REGIONAL
DATA PROCESSING
CENTERS

COMPAGNIE GENERALE DE GEOPHYSIQUE

CGG is a leading seismic contractor with four major data processing centers installed in Paris, London, Oslo and Houston, each running the company's proprietary data processing software Geovecteur® on Cray supercomputers. Experienced processing staff are backed by the expertise of R&D teams.

Regional processing centers offer the same complete range of seismic data processing capabilities on regional sites and with scaled-down hardware. By early 1992, 15 CGG regional centers were running Geovecteur® on Convex minisupercomputers while four other centers were operating the same software on RISC-based workstations.

As a solution to data processing requirements, regional centers offer the following advantages:

- rapid turnkey installation and upgrading
- elimination of import/export delays
- close liaison between regionally located clients, field data acquisition crews, and the data processing team
- efficient processing teams with highly qualified geophysicists
- rapid turnaround
- reliability of an experienced contractor with the backup of international processing centers
- customized solutions.

Several formulas are offered for regional processing centers:

- data processing services are offered on a contract basis in CGG-run centers. Additional centers are opened by the company as and when the market requires
- similar centers can be proposed on a dedicated basis, complete with CGG hardware, software and staff
- turnkey systems and software can be offered for purchase by Petrosystems, the CGG computer system sales subsidiary.

A WORLDWIDE REPUTATION FOR SEISMIC DATA PROCESSING

With well over thirty years' continuous experience of seismic data processing, CGG has an established worldwide reputation as an independent contractor in this field. Software development has been planned steadily, in response to market trends and technical advances.

The Geomax software suite developed in the early eighties standardized data processing on the smaller mainframes used in CGG's regional centers.

CGG began processing 3D seismic data in 1978 and moved to vector supercomputers in 1984, developing Geovecteur® as a 3D, 3C, vector/parallel seismic processing system. The emergence of UNIX® as an international standard allowed CGG to upgrade Geovecteur® into a fully portable system operating on any UNIX® platform, including Convex mini-supercomputers or RISC-based workstations such as IBM RS 6000 or CDC 4000, offering the advantage of identical and instantly recognizable functionalities on all platforms. Work has begun on Geovecteur® Plus, the next generation processing system, which offers advanced interactive interfacing.

Since 1988 CGG has been installing Convex computers in its own centers and has set up many Geovecteur® configurations for other organizations. On March 1 1992, Geovecteur® was running on 28 systems worldwide *(see map on rear page)*.

Thanks to this consistent approach, a very high level of competence and familiarity with processing tools has become a hallmark of CGG personnel in both international and regional operations.

