use can give hints on the geology. Yet, for that purpose one needs several series of data collected at various periods over the year. Image resolution is too week for small scale studies (<1:10.000).

Afternoon - Session III

Addition to the Presentation of the Geological Survey of Canada, Phyllis Charlesworth
Provincial and municipal governments, including forestry and agricultural departments are involved in the development of CGDI.

Addition to the Presentation of the Geological Survey of Hungary, Gabor Turczy
The radioactive waste disposal sites selected using GIS will only be used when politically accepted. Publicity is needed to increase public acceptance, and negative journalism is only counterproductive. Avoid election time!

Addition to the Presentation of the Geological Survey of Sweden, Jan Hultström
Manual digitising of the 110 map sheets of 25x25 km was never taken into consideration. Instead, the use of semi-automated ARC/INFO procedures including overnight running of batch jobs was regarded cheaper and leading to better quality soil maps.

ICGSECS 12 - Thursday April 24
Minutes of discussion

Morning - Session IV

Addition to the Presentation of the Geological Survey of France, Denis Bonnefoy

The French subsurface information system is at present only available for internal use at BRGM. Next year it will probably be available to the public on a webserver.
In addition to the 500 mapsheets at the scale of 1:50.000 available as scanned images, 57 sheets exit in vectorised format.
The problem of edge matching and legend matching does not arise because a unique data model is established countrywide and field geologists have to use the terms of this data model.
A project was started on 1:250.000 scale to obtain geological maps through the synthesis of maps at a scale of 1:50.000. This synthesis is not automated.

Addition to the Presentation of the Geological Survey of the Netherlands, Jan Jellema

The decision support system is still a prototype, tested for half a year but not yet put to practical use. Performance problems are due to the way Java uses the network. A higher bandwidth could alleviate this problem. The Geological Survey of the Netherlands hopes to sell this system as a framework to companies.

Addition to the Presentation of the Geological Survey of Austria, Piotr Lipiarsky

Wellmaster has been running successfully for 3 years and was sold to several geological institutions throughout Austria.
Its map layout module can be used as an alternative to ArcTools for the preparation of plots.

Addition to the Presentation of the Geological Survey of Iceland, Helgi Torfason

Groundwater seeping through rocks of high temperature is saturated (or contaminated) with e.g. sulphate, iron, magnesium. Most of the dissolved material precipitates at the surface. The ground water is not treated to remove the remaining dissolved elements. Sulphate has the beneficial side effect to reduce corrosion of water pipes. Precipitates are not used commercially.

Addition to the Presentation of the Geological Survey of Austria, Sebastian Pfleiderer

In the Netherlands river channels are reshaped into meanders including oxbow lakes and swamps to recreate natural landscapes and habitat. Sand and gravel is gained as a by-product to this process.
Contrary to the situation in Great Britain, in Austria the owner of a land selected for future raw material exploitation cannot take legal actions against the recommendation by the Geological Survey.
Similar problems arise in Switzerland and Malaysia when the value of land is lowered due to its classification as a potential risk area on geohazard maps.

Addition to the Presentation of the Geological Survey of Russia, Rem Karpov

The archives put into the Russian digital data base are available within the Russian Federation only. Distribution elsewhere must be decided upon politically.

Afternoon - Session V

Addition to the Presentation of the Geological Survey of the Netherlands, Jan Jellema

The surface water layer contains the location of rivers and lakes but not data on the water quality. For the hydrogeological database this layer is relevant because surface waters can infiltrate into deeper layers.

3D grids of the subsurface, derived from a high number of boreholes, define extent and bound- aries of aquifers and of separating, non-permeable layers. They can be directly used as input into hydro-geological flow models (ModFlow). Manual digitising of geological information is still necessary since 3D grids don't contain all available information. Geological well logs for example don't all exist in digital format.

The interpolation between boreholes and the calculation of layer boundaries for modelling is simplified by the geometry of geological deposits in the Netherlands which is horizontal and continuous. Discontinuities resulting from marine transgressions or river erosion are handled by defining regions of similar geology.

Addition to the Presentation of the Geological Survey of France, Denis Bonnefoy

Manual editing of the results is necessary because the model only proposes one solution. Geological modifications can increase the quality of the model and fill gaps where hard data is scarce.

Addition to the Presentation of the Geological Survey of Lower Saxony, Horst Preuss

The future goal of geological mapping is a 3D model. Since data density is much higher on the surface than at depth, care must be taken to read and interpret models as they don't represent the reality. It would be more honest to show the location of hard data in models and maps.

Perhaps in the future 2D maps will only serve as overviews at the scale 1:200.000 and smaller scale maps 1:25.000 may not even be published any more.

The objective should always be to know the earth in 3 dimensions although this may not be achievable even with better software and computers. To overcome these problems a new approach may be needed including process understanding. For example using information on sedimentation rates or understanding the physical principle of salt rise may lead to better results than trying to correlate between boreholes. In the field of process modelling much needs to be done and geologists should understand stratigraphy as a historical record of processes.

Addition to the Presentation of the Geological Survey of Austria, Edmund Winkler

At the Geological Survey of Lower Saxony geological interpretations with rule based systems failed because the training with complicated rules turned out to be too difficult.

Artificial anomalies occurring at the intersection of flight lines and tie lines can be easily removed using neural networks if they show characteristic patterns. Spikes contained in electromagnetic data resulting from railway lines can equally be removed.

Japan is going to invest 10 billion US $ in research on neural networks for the next 10 years.

ICGSECS 12 - Friday April 25
Minutes of discussion

Session VI

The main topics of ICGECS 12 included:
- Reorganisation of Geological Surveys (resulting form the obligation to face the question "why do we do what we do?")
- The web
- 3D Geology
- Data standards

Data standards should also be the main topic for the next ICGECS meeting and national reports should in the future contain each country's attempts to establish national data standards.
Future common efforts should include sharing experiences on IT infrastructure with respect to networking and on interoperable directories or metadata webservers.

The cooperation between Geological Surveys could be extended to exchange programs (not only data) and to harmonise functionality.
Unfortunately some Geological Surveys need to sell their products in order to survive, but whenever possible, data should be shared freely.

Concerning the next ICGSECS meeting in Moscow:
- The meeting will be held in the middle of may, the exact date will be fixed next month
- Joined cultural programs, e.g. city excursions or bus trips to other old cities, will be organised but individual programs can also be arranged. Details on guided tours to museums will be discussed later.
- A hotel of European standard and at a price of 100-150 USD will be reserved.
- Working sessions will last 6 hours a day.
- Visits to technical sites (e.g. the Russian Main Computer Center or other enterprises of applied technology) will be organised.
- ICGSECS members are invited to inform themselves about the Russian Confederation and the capital in particular, and specify what other sites they would like to visit.
- Three months before the conference two separate programs, on the various working sessions and on the social program, will be put together.
- Information on how to obtain visas for conference members and spouses will be given at the same time.
- For further information or suggestions Victor Kostiakov and Rem Karpov can be reached through email using the addresses specified on the mailing list (karpov@glavnivc.msk.su)

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Austria
Geological Survey of Austria (GBA)

Udo Strauss

The Department of Automatic Data ProcessingThe Geological Survey of Austria is a specialised institution belonging to the Federal Ministry of Science and Transport. It employs some 120 staff including 50 geologists and related professionals. The staff of the department of automatic data processing (ADP) is currently 10 people.

The ADP department is responsible for the

1) co-ordination of all investments in hardware and software
2) system operation and management
3) development of central databases
4) development of application programs for general use
5) software (operating systems, DBMS, software packages)
6) general in-house user support
7) geographic information system (ARC/INFO)
8) prepress-preparation of the Geological Map 1:50.000 of Austria

Computers

1	HP 9000/800 T500-5	512Mb	100Gb
1	HP 9000/800 K260-2	256Mb	20Gb
2	HP 9000/735	64Mb	6.0Gb
1	HP 9000/715-75	64Mb	2.0Gb
2	HP 9000/715-100	64Mb	2.0Gb
2	HP 9000/715- 50	32Mb	2.0GB
1	HP 9000/710-60	32Mb	1.0Gb (nameserver)
10	X-Terminals (HP)		
3	Novell-Server 486	64Mb	2GB
25	PC Pentium	16-32MB	850Mb-5Gb
50	PC 486	4-16MB	170-500Mb
3	Apple Macs	64Mb	1.0GB

Output Devices

1	Xerox Versatec 8900 Plotter
1	Linotronic 530 Filmtypesetter (PostScript)
10	Laserprinter DIN A4 (HP IV, PostScript)
2	Laserprinter DIN A3 (HP,QMS 860, PostScript)
30	Matrix- and Inkjet printers

Network

Ethernet is based TCP/IP and IPX. 100Mbit/sec technology was implemented at the backbone level (Fast Ethernet). A CISCO Catalyst 5000 switch was installed to increase the network troughput. The servers are connected with 100Mbit/sec.

The survey is using the services of the Internet, like email, name servers and WWW. A WWW home-page was published in Dezember.

Software

BASISplus DBMS L1G2 (on HP)
ORACLE 7.2.3 Server (on HP)

14 ARC/INFO 7.0.4
3 TIN
4 ARC/SCAN
5 GRID

Production and Development in 1996

Databases

The main DBMS is BASISplus from Information Dimension. BASISplus is now installed on the HP 9000/800 T500. ARC/INFO is available in 14 floating licenses and runs on all HP-computers.

GEOKART - is an information system on thematic maps from the field of geotechnology and earth sciences, in which currently relevant geological maps are stored as far as these cover, either wholly or partly, the area of Austria. The GEOKART database contains data of approximately 16500 maps.

GEOKART status: In production

GEOLIT - is an information system on geological literature on Austria. Data are collected form both published and unpublished reports, expertise's, dissertations, etc. The GEOLIT database contains data of approximately 45000 reports.

GEOLIT status: In production

GPV - is an information system on geological serials available at the GBA. The GPV database contains references of approximately 7500 serials.

GPV status: In production

GEOMAP - In the medium range program of the Geological Survey of Austria the production of the standard geological map in the 1:50000 scale and the mapping of mineral resources has the highest priority. To fasten this efforts the geographic information system ARC/INFO was purchased in 1990. Since this year, the department was actively engaged in the implementation of a digital mapping programme. This programme had two objectives: First, to build up a database of the content of geological maps, second to accelerate the rate of publication of these maps.

Up to now 25 out of the 213 sheets of the geological map of Austria 1:50.000 scale are digitized. The digitizing was mainly done by scanning and vectorizing.

The cartographic production and printing of these maps is be done by the PostScript interface of ARC/INFO. The films are produced by a Linotronic 500 photo-typesetter. Since 1993 the cartographic map production is done with this method.

GEOMAP status: In production

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Canada
Earth Sciences Sector (ESS) of Natural Resources

Phyllis Charlesworth

Overview: The management environment

As reported last year, the Geological Survey of Canada (GSC) was merged in August 1995 with Geomatics Canada (GC) at an administrative level to form the Earth Sciences Sector. Geomatics Canada is the group responsible for topographic maps and aeronautical charts, geodetic and legal surveys, and the Canada Centre for Remote Sensing, so in a sense, ESS is now more like USGS than it used to be. The administrative merger meant that the Computer Technology, the sector level Geoinformatics organization, inherited some additional staff from Geomatics Canada, but it has also resulted in a considerably increased support and management workload.

One of the first activities, was to define the IT framework for ESS Geoinformatics. This was done using client focus groups to define services and levels required, and the result was presented to senior management and accepted in October 1996. In the meantime, what had happened to form ESS (the merger) had also happened in other areas of Natural Resources Canada, and many areas were both changing and reducing budgets and staff.

