The ORFEUS Data Center

Bernard Dost (*)

In 1993 the ORFEUS Data Center (ODC; Dost, 1991) changed hosting organisation. It moved within the Netherlands from the University of Utrecht to the Royal Netherlands Meteorological Institute (KNMI) in de Bilt. This change in hosting organisation was necessary to ensure a longer term stability in the operation of the ODC. Key issues for the ODC are the rapid on-line data access and quality controlled, complete and efficient off-line data access.

During 1992 the ODC became the European node in the international SPYDER system, previously known as gopher/badger. SPYDER provides near real-time access to digital broadband data from selected high quality stations. The system is triggered by fast epicenter locations from the National Earthquake Information System (NEIS) in Golden, U.S.A. Electronic messages trigger several centers well distributed over the globe. These centers then collect the data by modem from selected stations in their region. Finally, data are distributed between data centers over internet. In this set-up the system is most efficient, while telephone costs are distributed and internet does not charge for data volume (like X.25) or connection time (as is the case with modem connections).

In 1993 the ODC accessed stations ANTO, DPC, KEV, KONO, PAB and TBT (see fig. 1). Preparations were made to include MEDNET station VSL, the joint MEDNET/GEOSCOPE station SSB and KNMI station HGN. Station HGN is not accessed by modem, but is directly available on hard-disc at the ODC. Recently, the GeoForschungsZentrum (GFZ) in Potsdam, that is building up the GEOFON network, became a SPYDER sub-node in Europe. Early 1994 the GFZ contributed stations MORC and DSB. We are discussing the possibility to connect the stations of the German Regional Seismograph Network (GRSN) to our SPYDER system. These stations, however, are accessible only through X.25.

The SPYDER system can be accessed through internet with a telnet to system **bswor4.knmi.nl**. Any user can login with user name gopher. The user is then captured in a menu from which he/she can select events, display the data on his/her screen, either by opening a X-window or a tektronics window, and eventually retrieve the data by ftp.

For 1994 we plan to connect the presently operational SPYDER system to the automatic Data Request Manager (autoDRM; Kradolfer, 1993). The autoDRM will be installed at many sites and is the non interactive counterpart of SPYDER. The autoDRM is based on the exchange of information through electronic mail messages. This implies that the data exchange format should be ASCII. Since the autoDRM was developed for the Group of Scientific Experts (GSE) of the conference of disarmament in Geneva, the GSE format is presently best suited. The ODC will therefore develop converters from GSE to SEED and vice versa.

The other key activity of the ODC is the off-line data collection. This includes collecting digital broadband data from as many European stations as possible. The goal is to collect a data set that is complete in contrast to the SPYDER data, that should be rapidly accessible. Data are converted into the Standard Exchange of Earthquake Data (SEED) format, that is internationally accepted and defined and maintained by the Federation of Digital Seismograph Networks (FDSN). SEED event volumes are produced and written to CD-ROM. In this form the data set is globally distributed.