THE GEOVECTEUR® ENVIRONMENT

Geovecteur® offers a unique advantage: **identical software is available to all users**, whether in the environment of one of CGG's international centers or on a regional site. Configurations may range from a single-user desktop work-station, to a multi-processor supercomputer serving several hundred geophysicists. Processing methodology does not change from one center to the next, ensuring that competent staff are available in all locations worldwide on a permanent basis, and that the experience of
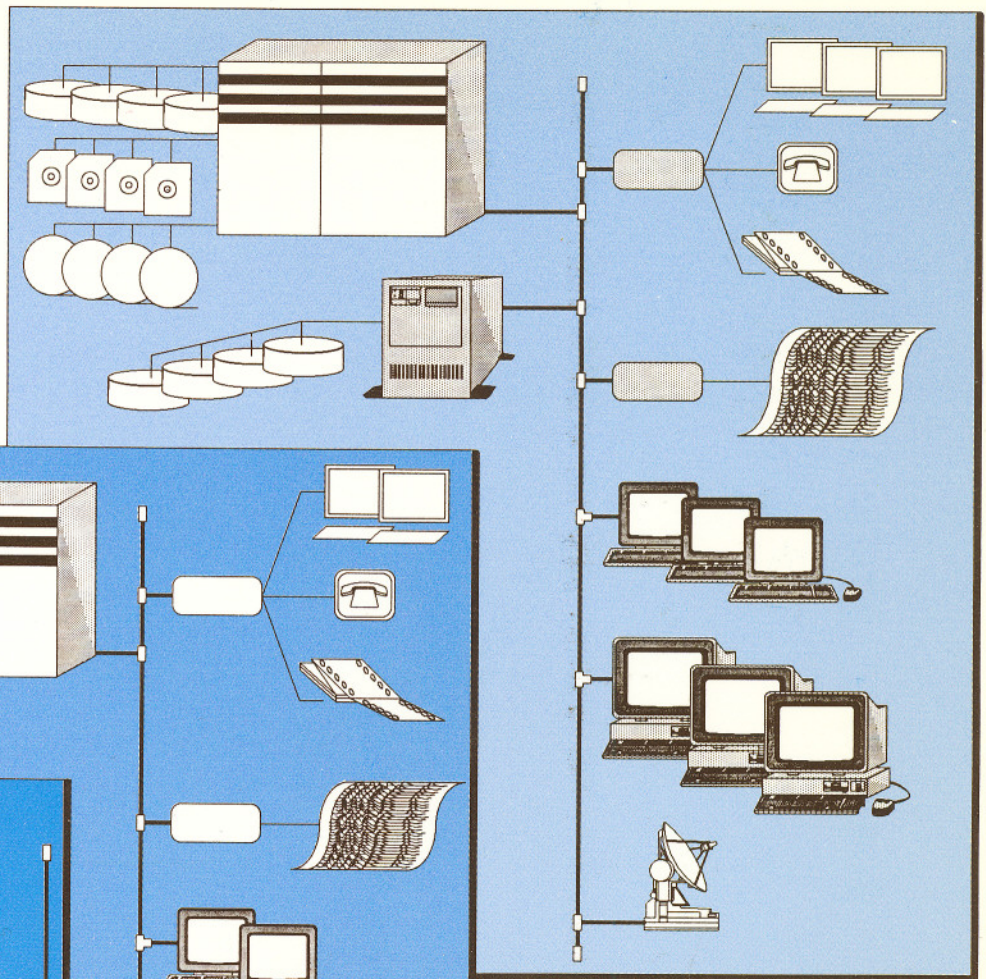