At the departmental level, a project was conceived called the Common Office Environment (COE) with the objective of standardizing the IT infrastructure and reducing overall departmental costs. This was based on similar types of initiatives mainly in industry which were used as models. Work started in the fall of 1995 on the COE project, and by December of 1996, after many weekly meetings, a blueprint, a business case and a high level plan were presented and approved. The most difficult aspect of the business case was that most of the benefits of COE had already been achieved within ESS, and the overall benefits for the department were very hard to quantify.

In order to implement the standardization decided upon, it is necessary to upgrade many of the user desktop computers to a minimum standard of (in the PC case) a 486-66MHz with 16Mb of RAM, or for a new machine, a Pentium-166 with 32 Mb of RAM. This requirement has meant that money was diverted from projects to buy new hardware, and staff time is being heavily used to upgrade operating systems and setup new computers. While we are trying to minimize the overall cost, and the disruption, some is inevitable; which means that what would have been overall project and program objectives are delayed.

Technical Environment

During 1996-97, we continued to run an enterprise-wide Banyan/Vines and TCP/IP network for the GSC, into which we integrated existing GC Novell and NT servers. In addition we started to convert Novell servers to Windows NT within the sector, and to offer some sector applications from an NT server to multiple platforms (Unix, MAC, PC/Windows3.1 and 95 and NT). We run a Helpdesk to focus support problems, and we use a large human network of divisional partners to share individual client support. There are both sector and divisional Unix servers throughout ESS, some of which are also switching to NT. Old hardware such as VAXes, are being rapidly phased out. Our total client base, shared among the support organizations, is approximately 1800 considering staff, post-doctoral fellows, visiting and emeritus scientists, contractors and volunteers.

The COE technical environment that was defined over the past year allows for Unix, MAC, Windows 95 or Windows NT workstations at the desktop, a common suite of Office Automation software which has yet to be chosen, a common email client and scheduler, MS-Exchange/scheduler, and a common way to access departmental applications called 'light client' based on the Winframe technology or Intranet. We have yet to implement any of this under COE with the exception of Exchange and Scheduler which have been piloted in several areas and implemented mainly in Ottawa but not yet in ESS. The technical challenge will be to ensure that this works and is scalable at an enterprise level, and to ensure that the actual business of the organization is disrupted as little as possible while all this is happening.

The database environment is varied, and includes everything from PC-level packages such as MS-Access, and Paradox, to Oracle which is the common database package for robust applications. A project is underway to define a sector project management information system, which may optionally be used by divisions to actually manage projects, depending upon the needs of the division.

While Arc/Info continues to be the GIS product of choice for geological cartographic applications, scientists are using simpler products such as MapInfo and ArcView for analysis. In addition, the new Autodesk product Mapguide has been used and is being explored for other applications.

Current Activities

ESS is attempting to facilitate the development of a Canadian Geospatial Data Infrastructure. This involves participation at the government-wide level (all levels of government) in meetings, obtaining the cooperation and input of industry and the academic sectors, setting up working groups or projects for specific activities, and keeping aware of and contributing to developments (particularly standards) in the international arena. At the program level, ESS will acquire and/or develop tools which will help the department make its geospatial digital datasets more easily accessible both internally and externally, and contribute to the overall infrastructure. Among the projects that are part of this initiative are ESS's CEOnet, LINC, and GeoExpress, all of which are accessible using the World Wide Web as an access method.

In February, the GSC organised a workshop on the future of bedrock mapping within the survey. Many areas were discussed but two issues raised during the workshop will potentially have an impact on the IT component of the survey. One area was the increased need for both classification and format standards. This requirement is due to the increased demand for digital geological data by our clients and also to the increasing number of collaborative projects involving researchers from many agencies using different GIS systems. Another area that aroused considerable interest was the requirement for three dimensional GIS capabilities.

The ESS has adopted Internet/Intranet technology more and more over the past year. It is being used both internally as an Intranet and externally to share information with clients. For example, the goal of the current development of a sector-wide project information system is to web-enable as much of this application as the current technology permits. Furthermore, the CGDI development is all targeted at the Web, as is a number of information outreach products. As a test, the surficial geological map of Canada is available on the Web at http://sts.gsc.NRCan.gc.ca/page1/sgm/maps.htm as a test product. Some other useful Canadian URLs are:
http://www.nrcan.gc.ca/gsc/ the GSC home page,http://www.NRCan.gc.ca the departmental home page, http://natural.gov.bc.ca/geosmin/minpot.htm a page of the provincial government of British Columbia, http://is.dal.ca/~mbutler/aczischttp: for the Atlantic Coastal Zone management, and /www.geocan.nrcan.gc.ca/iacg/ for the Inter Agency Committee on Geomatics.

This year has also seen almost every group in the government develop their own WWW home pages. So far, few have much real content on the World Wide Web, but it is hoped that the HTTP based server applications software that is starting to appear will have the potential to substantially improve

access to data. The additional possibility of running applications on the client using Java adds a new dimension to the Internet which could revolutionize the way we currently view and analyse all forms of data, but particularly spatial data. We are looking in particular at Map Guide by Autodesk, and at the Map Objects and soon-to-be-released web-enabled Arc View 3 packages from ESRI.

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Switzerland
Swiss National Hydrological and Geological Survey (SNHGS)

Peter Heitzmann

Office system (Federal Office for Environment, Forest and Landscape)

With the removal to the new sites the office system is completely equipped with about 460 PC586 with Windows 3.11 as user-surface. MS Office is the over-all general software package; a wide range of other programs are available. e-mail and X.400 is generally installed, WWW will be installed in summer 1997.

GIS, Data Bases and Digital Mapping Projects at the Survey

(1) GeoKarten 500
A GIS-based system for geological information at the scale 1:500'000 will be established. At the moment, lithological, stratigraphical and tectonic information is acquired; the hydrogeological information will be available at the end of this year. In a next step, geophisical information (gravity, magnetism, seismicity) will be added. The GIS system (in ArcInfo-Access) will serve as data base for cartography on intergraph. Data will be available in digital and analogue (printed) form.

(2) GeoAtlas 25
The first sheets of the Geological Atlas of Switzerland at the scale 1:25'000 are elaborated in a combined process with ArcInfo-Access and Intergraph to allow the edition as digital data set or printed map.

(3) Catalogue of Geological Maps
A GIS catalogue of geological maps published in scientific journals or reports. For a selected region a list of all the available maps can be established.

(4) Info-Slide-CH
A GIS catalogue of the mass movements of national importance is established and should be integrated in an international inventory.

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Germany
Federal Institute for Geosciences and Natural Resources (BGR)
Geological Survey of Lower Saxony (NLfB), Hannover

A.Voges, W.Struckmeier, H.H.Voss, H.Preuss

Organisational Remarks

The Federal Institute for Geosciences and Natural Resources (BGR), which is the central geoscientific institution of the German Federal Government, and the Lower Saxony Geological Survey (NLfB) work closely together and share one President on the basis of an administrative agreement between the federal and state governments. The two authorities occupy the same complex of buildings in Hannover.

BGR and NLfB have several branch offices, which are responsible for special aspects of geoscientific work. In October 1996 the BGR Berlin Branch Office has moved to a new site in Berlin-Spandau:

Wilhelmstr. 25-30 *Tel. (+49) 30 / 3 69 93-0*
D-13593 Berlin *Fax: (+49) 30 / 3 69 93-100*

Both institutes are in a process of reorganisation under given points of personnel reduction and other savings. A new organisational structure of NLfB with one of three management levels eliminated has already been accepted by the Ministry for Economics. The Central Services Division (with library, archives, central databases, publications, cartography, computer centre) shared by NLfB and BGR has not been affected yet.

Main efforts of BGR in 1996:

• Advising the Federal Ministries in questions of the environment / soil protection law.
• Exploration for and assessment of mineral and energy resources. • Investigations in the fields of engineering technology, geotechnics, groundwater, soil science, environmental protection. • Geotechnical studies related to the permanent disposal of radioactive waste as a point of main effort. • Technical cooperation with various developing countries.
• Marine and polar research. • Seismology and nuclear test observation. • Cooperation with international organizations and geoscientific institutions of other countries.

Personnel

BGR: 820 employees (42% scientists)
NLfB: 359 employees (41% scientists)

total: 1.179 persons (1.10.1996)

Budget

BGR: ca. 135 Mio. DM
NLfB: ca. 52.4 + 19.5 Mio. DM

Membership

BGR participates in the following international organisations:
•International Studies of Mineral Issues (ISMI)
•International Union of Geological Sciences (IUGS) and UNESCO
•OECD-Kernenergieagentur (NEA) and Internationale Atomenergie Organisation (IAEO)
•Ocean Drilling Program (ODP)
•Economic and Social Commission for Western Asia (ESCWA)
•Forum of European Geological Surveys (FOREGS)
•Commission for the Geological Map of the World (CGMW) and UNESCO
•European Environment Agency (EEA)
•EuroGeoSurveys

European Activities

The European activities of EuroGeoSurveys to create the Geological Electronic Information Exchange System (GEIXS) is fully supported by BGR. For the different levels of meta data, the creation of the defined top levels for European wide exchange (catalogue and index level) require additional efforts to be carried out in 1997. Support will also be given to create a common European topographic map basis and integrate/ install the web server system in Brussels.

Information Services

The Information Services are among the main instruments to support the geoscientific work of the BGR and NLfB divisions in terms of providing, preparing, and facilitating necessary information. Customers from outside the institute may also use the Information Services (especially library, archives, central databases, the GEOFIZ Information Centre) and contact the publishers to purchase books and maps. In 1996 the archive information desk noticed more than 8,700 requests, of which an increasing number of visitors (ca. 1,200 requests) could be identified.

A sophisticated menue driven user interface to the digital archive catalogue (DAK) is under development. The programmers utilize the fourth generation software tool JAM (by JYACC, USA) for this purpose. JAM is available and utilized on PC running MS-WINDOWS and on VAXes running VMS. It has also tools for linking databases to a web server (JAM/WEB toolkit).

The borehole data bank is still being managed by DASP, although several actions have been taken to redefine the data model for the use of a commercial relational database management system. The responsibility for a coordination within the community of the state geological surveys is taken by the a steering group (BIS). The strata descriptions are keyed according to accepted standards ("Symbol Key"). Different PC-based (WINDOWS 3.x) software packages are available for borehole data input (e.g. SEP-WIN) and for output in forms of profiles and sections (e.g. GeoDIN, TK-PLOT) using the given standards of keyed strata descriptions.

IT Infrastructure

The central computer cluster consists of the following •VAX-6400 •VAX-4000/300 •VAX-3100/76, operating Open/VMS, and •64-Bit-RISC multiprozessor computers •DEC 2100 A500MP (ALPHA), operating Digital-UNIX.

The internal network consists of •glassfibre-FDDI •thinwire/twisted pair ETHERNET •V.24 links with •600 V.24-Terminals, •100 X-Terminals, •750 IBM-compatible PCs, •100 workstations and •60 network printers.

The external net specifications are •64 Kbit WIN-access (TCP-IP) •9.6 Kbit WIN-connexion (Datex-P PAD, X.400). All of the network users have free access to Telnet/FTP/WWW and are reachable by E-Mail (SMTP). The following syntax is used:

Prename.name@bgr.de

In September 1996, BGR and NLfB have opened their combined web server with a total of 170 HTML documents. The server can be accessed by the following internet address:

http://www.bgr.de

BGR has started to replace the V24-Terminals and older VAX-stations by networked PC*s*. These are used as terminals (X-terminal via Reflection, A-terminal via Pathworks) or as personal computers with local software under WINDOWS 3.1 (MS-Office-Professional and site specific software). Tests of WINDOWS-NT on DEC-Alpha and on linked high-end PC*s* have begun in October 1996 and will probably be finished in April 1997. The preliminary results of testing the performance, network facilities and security features are positive.
Consequently, with a positive final test result, WINDOWS-NT may become the future operating system basis on all hardware platforms at BGR, omitting the already started soft transition from VMS to DEC-UNIX.