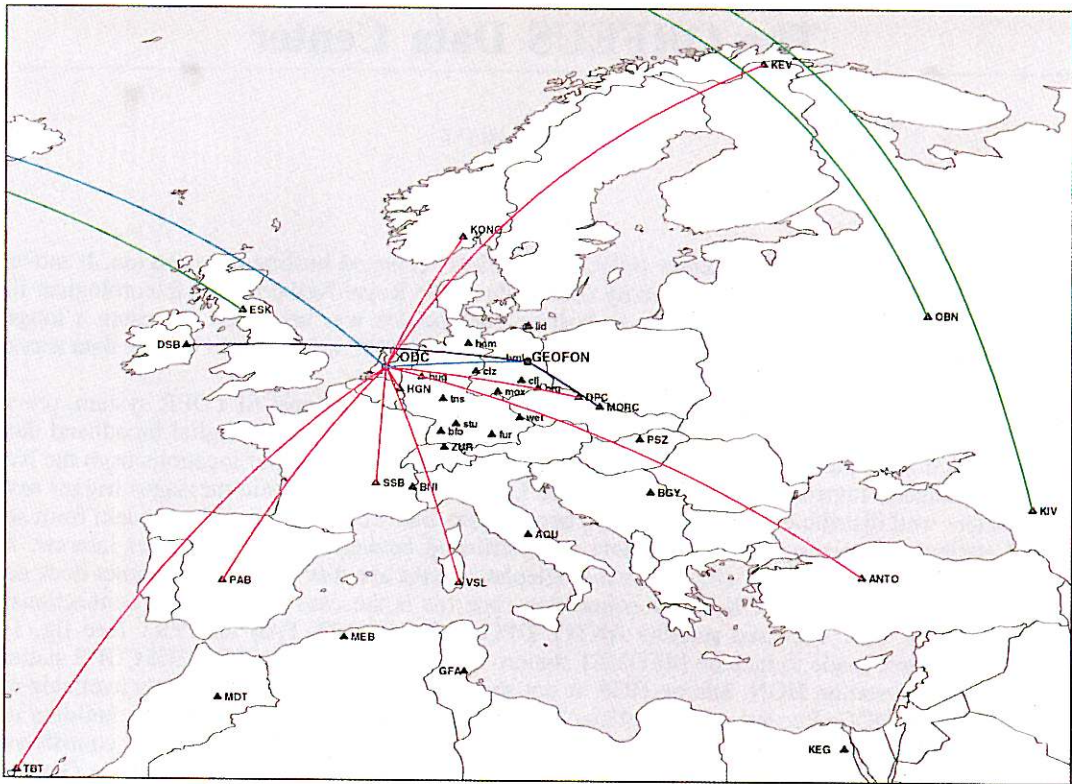(*) ORFEUS Data Center, P.O. Box 201, 3730 AE De Bilt, the Netherlands.

Fig. 1. Overview of directly accessible, digital broadband seismographs in Europe. Direct connections from the stations to the ODC are shown in red. Dark purple shows the connections to GFZ. In blue the internet connections are shown. To the west the connections go to the IRIS DMC in Seattle. Finally in green the connections are shown to the IRIS/IDA Data Collection Center in San Diego, U.S.A.

The status of the off-line data collection (CD-ROM data) is that all data for 1988 and 1989 are processed and the first half of 1990. In 1990 MEDNET data appear in the data set. For a total overview of contributing stations, see fig. 2.

Software development at the ODC are focused on SEED. Reinoud Sleeman developed the CDLOOK program running at a workstation equipped with an OpenLook user interface. This program is used for data selections of SEED or GDSN event volumes and is available through anonymous ftp from machine **bswor4.knmi.nl**. It is the intention to convert CDLOOK to the Motif user interface. He also developed the seedtools package, used to edit and merge SEED volumes and based on the IRIS developed SEED toolbox. In late 1993 he spent two weeks in Seattle cooperating with the IRIS Data Management Center in upgrading to SEED version 2.3.