supervisory staff in international centers can be applied directly to solving the specific problems that confront regional centers.
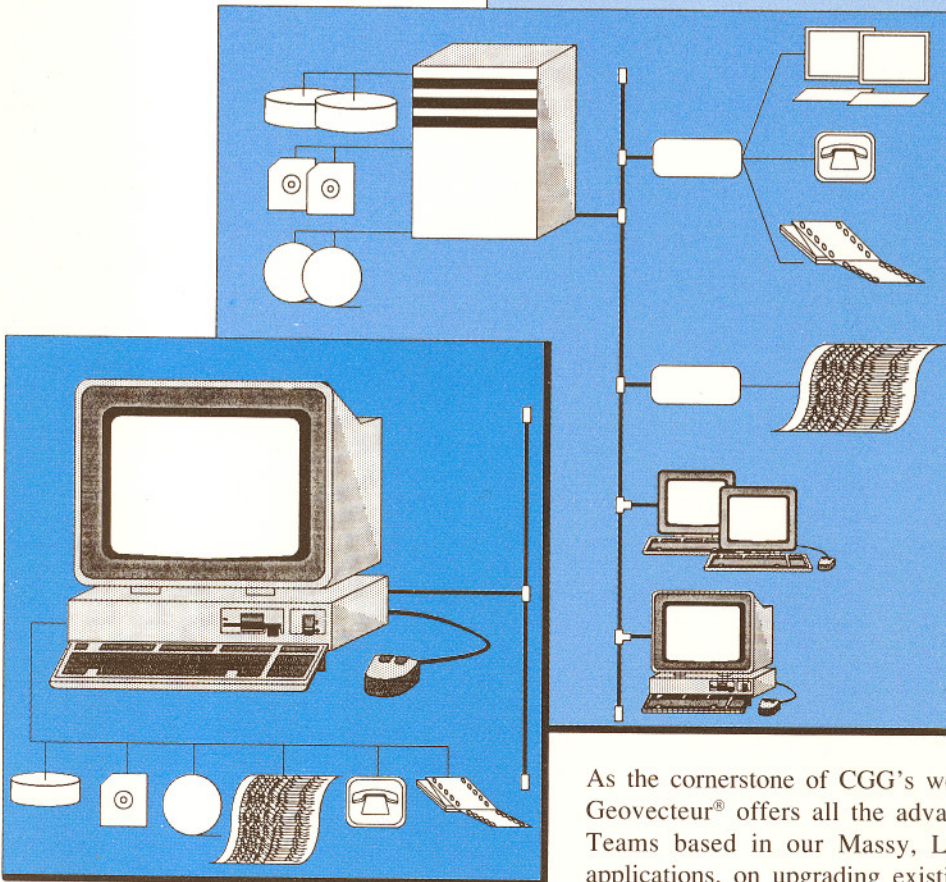
As the cornerstone of CGG's worldwide network of data processing centers, Geovecteur® offers all the advantages of a continuously evolving package. Teams based in our Massy, London and Houston centers work on new applications, on upgrading existing software and on continuously improving throughput.
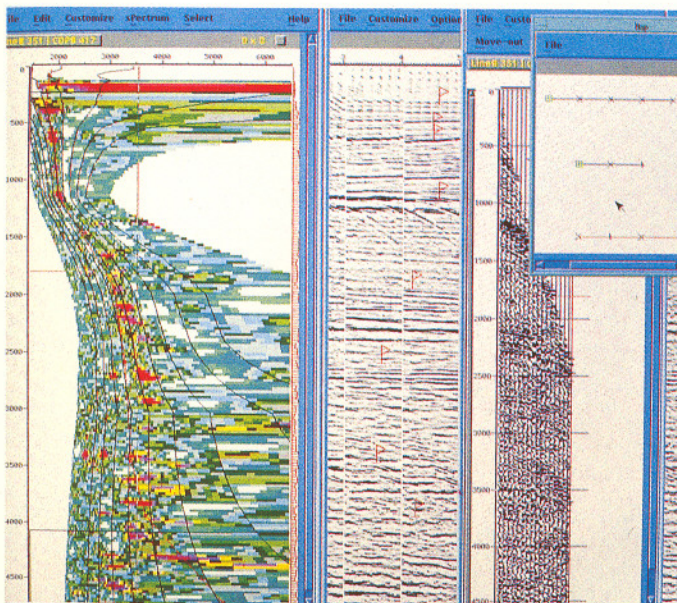
Velocity picking.
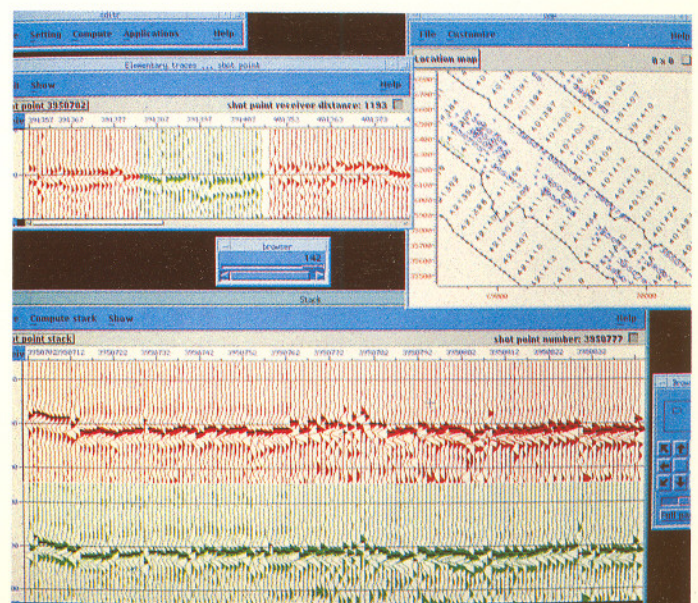
3D geometry QC and statics calculation from first break stacks.