Cartography and GIS

The digital topography of smaller scales (1:200,000) and overviews of Germany (1:1Mio) was supplied by the Institute for Applied Geodesy, Frankfurt/M. Larger scale digital topography of Lower Saxony has been copied from the ordnance survey's ATKIS-DLM25 (1:25,000). These data sets comprise vector data and amount up to 8 GB in ARC/INFO readable form. Raster data from scanned topographic maps are also available and used as background topography on plotters.

The cartographic sections of both institutes now run the UNIX-versions 7.x of ARC/INFO on two DEC-Alpha workstations. The older VMS-versions 6.x are still in use for special purposes of the branch information systems. Map printing is done according to the concept of creating color separated PostScript files inhouse and sending these to contractors who use Linotronic laser imagesetters for high quality output. The first applications of the computer-to-plate technique seem to be very promising. Printing costs are considerably reduced compared to the traditional way of map production.

The common catalogue of rules and methods, which has been developed for the Lower Saxony Geoinformation System NIBIS, is now being utilized for the Soil Survey under the name "Methodenbank" (method base). There are advanced software tools being implemented and tested in a WINDOWS-NT environment to access the different databases of the branch information systems. The responsible political boards of most of the German states accepted the Lower Saxony concept of guiding the access to information systems by means of a method base, which works in conjunction with the environmental data catologue (UDK).

NIBIS includes map information from different geoscientific branches, e.g. the geological map series GK25 (with 430 map sheets of scale 1:25.000), soil maps of different scales (1:5.000 to 1:500.000), land use maps and others. The amount of data forces BGR and NLfB to efficiently organize digitizing. The digitizing is mainly done by contract. Two companies use scanner techniques to digitize the well prepared base maps and convert boundaries into vector format. The area information is added as attribute data in separate files together with coordinates from a central point of each polygon.

The map catalogue and index system KANAS, which uses digital techniques to create "clickable" index maps dynamically on request, is used to identify all mapped areas from the various technical cooperation projects carried out by BGR. The system is also used by other sections to store map metadata of the index level.

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Denmark and Greenland
Geological Survey of Denmark and Greenland

Sten Troelstrup

General remarks

GEUS has now experienced its first whole year as one survey. It has taken quite a lot of work to speed up the merger of the former Danish and Greenlandish surveys to a maximum but it seems it was the right thing to do. Most of the staff from the former Greenlandish survey was moved to the expanded premises of the former Danish survey before summer 1996 and at the same time major adjustments of the organisation took place. The only department from the Greenlandish survey that hasn't moved yet will do so in may this year.

And then, at the end of 1996 planning has started to move all of GEUS back to the premises of the Greenlandish survey in the year 2000. As a means to strengthen the national capabilities in the geo-sciences area Danish government has decided to form a "Geocenter" - i.e. a physical door-to-door relationship between GEUS, the Geological Institute and the Geographic Institute of the University of Copenhagen, the Danish Lithosphere Center and the Danish Geological Museum. At present the level of cooperation within this Geocenter, which laboratories to share, how to finance and manage common facilities and so on is discussed, and all kinds of arguments are heard.

Central servers

The IT systems have been merged too, i.e. the central server equipment is now all in the same room and everybody is connected to the same network. New Intel-based servers have been installed for a new journal and for Microsoft Exchange, and a DEC Alpha 2100 has been installed as pc-server, all three of these running Windows NT Server.

By july our leasing agreement concerning VAX'es, disk equipment and system software will come to an end, and a new leasing agreement will not be made. We intend to substitute the VAX'es by one or two DEC Alpha servers, clustered with the one we've got already, as we intend to move from OpenVMS to Windows NT Server when appropriate. For at least the rest of 1997 we shall still need a VAX to run the present release of GEUS's finance system.

PC's and network

Pathworks/Decnet has been phased out as MicroSoft TCP/IP has been implemented as the standard protocol. MicroSoft Exchange has replaced WPO-mail throughout the ministry, Internet-mail and fax integrated into it. The Schedule+ calendar and the Public Folder facility in Exchange are used too and although troublesome the implementation of Exchange has been quite a success - the IT department hasn't got that much positive feedback for years.

During the installation of MS Exchange some 50 pc's had the cpu, harddisk or RAM upgraded and some 20 pc's were substituted by more powerful ones. Testing of Windows 95 and Windows NT workstation, one of which shall be installed as the standard later this year, is going on, and one of the concerns is the need for further hardware upgrades.

Using the central hub and Fast Ethernet technology bandwith has been upgraded for dedicated parts of the network.

Workstations

SUN Solaris has substituted SUNOS as the operating system on the workstations used for seismic interpretation and three of these workstations have had a HP Laserjet A0-plotter attached. No new workstations have been installed.

Database-strategy

It has been decided that new databases shall be Oracle-based and that major enhancements to any existing database shall be the trigger for that particular database's conversion to Oracle as well. Oracle Developer 2000 and Delphi are the programming tools to be used.

As the first implementation of this strategy the conversion of the danish borehole-database (which is really nothing but a file-system) to an Oracle-database has started. The borehole-database is part of GEUS's Environment Information System, in which all kinds of groundwater- and soil-related data will eventually be organised. The system has been under construction for some years using RDB as database, and the early parts will be converted to Oracle once the borehole-database is ready.

The GEUS database on oil- and gas-related data will be converted from RDB to Oracle in some kind of joined effort with Landmark. Right now the discussion is to which detail Landmark's data model shall be used.

GIS and digital maps

ZETA - the in-house made GIS of the former Danish Survey - is still heavily used in some areas but further development will not take place as ZETA shall eventually be replaced by ArcInfo/ArcView. The ArcView user community will grow considerably as the personal licenses are now converted to floating licenses.

The use of GIS-software whether this be ZETA or ArcInfo until now has focused on mineral-, soil- and groundwater data while the oil- and gas data from the deep underground have been processed by some in-house applications and the Landmark software package. The Landmark announcement that coming releases will have an ArcInfo/ArcView-interface is regarded very positive.

In 1997 the hardware and software investments needed to fully implement digital map production will be made and the coordination of tasks and routines in digital map production throughout the survey will be strengthened. There are expectations that CPS will be aquired for the final cartographic preparation.

Applications

The in-house programming activities are minimised even further during the last year and are almost entirely concentrated around database construction and conversion. A few single-user AVS/Uniras packages have been installed to facilitate cooperation with external parties.

The GEUS homepage should have been ready long time ago but responsibility for this task vanished somewhere in the organisation.

Staff in the computer department

One IT professional in the computer department resigned last year and management decided to use the opportunity to cut the staff. The computer department accordingly moved even more manpower from the central servers to pc's and network, cut off most of its responsibility and work concerning GEUS's databases, and stays to long behind the users in the UNIX-area. There are now seven IT professionals in the department to keep the total system running and to serve some 350 pc-users and three of those seven don't even work full time.

ICGSECS National Report 1996/1997

Spain
I.T.G.E.

Luis Delgado Martinez

INTRODUCTION

In 1994 the Information Systems and Documentation branch was reorganized in three departments: Documentation, Information Systems and Computer Systems. The first one has the responsability on the Library and Documentation Center while the two others are focused on geoscientific information and computer infrastructute, respectively.

The activity of the 'Geosciences Database Committee', created at the end of 1994 are going on. All technical departments are present in this committee. Main issues have been addressed to three working groups:

- Database inventorization and institutionalization
- Database normalization
- Digital pre-printing process

INFORMATION SYSTEMS

Its purpose is the development, maintainance and management of Information Systems that permit the user ready access and selection of the geological and mining information. It consists of two sub-units:

- Data Bases
- G.I.S.
- R.D.S.S. (Raster Documental Storage System)

Referencial Databases are supported in Basis-Plus and factual Databases are supported in Oracle.

DATA BASES ----------

*** SPANISH DATABASE ON EARTH SCIENCES (GEOMINER)**

Bibliographical database containing, at present, 48.297 references, from which 11.412 are ITGE's unissued reports, 30.286 are references about Spain (both from spanish or from foreign authors) and 7.293 correspond to references about Portugal an several spanish-american (latin-american) countries.

This database may be accessed through the network.

BIBLIO

Biblio database contains a digital catalogue of ITGE's library. It is constantly updated with the new volumes and monographic papers, having at present more than 58.000 references.

INFORMATION GUIDES

Digital catalogue of the documents, mainly research projects undertaken by the ITGE, that are kept by the Documentation Centre. The catalogue has, at present, 10.636 records.

GEODE

Referential database of international scope of issued documents related to Earth Sciences. It includes references about all the countries in the world, being the ITGE in charge of updating it with documents from Spain, Portugal an Latin-America.

COAL

ITGE contributes to "IEA - Coal Research" Project of the International Energy Agency (IEA), updating, maintaining and broadcasting COAL database. This database contains information on different topics relating to coal such as prospection, mining research, processing, marketing, etc. It consists of 275.000 references with a yearly increase of about 11.000 more.

DRILLINGS

It contains info about drillings and stratigraphic columns, kept by the ITGE. The database has 21.500 records and its putting into operation enables access to primary documents.

HYDROCARBON

This database contains 63.000 references about research projects on hydorcarbon carried on in Spain by different research companies.

MAPS

This database contains information about the complete cartographic funds kept by the ITGE. At present it has 22.213 records.

MAGNA

The MAGNA Project for the realization of the National Geological Map at scale 1:50.000, is the source of information for the MAGNA database. This database contains the complete collection of analysis and reports which sustain the cartographic criteria. This information is gathered up as additional, non issued, MAGNA documention.

The database is structured in diferent units, that after the updataing of 1996 reach the folowing figures:

- Limestones and chemichal rocks: 50.102 anlysis.
- Sandstones: 14.494 analysis.
- Granulometric: 5.012 analysis.
- Chemical: 1.605 analysis.
- Bibliographic references: 8.060

PALEO

It gathers information pertaining to paleontological reports, normalizad (standarized) on samples obtained from teh MAGNA project. This database, which was redesigned in 1994, contains at present data from 78.379 reports

POOLS AND TIPS

This database gathers the information obtained from the Project for the National Inventory of Pools and Tips. (Project finished in 1989), and contains information about 7.096 structures (locations).

UNDERGROUND WATERS

The database of underground waters contains information generated in the different hydrogeological projects undertaken by the ITGE. The kernel of this databse is made up by the inventory of water-points. It contains information on 124.063 points throughout the country, and its data are regularly checked and updated.

The database is sturctured in different modules with specific information. The amount of information, after the updatings done, stands as follows:

- 57.196 chemical analysis.
- 245.473 analysis on changes in piezometric levels.
- 24.859 on intrusion development
- 127.322 on flows and levels
- 10.296 pumping tests
- 34.686 on surface flows
- 79.617 litologic samples

In 1994 this database was redesigned due to the changing from SQL to ORACLE.

Data Browser is used to retrieve data and to make up reports.

MINING CATASTRE

It contains managerial and topographic information on the mining titles presently in force. Nowadays this application has been implemented in 11 Autonomous (self-geverment) Comunities and in several regional offices of eh ITGE.

GRAVIMETRIC

Along 1996, the task of data gathering, data normalization and integration has continued, adding 3.000 new structural gravimetric stations and 478 detailed (mining) gravimetric stations.

At present, the database collects data from 113.298 gravimetric stations distributed among 280 sheets 1:50.000.

In 1996 was implemented in an institutional database server.

CD-ROM PRODUCTION

- Information Catalogue of the Iberian Pyritic Belt from an in house development.

- GEOMINPC, an application wich enables querys over GEOMINER data base.

GEOGRAPHIC INFORMATION SYSTEMS (GIS) ----------

Corporate GIS system in ITGE is Arc/Info and is used in five thechnical departments and in Information Systems also. In the beginning of 1994 old HP-9000 3XX and 8XX were replace by new worksations HP-9000 735.

Throughout this year the digitization of geological information in digital format, for the realization of the National Geolological Map, was continued. A total of 50 sheets were digitized using ITGE's both human and technical resources. At date 31 st December, a total of 311 MAGNA sheets 1:50.000 are already digitized.

In order to increase the production of digitized maps, a new digitizing room was set up enabling three more working positions. Two of them are old workstations which are used to digitize with raster images from geological boundaries as background. The other one is a Pc 486 with Tracer, a vectorization program, and ArcCad.

Several GIS projects were developed in the technical departments, the main one was centered in the Iberian Pirytic Belt, a metalogenetic province in the SW of the Iberian Peninsula. This database includes information about minning resources, geophysic, remote sensing and mapping geology at diffeent scales. All information has been intrgated into a GIS and query and display applications have been developed. Apart from remote sensing, 300 Mbytes of disk are needed for the database.

Other projects developed in the GIS unit of the Information Systems department are:

- Underground GAS storage: 1:200.000 scale site identification of favourable areas

- 1:50.000 scale geological mapping budget of the Dominicana Republic.

- 1:50.000 scale National Environmental Mapping Plan budget of Spain. This Plan includes geological, lithological, geomorphological, soils, vegetation, landscape and natural sites of interest mapping.

- Technical assessment in GIS to the Geological Survey of Argentina.

- Printing of geological maps from digital information.

RASTER DOCUMENTAL STORAGE SYSTEM (R.D.S.S.) ----------

The RDSS is a raster image documental management system, set up at the end of 1996 on a UNIX workstation. They consist mainly of unissued documents, their size ranges from DIN-A4 to DIN-A0.

COMPUTER SYSTEMS

Its aim is to develop and provide ITGES computer and communications resources with an homogeneous structure. For that purpose it counts on:

* Systems an Communications Administration
* Maintainance
* Trainning center

Hardware Inventory

* 34 computer units run under UNIX operating system, with the following tasks:

    - 15 units used as servers for databases, ofimatic uses, printing, sketch design, images and networks.

    - 15 workstations for technical branches (mainly GIS).

    - 1 microsupercomputer for image processing.

    - 3 managment minicomputers

* 335 DOS microcomputers.

Communications

* An Ethernet LAN network with TCP/IP protocol connects Unix worksations an DOS Pcs through the ITGE main office in Madrid. Other offices, also in Madrod, are connected by a 2.400 bps IBERPAC X.25 network.

Connection to INTERNET is operational and a 64 Kb/s link betwen ITGE and the IRIS node has been implented.

Database software inventory

* Arc/Info is used for digital mapping and as analytical tool.

* Oracle supports factual databases.

* Basis-Plus supports referencial databases.

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Finland
Geological Survey of Finland

Kalle Taipale

The Ministry of Trade and Industry in Finland started in 1993 a process in which all the innovation and technology policy measures as well as organizations under the auspices of the Ministry will be evaluated with the aim of improving their effectiveness. In 1996 the GSF was in turn. The Ministry invited Dr. Peter **Cook** from the United Kingdom, Dr. Eduardo **de Mulder** from the Netherlands and Professor Markku **Temmes** from the Helsinki University to conduct the evaluation.
The in-depth evaluation showed the GSF to be a first-class organization that is delivering exellent and cost-effective science that is of great benefit to Finland. However, the Review Committee recommended a number changes for the Survey to be better placed to respond to future challenges. Among the 33 recommendations only one handled directly the information management issues urging to develop a more considered approach and a clearer policy towards databasing and data release. Other recommendations will have a more indirect impact on the information management, computing and network policies. The recommendations have been taken in serious consideration and work for change has begun.

Hardware, software and telecommunications

An overwhelming majority of the data processing power is now in the UNIX-based client-server systems. The old Rdb-databases, some administrative applications and a few map production systems still operate under VMS. Servers and workstations of the system are mainly Digital's Alfas plus some Silicon Graphics running the image processing system ERMapper.
Updating of the local area network has been started in order to increase it´s capacity from 10 Mb/sec to 100 Mb/sec in the most critical sectors of the net. In these sectors mainly GIS and image processing data are transferred between servers and workstations.
A firewall system was implemented during 1996 to improve data security of GSF´s information system. Only the www-server for the external users is left outside the firewall. Intranet information services inside the wall are based on free or cheap software downloaded from the net, ie. Netscape or MS Explorer for browsing the net, Eudora Light for E-mail, WS_FTP32 for file transfer etc. People are encouraged to use the net with the aim to make it the principal communication media of the GSF.
The internal web-pages offer access to the metadatabases of GSF, link collections to other web resorces, administrative documents, annual reports, minutes to steering group meetings, phone directory, bulletin boards and news lists. It also offers bank connections, access to electronic bookstores, National Land Survey´s digital map store, traffic time schedules, weather service and so on.

Data and metadata

An inventory of printed maps and other old data was finished, and scanning and vectorizing of selected maps commenced. The digitising of several hundreds of maps will take still at least one more year.
Planning of a large project for standardisation of both attribute and spatial databases, map production methods and user interfaces of GIS systems has been started, and the project itself will be started later this year.

11 of over 20 TRIP metadatabases have been opened to the public as a web service using TRIPhighway software. The service is mainly in Finnish and can be tested at http://info.gsf.fi/. These databases contain FINGEO Geological Bibliography of Finland since 1971, RAPGEO unpublished reports of GSF, KIRJAT books etc. at the library of GSF, GTKJUL publications issued by GSF, LOPPI National Drill Core Archive, TREK Research Projects at GSF, BULLETIN270 Geological Bibliography of Finland 1934-1970 (a scanned printed bibliography, not indexed), BULLETIN108 Geological Bibliography of Finland 1555-1933 (scanned, not indexed), GTKMATKAT a list of travel reports and GTKKARTAT a list of all maps published by GSF. For some databases English search forms are available at http://info.gsf.fi/eng/.

The information services also contain GEOREF and Multilingual Thesaurus (for internal use only because of copyright reasons), as well as the catalogue of the new publications at the libraries of the survey. A list of available digital base maps can be browsed also. This database contains information about all digital base maps in GSF (name of the map, scale, type (vector or raster), copyright owner, format, possible limitations of use, contact person and a brief description of the map content.

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France
BRGM

Denis Bonnefoy

As presented during ICGSECS-10 meeting, hardware and network renovation is now completed. 25 regional surveys are nows connected with TCP/IP network. Windows NT server have been setup at the main regional centres. They are used as post office, files server and databases server. A national data server with Oracle 7 is accessible at national centre (Orléans).

Data standardisation

A consequently effort in data standardisation have been done these two last years. The affected data domains are geological maps at 1:1000 000, 1:50 000, ground water quantity and quality, industrial waste land and mineral description.

Standardisation means:
- definition of unique data model,
- development and setup in 22 regional centres of data input application, training of users,
- consolidation of the regional databases on national geological data server,
- development of data consultation and data extraction applications.

For 1997, this effort will affect quarries, ground hollows, regional geological maps at 1:250000, library and map library.

Data capture

In 1995-1997, BRGM has digitised or collected:
- around 500 images of 1:50 000 geological maps,
- more than 20 000 A4/A3 documents. Each document illustrates subsurface data: detailed location, geological scheme, analysis results...
- 10 000 description of industrial land wastes,
- 18 000 new gravimetric measurements,
- 7 000 new subsurface files.

Data dissemination

Three main tools are used for data dissemination
- the "French" Minitel through Internet for subsurface data and ground water level,
- the CD-ROM: this media is used for geological maps, subsurface data, ground water data.... The usual formats are ARC/INFO and/or MAPINFO exports files for coverages and TIFF for images.
- Internet: we develop a prototype for Oracle data browsing . This tools will operate in 1997 at http address www.brgm.fr.

Data management

A new geological data server (SUN/Solaris/Oracle 7) has been bought this year in addition to the Digital one (Unix/Oracle 7).

The Sun server is a http server who will support Internet access to geological metadata. BRGM has also installed Spatial Data Engine from ESRI for geological map and geographical data management and request. This work is a preparation for the GEIXS metadatabase.
The Digital Unix server is exclusively used for data capture (network connection).
During this year, we also bought TEXTO for Oracle for bibliographic data management from regional and national access to the bibliographic data.
At the end of 1996, BRGM is still using VMS only for BRGM records.

GIS tools

No changes in 1995-1996 for GIS tools. BRGM uses now MAPINFO Version 4, ARC/INFO and ARCVIEW version 3 with SDE access.
BRGM begins to train his developers to Java and to write Java script for GIS data management.

3D Research and Development program

Active research activities have been completed during the two last years: GéoFrance 3D program objectives are to develop a demonstrator of 3D geological map by using DEM data and geological sections and structural data. In 1996 a graphical editor of section have been developed built on software library CAS.CAD from Matra Datavision.

Co-operation/commercial activities

Through a French-Indian cooperation, two important IT programs are now running.
Indian Bureau of Mines
BRGM has developed and installed an information system Indian Bureau of Mine:
national mineral inventory and beneficiation, mining leases and GIS, mines cum production, external trade, mineral consumption, world mineral intelligence.
Geological Survey of India
BRGM starts in 1996 an important project of Geodata Centre at Geological Survey of India. This project includes the computer equipment (with building cabling at Calcutta CHQ and in 3 regional centres), the development of information system with fifteen databases (Oracle and ARC/INFO), the installation of library, remote sensing centre, map making centre and multidata processing centre

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Ireland
Geological Survey of Ireland

Mary Carter

General

In 1996 a further 16 Pentium PCs were added to the network. All PCs now run WINDOWS. A second server was installed in February 1996. During the summer, a standalone Email PC was set up and in November, Internet Email was made available to all members of staff on our network. A World Wide Web page was created and can be found at http://www.irlgov.ie/tec/gsi/index.htm.

Preparatory work has been done towards initiating a survey wide set of standards for describing its data. A workshop was held to introduce all staff to the potential of GIS as a method of viewing and analysing GSI's data. The Bedrock geology 1:100,000 sheet data, which are prepared for publication using ARC/INFO, were prepared for viewing in ARCVIEW so that staff would have an opportunity of viewing map data in a GIS environment.

Digital Map Production

The UNIX network consists
Sun Sparc 10 with 6 GB disk space
Sun LX with 1.5 GB diskspace
Exabyte 5 GB tape backup unit
QIC 150 tape drive
A0 digitiser
CD drive
Calcomp 68000 colour raster plotter

Our Digital Map Production System is now based on Arc/Info V 7, together with Cartographics, which also assists in speeding up the processes of map production.

The 1:100,000 map series is produced digitally on this system as a result of a successful co-operation between IT, Cartography, Bedrock and Minerals Sections.

Consideration is being given to 1:50,000 map series for Quaternary Map production.