THE GEOVECTEUR® PACKAGE

Geovecteur® is one of the most complete and flexible packages available
on today's market with a full range of application-specific modules
to cover the entire panorama of seismic processing requirements.

GEOVECTEUR® INTERACTIVE PARAMETER SELECTION OR CONTROL PROGRAMS

. Velocity picking of semblance, gathers and stacks
. Velocity QC and editing
. Wavelet estimation
. Instrument phase compensation with deterministic signal calculation
. Long wavelength statics
. Structural modeling
. Stratigraphic modeling

. First break picking
. Digitizing maps, seismic sections
. Display of seismic data sections
. Display of non-seismic data (maps etc.)
. Color palette adjustment
. Comprehensive Interbase data base for velocity and static correction management
. 3D geometry QC and statics calculation from first breaks by algebraic construction

GEOVECTEUR® GEOPHYSICAL APPLICATIONS

Geovecteur® includes an extensive range of modules, which can be grouped into the following families:

Demultiplexing

Definition of survey data and field geometry
. Direct input of 2D and 3D field diskettes in machine readable formats

Static corrections
. Surface consistent statics
. 2D and 3D CDP consistent statics
. 2D and 3D refraction statics

Velocity analysis, velocity horizons, NMO corrections
. Semblance
. Gathers
. Constant velocity scans
. Variable velocity function mini-stacks
. Constant velocity mini-stacks
. Automatic residual NMO adjustment
. Velocity horizons

Amplitude control
. Spherical divergence compensation
. Digital AGC
. Dynamic equalization with multiwindow and multichannel options
. Amplitude analysis by trace group and by window
. Noise edit by Median and Spectral discrepancy

Filtering, deconvolution, anti-multiple programs
. Q compensation
. True surface-consistent deconvolution
. Band-limited deconvolution
. Tau-P deconvolution
. Multichannel deconvolution
. Radon transform, f-k, wave equation anti-multiples
. Specified peg leg attenuation

Multi-channel filtering
. f-x deconvolution
. Intelligent trace interpolation

Addition
. Beam steering
. Lateral dip investigation for wide lines

Migration and depth conversion
. Datuming
. Wave equation, Kirchhoff and f-k DMO
. Wave equation, f-k, f-x, Kirchhoff migration
. Depth migration
. Pre-stack depth migration

3D seismic processing programs
. 3D refraction statics
. Intelligent binning
. Bin centering
. 3D surface-consistent residual statics
. 3D CDP-consistent residual statics
. 3D DMO
. 3D f-x noise attenuation
. One pass 3D f-x migration
. One pass 3D depth migration

Tau-P processing programs

Vertical seismic profiling

AVO stratigraphic inversion

Shear waves and 3-component processing

Display

Mapping

Input/output modules

Miscellaneous utilities

GEOVECTEUR® PRODUCTION CONTROL

. Parameter data base
. Automatic job flow coherency control

. Integrated accounting and statistics
. Easy transfer and backup of seismic and non-seismic data

SYSTEM SUPPORT

All CGG's regional centers can offer the same services as those available in the international centers, including the company's Quality Assurance and Safety procedures.

Hardware support is provided by an on-site computer hardware technician and system administrator. A team of hardware specialists is also on permanent call at the Massy headquarters, ensuring that centers deal directly with a single organization: **CGG's own staff** handle hardware maintenance as well as system and application software administration.

Software support is provided by a geophysicist on site, backed by the product coordination group in CGG Massy, who intervene via data communication links. They liaise with the R&D division and computer science departments by means of CGG's software reporting system.

Hardware maintenance in CGG's Massy headquarters.

TRAINING

CGG policy is that **quality** can only be achieved through **effective and comprehensive training**. Consistently with this, the company offers a range of training programs tailored to the needs of processing personnel.

CGG center managers attend annual conferences covering all latest technical and managerial issues. **Updates** and **refresher courses** are available both to CGG staff and to clients through the company's training center CEFOGA, in Massy or abroad, and are led by a senior member of the R&D Division.

All training is backed by a complete set of **documentation**, designed to be followed and annotated by the trainee during the actual course.

As a further aid, **computer-assisted training (C.A.T.)** is available on personal computers. This interactive training method gives a complete panorama of geophysical methods and is consistently updated to cover new methods and approaches. C.A.T. is available in the CEFOGA center in France, and in processing centers abroad. C.A.T. is also available to clients.

CEFOGA offers training with the Geovecteur® data processing package on an IBM RS 6000 workstation complete with student consoles.
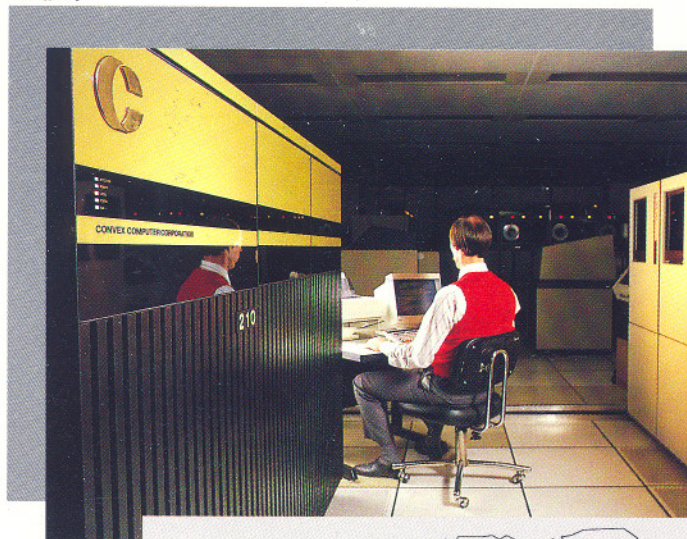
DEVELOPMENT BACKUP