PC NETWORK

DELL 5100 server with 8 GB of disk space and HP1200e backup unit
DELL 450 DE server with 2GB of disk space
39 486 PCs
21 Pentium PCs
6 A0 digitisers
HP Surestore CD writer

Software on the network includes
Word
Excel
MSMail

DataFlex
WordPerfect

Software running on local hard disks includes:
Autocad
Cadoverlay
Aldus Pagemaker
Geosoft
CorelDraw

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Iceland
National Energy Authority

Helgi Torfason

Orkustofnun (OS) - The National Energy Authority of Iceland is a government organization under the Ministry of Industry, charged with the responsibility to research and investigate the energy resources of the country, and to chart and issue statistics on them, as well as being the principal advisor to the Government of Iceland on all matters oncerning erergy developement and utilization.

OS is divided into Energy Administration and Energy Research. The Dept. of Energy Administration will advise the government on energy matters; collect and keep accounts on energy resources, and initiate research on these resources; keep accounts on the energy budget; make long term plans on the utilisation of energy resources; further cooperation in the energy sector and coordinate energy research by long term planning; carry out administrative tasks allocated to NEA by law or state directives; distribute information to governmental institutions and to the public on the energy budget and the utilisation of the energy resources; and administrate energy resource areas owned by the state. It will also be in charge of all data collected by the various departments of OS.

The National Energy Authority has been active in the fields of exploration, development and utilization of energy for over 40 years. The total number of staff at the National Energy Authority in 1995 was 93, of which about 65 were specialists in the relevant fields of earth sciences and energy. OS being far the largest earth science research unit in Iceland has collected data on geology, geophysics, geochemistry, hydrology, energy etc. for some 40 years.

DATA BASES

Due to large geophysical projects and the need for a strong calculating force, OS has since 1985 used UNIX on several workstations. PC-computers have grown in number, mainly as they are cheaper but Windows-based programs are also quite easier to use than programs developed for UNIX. In the beginning data was stored in files and tailor-cut programs developed in OS or acquired from elsewhere were used to interpret and manipulate the data. Collected data is now stored in Oracle DBS, some parts still being developed. Oracle server was purchased in 1988 (5 seats) and has mainly been used in geochemistry, hydrology, borhole data and to a lesser extent geology. Specialized programs are used to get data from Oracle for interpretation etc. Geographical data were not collected in large amounts due to lack of software. When Arc/Info was purchased this situation changed dramatically and now a big emphasis is being put on storing geographic data and moving new and existing data into Arc/Info.

GIS AND CARTOGRAPHY

Arc/Info was purchased in 1993 and has mainly been used for making maps and organizing various data. We have now 6 sessions for Arc/Info and 4 sessions of Arcview 3.0. This is still in the early phases of development. Arc/Info has been used to make 5 printed geological maps and 4 others are in the last stages of preparation. Arc/Info and Oracle are also used together to manage huge databases on hydrology of Iceland, being used for road management, planing hydropower stations etc.

PLATFORMS

OS uses a network of (HP) UNIX-workstations with X-Windows terminals for users. There are 10 HP-9000 series workstations with 60 X-Windows terminals. Some 40 PC-computers (586 and some 486) are linked to the ethernet. At the moment some 10 NTrigue users are being installed on the net, allowing users to make use of the Microsoft Windows environment. A new computer HP-9000-D370 is to be purchased in 1997. Orcale is being run on a HP-workstation and Arc/Info on two HP-workstations. For output we have HP-DJ650 inkjet printer A0 and for digitzing we use Calcomp A0. A small A4 scanner is used for small jobs but for larger formats we get maps scanned at a private firm. Available disk space is 18 GB, always to small.

SPECIAL GIS PROJECTS

Geology of the City of Reykjavik and suburbs is in its final stages. This project was started in 1991 due to finish in 1997/98. This incorporates mapping, drafting and printing of 12 maps in the scale 1:25.000, 4 maps in respective fields solid geology, superficical deposits and hydrogeology. The first 3 maps were produced with conventional methods but the other with Arc/Info.

Geothermal map of Iceland 1:500.000 is in preparation, due to be printed in 1997/8. This map is designed in Arc/Info and data is stored in Oracle.

Geology of Hraun, Eastern Iceland. Geological map in the scale 1:50.000 is being prepared in an area where hydropower production has been proposed.

Some 3.6 km3 of meltwater from the volcanic eruption in Bardarbunga, Vatnajokull, in October 1996 flooded the sandur plaines south of the glacier. The flood peaked on the 5. November when about 55.000 m3/s surged from the glacier. The meltwater did collect in the Grimsvotn caldera below the glacier and was released in one big surge. The changes on the sandur plain, in watercources, the coastline etc. have been monitored since then, using Arc/Info.

Geological maps are being made for the firm Melmi ehf. containing data in relation to a gold-exploration project in Iceland.

Topographical maps for Landsvirkjun Electric Power Company have partly been digitized and are stored in Arc/Info.

Geothermal map of Hveragerði village is to be revised in 1997 using Arc/Info.

Geological map of inland walleys of Skagafjordur in northern Iceland, and two similar maps in central and southern Iceland, all of which being prepaierd in relation to proposed future hydropower stations.

Surface deposits map is being made of inland Skagafjordur using Arc/Info.

A data base concerning proposed hydropower schemes in Iceland is constantly being updated using Oracle and Arc/Info.

Several projects concerning environmental issues are running, using Oracle and Arc/Info as data base management and to manipulate and present the data.

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Lithuania
Geological Survey of Lithuania

Julius Belickas, Povilas Stonys

Strategy and organisation

The Geological Survey of Lithuania is the only organisation collecting and systematising geological data all around the Country. This purposes as supply of consumers with geological information is general task of Information division in this year, too.
It seams there are not strategical and organisational changes during last year in LGS.

Information division takes care of:

- Geological data systematisation in general
- Information technologies implementation, support and developing in LGS to manage geological data
- Survey staff education and teaching in computer skill
- Geological information and data distribution to society
- Technological assistance in data processing and transfer
- Technical supported maintenance of hardware and software

Geological data systematisation grounded on principal ”data model is true reflection of geological objects”. Such principle is backbone of Oracle CASE method, used in designing the Geological Information System of Lithuania, too. Another principal applied under construction of Information system is aspiration to combine all used software and data into so named Warehouse. The application ”GIS-Geolis” designed in 1996 is an example of this. ”GIS-Geolis” is the tool that realise Oracle data accessibility trough MapInfo GIS environment.

The applications based on Oracle RDBMS are designed especially for LGS by Information division on co-operation with commercial company ”Information technologies”. It is going to sped up designing special applications in LGS in this year.

GIS(Microstation PC, Map Info and partly Arc Info) applications, special geological data processing software were adapted by Information division specialists during 1993/95 years.
At the same time programmers educate geologists and technicians in computer skill intensively. As it was the first acquaintance with computers for most of them, weekly studies for LGS staff on Windows, Word processing, Email and Internet systems were organised.

The routines of completing of geological library, providing geologist thematic literature is pressed for moving to computer management. The beginning was done by establishing Internet direct connection, search information in CD ROM’s and the establishing of temporary bibliographical data base.

Data management

There is made decision to aspire to ‘Client/Server’ data management applied to attribute as to vector information as well. Few applications build in Oracle DBMS have ”Client/Server” architecture now. Oracle RDBMS upgraded to version 7.3.

Data Base

The choice to use Oracle RDBMS for attribute data keeping was done in the beginning of creating geological system still invariable now too. The most important for geologist data base subsystems were designed and installed within three years. The developing process is continuing. So Oracle RDBMS upgraded to version 7.3 and bought Oracle tools: Developer/2000 and Designer/2000

According to the data model all subsystems are closely connected together. For example from geological Index screen in boreholes application it is possible to go across Stratigraphical schemes interactively. It is possible from geochemistry testing results go to the lithological layer description, etc.

Access to the data is limited depending on the determination the user's role. Planed external access ”on line” for customers was not released last year due to technical problems should be done in this year.

Cadastre of boreholes contains now about 25 thousand records. It is enriched with new ones bored every month. Subsystem is in great demand among geologists. It is by 15-20 geologist daily. Simple interface for the subsystem data transferring to interpreting packages is included. Application released under third Oracle forms.

Geochemistry subsystem allowed to manage testing results of various geochemical investigations all over the Country. Each test sample point has special references and might be integrated into GIS application.
Subsystem was installed in the end of 1995 year and filled with few of tens' thousands records till now.

Hydrogeochemistry subsystem inherited the same quality as the previous ones because it is in progress, too.
Stratigraphy and litology parts are closely related with boreholes information and supplement the latter. Both parts were realised in 1995, too. They contain data of various (more ten) local, national and international Stratigraphical schemes as well. It makes possible easier to compare Stratigraphical units, various in time, and describe lithological components of layers in detail.

Such subsystem of attributive data became as basement for further boreholes parameters processing and interpretation by implemented special software or GIS environment.

Groundwater level monitoring subsystem contains routine data of ground water level observations in state monitoring network since 1946.

Wastsites inventory application is not integrated part of the system but it is realised in true client/server architecture. Application is realised by Specialists of Geological Survey of Norway and transferred on co-operation background to LGS. It is necessary to adapt to above-mentioned applications.

Bibliofond subsystem is under the development now. It will cover library, archive and bibliography routine needs. Temporary segment of Bibliofond subsystem was designed and realised in 1995. It contains about 3 000 bibliographical records from 1984 to 1995. Project is going to be finished and implemented in 1997.

Other data bases as temporary data storage’s are realised as Paradox, Excel and etc. applications. MS Access is on adaptation now, too.

GIS and digital mapping

PC based Arc Info, Microstation and MapInfo as digitising technology are used in LGS as well. In fact Map Info package is very popular among geologists. It is on use in all Divisions as most simple in adapting software.
More complicated maps were prepared using of Microstation PC. Unfortunately this software mastered only by one specialist. Others use it only for digitising purposes.
ArcInfo 3.4 (PC) utilised for separated special functions of data conversation, only.
Regardless of that, the implementation of GIS technologies was so effective that it gave an opportunity to deliver geological information to local municipal authorities in digital formats, as GIS application and colour output as well.
For example listed bellow maps' sheets were prepared to local authorities of Siauliai City in scale 1: 25 000: Recourse of Subsurface, Hydrogeolgy, Prequoternary geology, Geopotencial map, Geomorphology, Engineering conditions, etc. Applications consist of forty layers containing attributive data tables accessible interactively.
The mapping results of joint Polish - Lithuanian project ”Belt of Jotvings” were achieved by digital technologies completely. Project finished last year.
The digital technology is being adapted into national mapping projects, too. Great number of digital data makes to think about their systematisation, storage and data sharing technology.
These methodological problems will be solved within the ongoing project ”Digital map production at LGT” run by specialists of the Information division.

Oil field data processing system

Strong geophysical data processing and interpreting complex was installed and adapted in 1996. It consists:

- seismic processing software - Promax 6.0
- Oil reservoir's simulation tool - Eclipse 100
- and the Schlumberger Geo Quest :
  - Finder - Data Manager System,
  - Charisma - Seismic Interpretation System,
  - Geo Frame - Petrophyscs and Loging,
  - RM -Reservoir Modelling.

They run on three Sun Spark Stations 20/61/71.

Networking

First Email connection based on commutative phone lines established 1994 year.
This connection converted to direct Internet access throughout 64 kbps modem in the end of 1995. The domain ”lgt.lt” was registered in Internet and Email server ”@lgt.lt” was established in the Vilnius University Server. Since 1996 the DNS and Email server were moved to new Sun Ultraserver 170.

It made information exchange attractive and very easy for all Survey staff trough each PC/TCP connection. Local Network (LAN) was extended approximately for four tens' desktops in 1996.

The next steps in networking area could be delivering of information to customers on line and maintenance of home page and metadata. First shay presentation of Geological Survey put on it's ”home page”(**http://www.lgt.lt**).

Computer facilities

The current computer system is oriented to "Server-Client" architecture. The old MOTOROLA mini computer, running UNIX V/88 operating system, is just file system server. All main tasks are trans-

ferred to our new server Sun UltraServer 1 that runs Sun Solaris 2.5. This server now is data base server, domain name server and E-mail server. More than 40 PC's as clients of net server are running DOS, Windows 3.11/95, and PC/TCP software. Desktop software, running on these PC, listed below.

Specialists of Survey can connect to server and work with data base, transfer files, print to remote printers and plotter's trough network. Computer equipment use in LGS shown in picture.

List of Software

Operating Systems

- Solaris 2.5
- Sun OS 4.1.4
- UNIX V/88
- MS DOS
- Windows 3.11
- Windows 95

RDBMS:

- Oracle 7.3 for Unix
- Oracle 6.0 for DOS

Oracle tools:

- Developer/200
- Designer/2000

GIS:

- Microstation PC
- ArcInfo PC
- MapInfo PC
- Idrisi

Networking facilities:

- Windows' 95
- TCP/IP
- PC/TCP
- Software for accessing Internet

Geopysical System:

- **Promax 6.0**
- **Eclipse 100**
- **Geo Quest**
  - Finder
  - Charisma
  - Geo Frame
  - RM

Other:

- MapBasic
- MS Office:

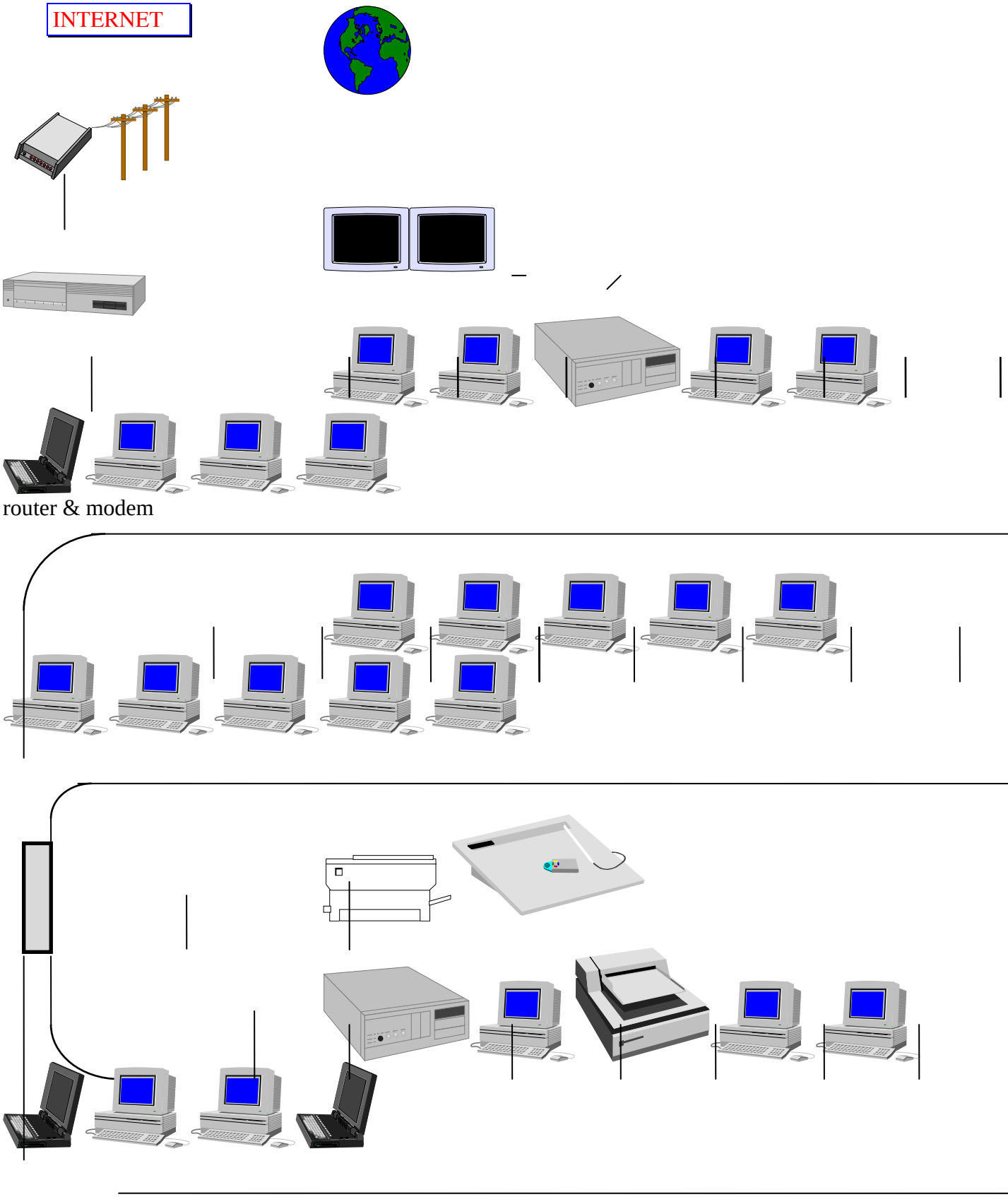
Access, Word, Excel, Power Point

- Surfer
- Grapher
- Rockware
- Modpath
- Modflow and etc.

Hardware:

Facilities	*Number*	*Main parameters*
Servers and Workstations:		
• MOTOROLA M8240 • SUN Spark Station20/61/71 • Sun Ultraserver 170	1 3+1	25Mhz, 1.3GB; 32 MB 60Mhz, 34GB; 128 MB/167Mhz, 4 GB, 164 MB
Desktops and portable PC:		
• Pentium • 486 386	11 20 9	75MHz;1GB; 8/32 33/50/66Mhz; 0.2/0.5GB;4/24MB 20/25/40Mhz; 0.04/0.4GB;4/8MB
Networking equipment:		
• Martis Modem SBM 64		64 kbps
• Router CISCO 2501		
Internal Repeaters: Ether R-4/Ether R-2		
Peripheral equipment:		
• Plotter HP Design Jet 650c, P/S		
• Digitisers: -Calckomp A0, A1 -Altek A1 -Genetiser A3	3	
Printers:-HP LaserJet	2	
-HP DeskJet 1200 P/S -Epson LX, LQ	4	

LGS computer network



ICGSECS National Report 1996/1997

The Netherlands
Geological Survey of the Netherlands

Jan Jellema

From the first of januari this year, the new merger between the geological and the hydrological institutes has been effectuated. The name of the new institute is ”The Netherlands Institute for Applied Geoscience”, commonly referred with the Dutch acronym NITG-TNO.
The new Institute is independent of the central government, but is included in the TNO-conglomerate of institutes for applied technology. Funds have to be generated by Government orders or orders from third parties.
The merger had several consequences for the IT-policy. Not only are all positions in the organisation redefined, but also all hard- and software are evaluated for their future use. The new IT-manager is mr. I.Ritsema, while I myselfwill be engaged as IT-advisor.

For the future development of the geo-scientific databank our preference is Oracle instead of Ingres. This decision implies a complete conversion of all modules of the geologic databank. At the same time the new databank will be extended with provisions for the hydrologic phenomenae and for surface water.

The oil- and gas department is provided with a multi-client database based on software from Schlumberger, including Finder and GeoFrame. An interesting new product is a decision support system for oil- and gas companies, made in Java language and suitable for Internet application.

Modeling is improved by purchasing the true 3-dimensional software from the Norwegian company Geomatic. We intend to use it also for complex groundwater modelling. The ESPRIT project OMEGA, in cooperation with other parties, will extend the CAD-products of MATRA Datavision with earth-modeling capabilities.

For internal use by the laboratories the Diaxol programme is developed, which makes it possible to present all kinds of parameters along the vertical axis.

The main hardware of the NITG consists of:
Servers: SUN 1000, Sun Ultra
Workstations: SUN Sparc 10, 20, Ultra and Silicon Graphics.
Personal Computers: Compaq 486, pentium.
Network protocol: TCP/IP, PC/NFS
Plotters: HP Designjets, Versatec color rasterplotter.
System Management: CA-Unicenter, TIVOLI

RDBMS: Oracle
GIS: ARC/INFO, ArcView and SmallWorld.

Geo-applications;
Oil- and Gas: Finder, Charisma, Geoframe, Z-Map, Eclipse
Subsoil: Logger, Gridzo
Hydrology: Geomatic, Modflow, Marine geology: Promax

ICGSECS National Report 1996/1997

Norway
Geological Survey of Norway

Bjorn Follestad

Geological Information Centre

During 1996 the Geological Information Centre was established as a separate department headed by a director. The Information Centre includes the IT, GIS, and Marketing sections. The GIS section also includes the map production facilities.

Total Quality Management

It has been decided to use the principles from Total Quality Management as the overall basis for the management of the survey. The systematic work towards this end is expected to be one of the major efforts during the time to come. The Survey got its ISO 9000 approval for the chemical lab two years ago.

Networking

The connection with our branch offices is now based on lan-to-lan communication via ISDN. We use Windows NT network system with TCP/IP protocol. There are some problems with keeping the ISDN activity down to a minimum.
The mail system is now based on use of Microsoft Exchange Server.
During this spring NGU will install a firewall in order to protect our IT systems. We have decided to use the Cisco PIX solution. The security enhancement will also include facilities for automatic virus-scan of all inn and outbound messages. Lately we have had experience with the problems arising from a macro virus most likely received through Email. Our anonymous FTP service has also been abused by people using our upload directory for trading.

Databases

All new databases are now established on a Windows NT platform using the Oracle toolkit. At the moment only reference level data are available on the Internet. We plan to establish a separate data-base outside the firewall containing a copy of the data that should be available to people outside the Survey.

NGU is now considering use of Spatial Database Engine (SDE) from ESRI to keep track of the spatial data. Most probably we will start using this system during the autumn.

GIS and map production

The traditional UNIX based Intergraph production line for geological maps are now almost completely replaced by Windows NT based systems. We still use both hardware and software from Intergraph.
We intend to replace all our UNIX-based ArcInfo activity with the Windows NT version.

Standards

NGU is involved in the development of a national standard encoding and exchange format for geographical information (SOSI). This group has also representatives in the relevant international standardisation bodies in order to co-ordinate the work and minimise the modifications necessary whenever international standards emerge (CEN/TC287 and ISO/TC211).

International activities

NGU has for some years been involved in projects in Russia , Lithuania and Latvia. During the last couple of year a co-operation with Ethiopia and Eritrea is also established. In all cases some activities on establishing basic IT framework and database design is included in addition to the geo-sciences activities..

ICGSECS National Report 1996/1997

Russia
Ministry of Natural Resources

Rem Karpov

United Information System of Subsoil Use (UISSU) carries out its activities under the guidance of the Department of informatics and information resources the RF Ministry of Natural Resources formed last year with full responsibility for saving and management of Russian fuel, mineral and water (surface and underground) resource.

Hierarchically structured UISSU runs on three levels:

1. Federal level with Head Information and Research computer Center (or GlavNIVC in the Russian abbreviated transliteration).

2. Intermediate level represented by 11 Regional and 6 Specialized Information Computer Centers (ICC) which cover all the territory and sea shelf of RF. Specialized ICC are involved in the capture, analysis, visualization and archiving of geophysical, hydrogeological, marine, ecological and economic geo-data.

3. Local level - Information departments of administrative bodies established practically at each member of Russian Federation in framework of geological committees, etc, which supervise over ”the State fund of subsurface lots”.