The management structure at CGG ensures that each processing team has its own correspondent at the highest technical level, thus avoiding delays in problem-solving and providing continuous supervision and follow-up of each project. Each processing group is thus **supervised by a member of the R&D Division**, who also initiates development projects to respond to specific problems raised by a particular processing task.
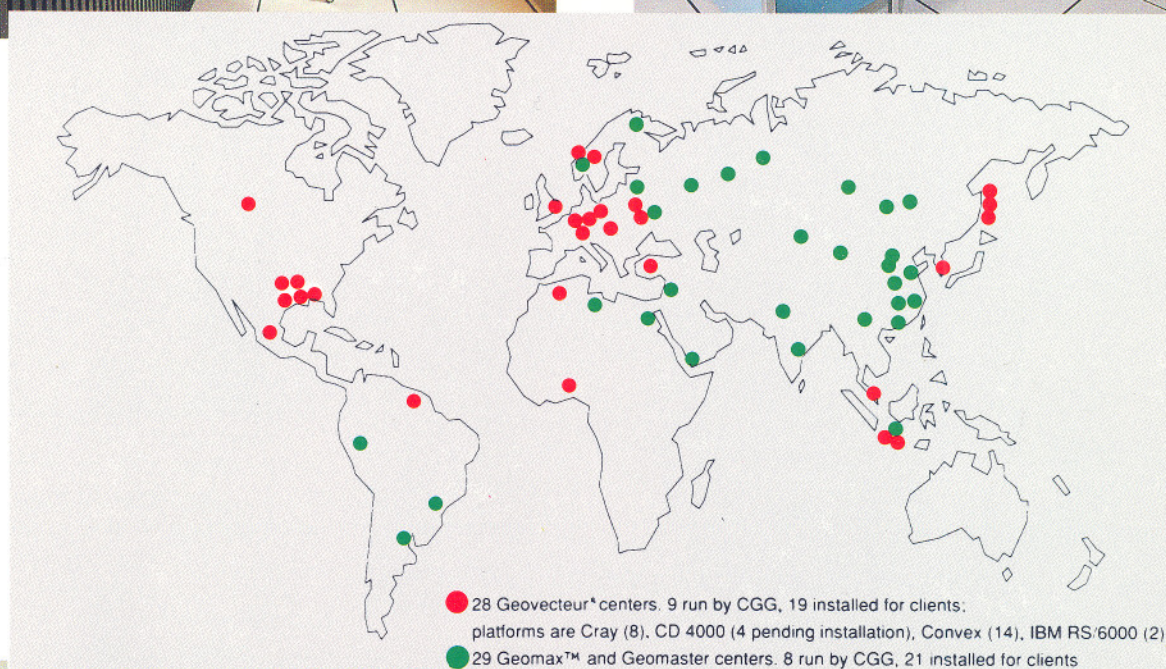
Feedback from processing groups is used as the basis for establishing new development projects. R&D is a major feature of CGG's policy for the future, and the company devotes a large share of turnover to this activity.

A WORLDWIDE NETWORK OF REGIONAL CENTERS

Calgary.

Caracas.

● 28 Geovecteur* centers. 9 run by CGG, 19 installed for clients:
  platforms are Cray (8), CD 4000 (4 pending installation), Convex (14), IBM RS/6000 (2)

● 29 Geomax™ and Geomaster centers. 8 run by CGG, 21 installed for clients

Mexico.

Vienna.

Massy
CGG - Petrosystems
Tel. (33-1) 64 47 30 00

London
CGG - Petrosystems
Tel. (44-81) 899 24 00

Houston
CGG A.S. Inc.
Petrosystems Geoscience Software Inc.
Tel. (1-713) 784 07 40

Singapore
CGG
Tel. (65) 235 97 33

Rio de Janeiro
CGG
Tel. (55-21) 224 59 79