All the elements of UISSU operate as a single information structure in accordance with common regulations, rules and standards on collecting, retrieval and transfer of geo-data.

A challenging problem facing the System is a conversion of factual (prime), textual and cartographic geo-information prepared and stored formerly in an analogue form into digital code . No less than 300 thousand reports on geological prospecting with several thousand standard nomenclature sheets of geological, geophysical etc maps on scale 1:200K and many hundred on scale 1:1000K are now accumulated in paper form in Russian depositories. Much more analogue geo-data were obtained during previous stages of field investigations.

A rough estimation of geo-data stored annually in digital formats gives a figure around 10 or 12 TB with the lion’s share pertaining to raw data of geophysical surveys (basically seismic, aeromagnetic and aerogam-maspectrometric), marine geo-observations, geochemical and water pollution laboratory measurements etc.
GlavNIVC as a general coordinator of the System provides funding, personnel training, quality assurance and control on communication operational network of data interchange. It keeps mainly meta-information small-scale (1:10M - 1:1M) GIS, the most important databases, linguistic and data models support facilities.

The System’s client/server arcnitecture hardware are SPARC Server 1000E, Macc memory SPARC Storage Array produced by Sun Microsystems with Solaris 2.4 and powerful PC’s in clients positions with GIS ARC/INFO applications using DELPHI product.

About 40 working places on Sun SPARC Station ARC/INFO and more than 200 PC ARC/INFO installations are used on this Project. ARCVIEW GIS tools and ORACLE-7 DBMS are integrated in the System.

Severel hundred of standard nomenclature map sheets (on scale from 1:200K to 1:10M) are already automized and modelling of oil and gas fields is being developed.

More than 400 trainees attended training courses on ARC/INFO, ARCVIEW, AVENUE, ARCStorm, ARCGRID, GEODRAW (Russian product) and GEOGRAPH (Russian product). Training is carried out by ESRI certified instructors (employees of GlavNIVC) on PC-Introductory Course and on SUN SPARC Station - Advanced and Spacial Modelling Courses.

Since 1995 GlavNIVC works on joint project with USGS for GIS on geology, fuel and mineral resources of Russia which will be available soon as CD-ROM product for general use as information reference system for maps employment. It comprises digital maps on scale 1:2,5M:Base Map, Geologic al Map, Map of Mineral Resources, Map of Oil and Gas Fields, Allocation. There are also databases with the description of the map's features. On Base map boundaries of administrative regions, cities, towns and other settlements, highways and railroads, rivers and lakes are depicted. Map of mineral resources indicates deposit names, locations, commodities, production size, stage and mode of development, host rock geology, ore mineral composition, genetic type, age of mineralization, shape of ore bodies, grade of main components, investigation stage, source of information etc.

Internet WWW sites with use of 64 KBps dedicated communication channel are now under development. The WWW address of GlavNIVC is www.gbdgi.msk.ru.
PC's with Windows NT, NetWare 4.1 Web Server and ASP of BAY NetWorks are used as WWW server.

The members of UISSU are now also performing WWW enrolment.

For archiving of full-text geological reports in TIF format Exalibrus Electronic Filing SoftWare (EFS) in experimental regime is used. Client/Server architecture on Solaris 2.4 with SUN SPARC2 Workstation as server and Scanner HP Scanjet 3C on Pentium 90 as client provides satisfactory saving service.

The special GIS problem is delineation of plots with distinguished degrees or details of geoinvestigations by different methods and resolving powers obtained in field measurements. Using GIS ARCVIEW-2 with a "point and click" spatial reference system more than 60 thousand entries on geological prospecting now can be retrieved from a database which is still in a regime of expansion.

To create high level data models, entity-relation (ER) diagrams, taxonomy classifiers, thesauri etc the CASE-technologies are used with such ORACLE products as ERVIN/ERX, Developer 2000 and Designer 2000.

In composition of a ER diagram Cadaster of mineral deposits 96 entities (50 with thematic dictionaries inclusive) and 910 attributes are involved. The economic geology thesaurus comprises now close to 20 thousand mutually noncontradictoried and interrelated terms with 190 thousand links of associations between them approximately.

11 types of automated data input devices has been worked out and implemented in the System. For example, for field seismic logs (2D and 3D modifications) registration 62 tables, 41 reference dictionaries and more than 700 attributes are used. Similar applianced for magnetic, gravimetric, electrometric field measurements are used. To collect raw data on geochmistry, boreholes drilling, drill core logging etc. precise automated directives are elaborated. For archiving of seismic field measurements and well's logging results tape devices EXABYTES are widely used.

On hard discs anomalous gravimetric fields (Bouguer and free-air reductions) on scale 1:200K for more than 800 standard nomenclature sheets in Gauss-Kruger coordinate system are now recorded. The same recording for magnetometric and radiometric fields is now in progress.

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Sweden
Geological Survey of Sweden

Jan Hultström

General

The Geological Survey of Sweden (SGU) is a governmental authority under the Department of Industry and Commerce. SGU was founded in 1858. Today SGU has about 275 employees. The main office is in Uppsala, close to Stockholm and there are local subsidiary offices in the west, south and north of Sweden.

The Geological Survey develops, synhesizes and markets qualified geological information for planning and decision-making purposes for a number of areas e.g. environment, land use planning, supply of natural resources, agriculture and forestry and total defence in Society.

Data from basic geological investigations on land and at sea are stored in various databases. The information is presented as maps, descriptions and reports.

A Business Processing Reenginering project has led to some radical redesign of business processes to achive improvements in critical, contemporary measures of performance, such as cost, quality, service and speed.

One important change concerns our view of data aquisition and data interpretation. Digital storage of geological information in a common database is to be regarded as the final goal of surveying activities as well as starting point for flexible product development and production. and thematic products.

Due to a sudden shortage of grants for 1997 and a bad economical result for 1996, our long-term strategy planning and BPR projects had to be abandomed in favour for hard economic planning in order to survive the next coming years. This means the dismiss of 20 % of the staff and a reduction of investments to almost zero. This has influenced the ADB activities since last summer. There is not much to add to the report made for ICGSECS-11.

Staff

The survey is organized in matrix form having one axis with resource and competence centers and the other built up by projects. The latter buy personal and technical resources from competence centers according to a list of rates. The Department of Technical Support is a competence and resource center with 13 ADB experts. Compared with last year this is a reduction of 5 experts. The young ones lieve the survey for a better future elsewhere.

Communication

Internet and the freeware Eudora have been used for mailing inside and outside the survey for some time. Our subsidiary offices are now connected to to the network in Uppsala by ISDN communication, which works very fine.In 1996 a fire wall and a web server were installed using Gauntlet 3.x Firewall software, Axil 245 and Sun hardware. A home page can now be
retrieved by address http://www.sgu.se The costs of firewall were no more than 30 thousand U.S. Dollars.
The groupware Lotus Notes has been used a couple of years as a local mailing system and also for handling databases retrieved and updated by many users e.g. reports, budgets, statement of accounts, notice to attend.Our next move is to unite Internet and Lotus Notes. Lotus supply routines called Domino which could be useful.

Databases

As mentioned above our present strategy gives the geological databases a central role. This view is reflected in a new organization where all important databases are assembled in one and the same organizational unit, what we call a programme. The programme will secure coordination of data to be analyzed from different databases and to produce new products based on interdisciplinary data. Ingres will be used as the main tool. For data entry and for local management of data on PC´s we have choosen Acces. Datadirect from Intersolv is used as ODBC driver.
During the last year, 25 databases have been converted from minicomputer system, PRlME and DBMS, MIMER, to network, UNIX and Ingres. The next move is to redesign, remodel and quality classify a number of databases .

GIS

The Geological Survey has decided on Arc/Info as the main GIS tool . Although the ambition is to reduce the number of systems used at different branches of the survey an encreasing number of user prefer Map Info as their local tool. Our geophysisists have decided on Geosoft. Some bedrock geologists and marine geologists use Intergraph for 3-dimensional analysis. Arc/Info is predominant in more heavy analysis, for flexible product development as well as for the production of published maps. There are now 16 UNIX licenses of Arc/Info in our network and a few PC- installations.

Digital Cartography

As of date new production lines have been developed comprising scanning of field manuscripts, half automatic recognition and coding of areas, lines and points. This is followed by raster processing with Arc/Info routines on workstations and loading into a database. Other projects retrieve relevant information from the databases and produce standardized printed maps as well as thematic products for different customer.

Platforms

As of date the number of computers exceed the number of employee at the survey."The network is the computer" which for us means about 30 Sun workstations in a TCP/IP network. The communication includes also about 300 PC via PC-NFS. Our lan is based on twisted pair and glass fiber. We have invested in an Ethernet Switch to get a more efficiant use of the network. This will also form the basis for a 100 Mbit /sec communication in the future. The role of the PRlME system has come to an end. Heavy processing is now performed on Sun Sparc workstations while Personal Computers are used for data aquisition, some processing, and of course, word processing, calculus and mail communications. PC- Xware open up the UNIX world also for the PC´s. In order to keep up with the demands of new releases from Microsoft and Lotus there is a constant need of more powerfull PC´s. For the moment

new versions of Lotus Notes and Office programs ought to be installed, but this is delayed due to our economic situation. Windows 95 is slowly introduced. On the peripheral side the survey has invested in a color plotter HP DesignJet 750C and a couple of Tectronix Phaser 550. Rasterization on HP is made trough ArcPress on Postscript and metagraphic files from Arc/Info. We are now testing digital cameras for color scanning of field manuscrips in A1 format. So far the resolution is not good enough.

Security

Most systems are available on the network system, including an accounting system. In order to prevail misuse of geological and economical information a security system is now installed on every computer unit. A firewall will prevent users on Internet to access secured databases.

Standards

The survey takes active part in National and European projects to standardise components that are important for the efficient and secure exchange of geographical data. This involves uniform standards for the description of facts, quality and terminology as well as design of systems for electronic data transfer.

ICGSECS National Report 1996/1997

United Kingdom
British Geological Survey

David Ovadia

Introduction

For computing in BGS, 1996/97 has been a year of consolidation. The business climate for BGS has been dominated by uncertainty caused by a UK Government review (called Prior Options) of BGS' future in the public sector. This has now (January 1997) decided that BGS should remain in the public sector but with new conditions that, inevitably, will lead to less science budget money and a greater need to attract new commissioned work.

A new organisational structure intended to save costs and introduced in November 1996 by the Director will result, from April 1997, in the closure of the Information Systems Group, which I head, and the end of the "bought in" IT operation from NERC Computer Services. From April onwards, IT support will come under Facilities Management, a part of BGS Administration, and a new R&D activity will be formed intended to develop new digital products based on BGS data. One such example will be a GIS based automated report writing output for geological information linked to postal codes, known as ALGI (Address Linked Geological Information) now being trialled in the Bristol area.

Clearly, much of BGS' science budget funded focus in the future will be in support of multi-disciplinary thematic programmes, such as Environmental Diagnostics and URGENT (Urban Regeneration and the Environment) that will involve BGS working with other institutions, universities and industry.

Also, there has been created new business development roles within defined sectors, UK and international. These will give a direction for market-pull activities.

Computing

It is essential that IT responds to the changing business climate and contributes, where possible, to reducing costs and supporting new business or scientific activities. IT is now "into everything" and managers want greater functionality and reliability at lower cost.

Our VAX replacement is now almost complete. The VAX service at Keyworth is now switched off; that at Edinburgh will survive for another year or so. The legacy of old data and VMS formatted tapes remains, however, and there is no easy solution to this.

Most of our local area network has been upgraded to structured cabling under UTP category 5, and our wide area networking is 2mb/sec and runs only TCP (X.25 has ben terminated).

We are introducing NT based networks in response to user demand, but still retain Novell as the main PC client server system.

Great cost savings have been achieved by taking almost ever item of hardware, and much of our software, off maintenance and simply paying for repairs or replacements as needed. Hardware maintenance is, these days, a euphemism for breakdown insurance and is fast becoming an unnecessary luxury unless one needs very high availability systems. Similarly, software maintenance buys unnecessary and disruptive new

versions, often not needed. However, we have found it is rather an "all or nothing" situation in that one upgrade depends on another, so care must be taken before cancelling contracts.

Although our main software platforms continue to include Oracle, Intergraph, Arc Info / Arc View and Earth Vision, we have seen rapid growth in the use of Microsoft Office products, especially Access, and in Vulcan, Geographics and MapInfo.

The difficult challenges as IT "breaks apart" include handling legacy data, maintaining central back-ups and security, avoiding under-utilisation of equipment, re-inventing the wheel (the "not-invented-here-syndrome"), IT training and charging for data on the Web. Culturally, everyone thinks they are an IT expert today, resulting in 101 different opinions for every 100 staff!

Databases

We continue to build databases and to produce data in forms that are asked for by our customers. We have now released the BbC (British boreholes Catalogue) on CD-ROM (published by Pearsons and sold for £99 with discounts for academics) which has embedded on the CD a run-time version of Arc View and the 1:250 000 scale Ordnance Survey map of the UK, plus the location and metadata associated with 500 000 onshore boreholes and wells.

BGS is working with our European partners in GEIXS (Geological Electronic Information eXchange System) which will provide harmonized EU-wide geological metadata on the Web (a more detailed presentation about GEIXS will be given during the ICGSECS conference).

ICGSECS National Report 1996/1997

United States
United States Geological Survey

Hedy J. Rossmeissl

The advent of the information age has fundamentally changed the ways in which we interact as a society. A viable national science agency must examine the changes occurring in society and respond in ways that are meaningful to the needs of society.

Information Management

National Land Remote Sensing and Geospatial Data Archives

The principal purpose of information management activities at the USGS is to preserve and provide access to existing geospatial data through archiving, physical database maintenance, clearinghouse activities, and data and information dissemination. These activities will receive growing emphasis in response to society's demands for access to data generated by the USGS, other Federal and State agencies, and other organizations' programs. Society also has the expectation that in an information age, information and data products should be delivered quickly and efficiently. USGS participation in National Spatial Data Infrastructure, Mission-to-Planet Earth, civilian applications of data from a variety of sources, and other interdisciplinary earth science investigations highlights the critical need for technologically advanced systems to store, manage, and provide ready access to these diverse and complex data sets.

Today, the USGS manages more than 11 million frames of aerial and space photography and more than 130 terabytes of digital imagery, cartographic data, and earth science data, and distribute thousands of data products annually. In 2005, the USGS will have management, preservation, and distribution responsibility for tens of millions of frames of aerial and satellite imagery, and more than 1,400 terabytes of digital geospatial data. Managing this magnitude of growth is truly a challenge, one that is further complicated by the diversity and complexity of the data sets that will result from a variety of national and international programs.

National Biological Information Infrastructure (NBII)

A fundamental part of the USGS mission is to make biological data, information, and associated technologies more accessible for our customers and partners to use in making natural resource management decisions. Development of a national partnership for sharing biological information -- the National Biological Information Infrastructure (NBII) -- is a significant component of this effort. The NBII is using the Internet/World Wide Web networks and technologies to establish a distributed "federation" of biological data and information sources through which people can find information they need, retrieve information electronically, and apply it to resource management questions. Partners and customers in this effort include government agencies at all levels, private sector organizations, natural history museums, libraries, educational institutions, international organizations and the public. The USGS is working simultaneously on three fronts in implementing the NBII: 1) by making the most significant biological data and information products from USGS research, inventory, and technology programs electronically accessible; 2) by supporting the efforts of many public and private partners to make their significant biological data and information accessible to others over the NBII; and 3) by working cooperatively with other agencies and organizations on new tools, standards, and technolo-

gies needed to provide the infrastructure components of NBII. Through the NBII, customers now have greater access to significant biological information resulting from the work of USGS scientists. Examples of such products currently available online on NBII are the North American Breeding Bird Survey which includes population trends and abundance information for over 400 species of North American birds; data on the distribution and control of a variety of exotic aquatic species such as the zebra mussel, data on wildlife disease outbreaks and mortality incidents in the U.S. and internationally, and state-level maps of biodiversity resources from the national GAP analysis program.

Telecommunications

The USGS is moving forward to bring Asynchronous Transfer Mode (ATM) to local area networks and then to desktop computers throughout the USGS. This technology is a critical factor to enable the use of expanded and enhanced applications programs, multimedia publishing, and enterprise computing. The bandwidth that ATM provides is essential to an organization in the information business. The USGS is a co-system manager for the Department of the Interior wide-area network (WAN) DOINET. This backbone network consists of 15 locations interconnected with 24 T1 circuits (1.544 Mbps). In preparation for moving to a hybrid cell relay/ ATM backbone, all 15 Cisco/Stratacom switches were upgraded to be ATM-compatible in August 1996. USGS purchased three Stratacom IGX ATM-capable switches in September 1996. Installation of the three IGXs was complete in December 1996 (Reston, VA, Lakewood, CO and Menlo Park, CA) The next phase of the plan is to upgrade the current point-to-point T1 circuits inter-connecting the three IGXs to a public ATM service starting at 3 Mbps with potential to increase speed incrementally up to 45 Mbps. The current goal is to have ATM in the USGS backbone during the last quarter of FY97.

In a related project, the USGS has installed ATM on a prototype basis in the Reston headquarters building. This prototype to a limited number of workstations is now in test mode. Completion of similar activities at Lakewood and Menlo Park will allow USGS employees to evaluate the feasibility and capabilities on a LAN-to-LAN over the wide area network. Dependent on the WAN ATM, end-to-end evaluation is planned for completion by the end of FY97.

Internet for Information Dissemination

As the Nation's largest earth science research and information agency, the U.S. Geological Survey (USGS) maintains a long tradition of providing "Earth Science in the Public Service."
The USGS operates one of the most content-rich sites on the Internet. The "http://www.usgs.gov" provides a gateway to more than 100,000 pages of on-line information, including on-line digital elevation data and indexes to topographic maps and aircraft and satellite images covering the entire country. Historical records of streamflow for 30,000 stations are on line. All recent worldwide earthquakes are listed and mapped on line. The North American Breeding Bird Survey has maps of bird abundance and population trend maps for 400 species. Nearly all major new publications are on line. All of this information contributes to the wise management of the Nation's natural resources and promotes the health, safety, and well-being of the people.

The USGS World Wide Web site is a nationwide network of 140 individual webservers, each serving information with a thematic or geographic organization. The combined USGS sites serve about 4,000,000 pages per month to approximately 200,000 users. This includes nearly 2,000 local, state, and federal organizations that use USGS information to minimize the loss of life and property from natural disasters, such as floods, volcanoes, and earthquakes. Usage is tripling every year. As a channel for distributing USGS information, the WWW now equals traditional methods such as printed reports.

Some examples of the scope of operations include:
-- 11,000 users see graphs of "real-time" streamflow each month.
-- 200,000 Fact Sheets about scientific topics have been delivered.
-- 95% of users are from outside the USGS.

-- The USGS earthquake server gets 25,000 hits per day.
-- K-12 education, exploration, and life-long learning
-- USGS fact sheet Fax-on-Demand
-- Locational and descriptive information of over 2 million named physical and cultural geographic features throughout the U.S.

The Federal budget provides nearly all funding for USGS WWW service. Individual sites are funded primarily by the accounts of the content providers, and funding is sometimes supplemented by cooperative agreements with local agencies. Most information is distributed free, though cost-recovery is practiced for some larger items, such as satellite images.

Thematic pages, such as "Access USGS: San Francisco Bay and Delta" assemble a wide variety of information about special places. "Access USGS: San Francisco Bay and Delta" presents near real-time displays of wind patterns, movies showing fresh-water inflow and salinity, satellite images illustrating changes in wetlands, earthquake hazard maps and preliminary earthquake reports, and animations of urban growth.

In 1996, the USGS also initiated an effective intranet which is being used to provide program support information and services to employees throughout the United States. The USGS is continuing to capitalize on a computer-literate workforce and a strong internal network by adopting Internet and WWW technology as an efficient tool for information dissemination for internal and external customers.

Digital Product Dissemination

The USGS has begun using on-demand robotic product distribution systems to speed delivery of products and reduce manual intervention in order processing. Most of the USGS products previously delivered on CD-ROM media are now created using this system, rather than pressing multiple copies and storing them in warehouses. Information technologies have enabled the USGS to not only make its information more widely available, but also to assist users in locating other needed data that are produced by other organizations. The National Spatial Data Infrastructure (NSDI) organizes and provides a structure of relationships between producers and users of geospatial data that facilitates data sharing <http://nsdi.usgs.gov/nsdi/nsdi>. By participating in the NSDI, increased opportunities are available for USGS data to be used in decision making at local, regional, national, and global scales. In addition, other data producing organization are identified that can produce data to supplement USGS efforts and identify candidate organizations for future data collection and use. Continued enhancements and innovative approaches to these information systems and product delivery systems are essential for the expected increases in data holding and customer demand for these data as the USGS prepares to tackle the challenges of the information age.

Product Innovation

National Atlas of the United States of America

One product which typifies the attitude within the USGS towards providing information in innovative ways is the electronic National Atlas of the United States of America on which work has begun. It will replace the 1970 version which was a 400-page, oversize, 12-pound volume of maps. The new Atlas will provide an intuitive, graphic view into the enormous spatial data holdings of the Federal government. It will provide authoritative views of relevant scientific, societal, and historical information with easy-to-use tools to display, manipulate, and query so that customers can produce their own relevant information**.** The Atlas will make information more accessible to individual Americans and provide links to current and real-time events, exploiting information access and delivery technologies that did not exist in 1970.

New customers will be served by the electronic National Atlas. In the early 1970's, the National Atlas was typically found in the reference collections of libraries across the United States. Educators and

government organizations also were primary customers for the original Atlas. But at a sales price of $100, not many Americans had the Atlas in their homes. The new National Atlas is crafted for individuals who own or have access to multimedia personal computers, thus extending the value of USGS science into the American home, schools, and libraries. The USGS is forming strategic alliances with private sector partners to gather and analyze customer information and to assess the market for the National Atlas. Efforts in 1997 will concentrate on clarifying customer needs and expectations, and using this information to enhance product development. Initial products will be available in 1998.

The National Geologic Map Database

Geologic maps, derivative maps, and related information serve a vital role in supporting public and private decision-making, general education, and advances in scientific research. This information, however, is located at many agencies and institutions, and is not readily accessible to many people. In order to ensure that this data is readily available to a variety of users, a National Geologic Map Database is being developed. The Database will serve as the central archive or point-of-contact for users searching for earth-science information. It is intended to fulfill several functions including: a catalog of available map information for perusal and searching; a data depository; and a source for general information on the nature and intended uses of the various types of earth-science information. To address these functions, coordination will be required among the many agencies and institutions that produce earth-science information. The USGS has been identified as the agency responsible to ensure coordination. The central component of the Database will be a catalog of metadata, searchable over the Internet.

As collectors, creators, and disseminators of scientific information, geological surveys around the world are recognizing the significance and importance of comprehensive data and information management. Through improved access, the value and benefit of these data can be increased and expanded to reach all of our citizens.
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