Although most developments in SEED related software are carried out on modern workstations, any user with a PC should be able to read the data on CD-ROM. For this purpose the SONIC software, that is able to read digital data in GDSN format, was adapted to read SEED volumes. Unfortunately, this has not yet resulted in a stable product and we are looking as an alternative at porting the reference SEED reader (rdseed) to the PC.
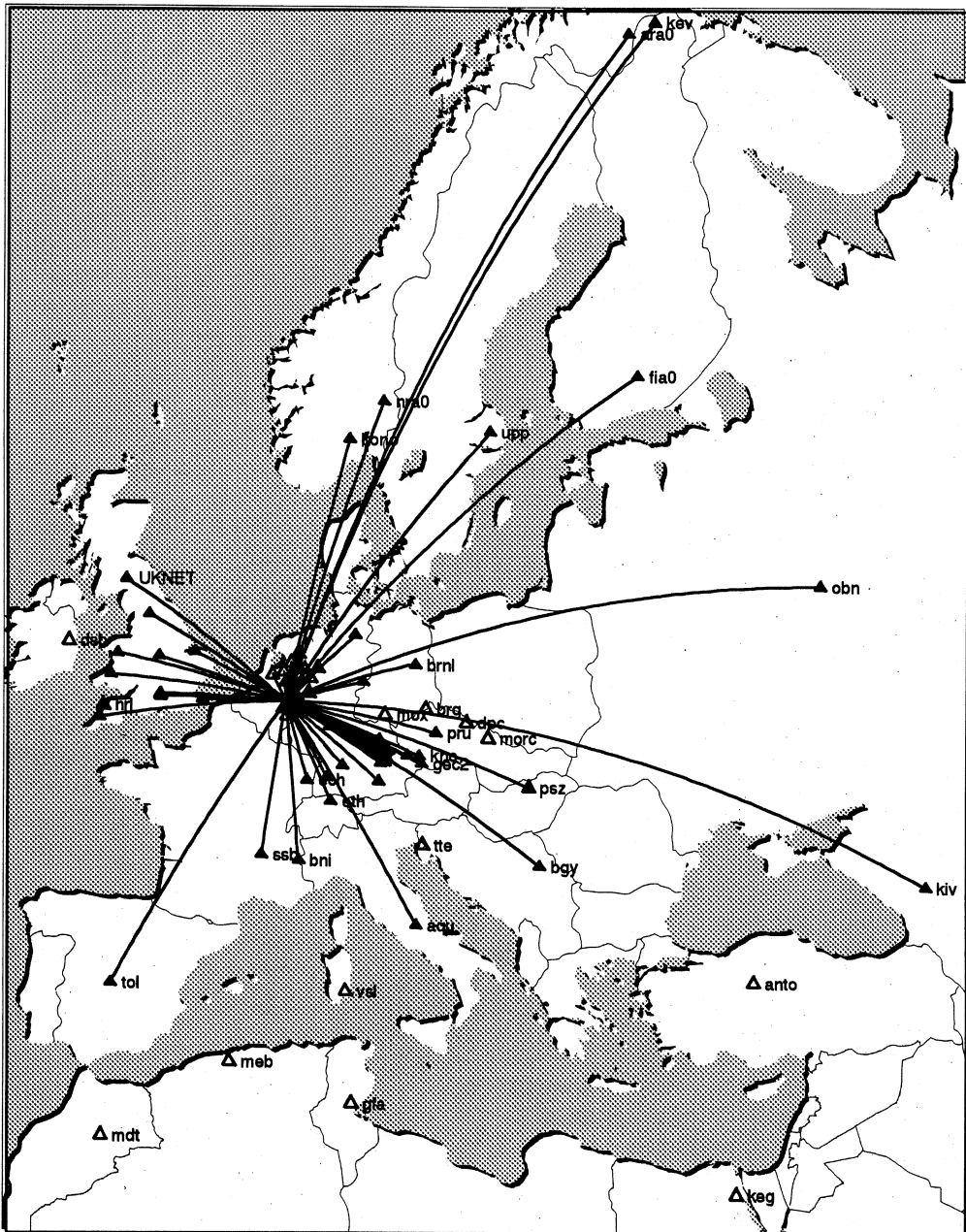
Fig. 2. Overview of broadband stations contributing data for the 1992 Roermond event. Open triangles show broadband stations that have not (yet) contributed to the data set, but were operational in 1992.

The ODC has the capability of simulating CD-ROMs before they are produced and recently to write CD-ROMs in small quantities. This is important for testing of data sets on CD-ROM. In 1992 a CD-ROM was prepared containing data from the European GeoTraverse. Early 1994 tests aim to produce ISC data in uncompressed form on CD-ROM.

In 1992 a large quake ($M_L = 5.8$) struck the town of Roermond in the Netherlands. The ODC collected data from European digital broadband stations, while the KNMI collected digital data from short period stations. A study was conducted comparing the station characteristics and the resulting data sets (Dost and Sleeman, 1994).

REFERENCES

Dost, B. (1991): The ORFEUS Data Center, in *Workshop on «MEDNET; the Broadband Seismic Network for the Mediterranean» 1990,* edited by E. Boschi, D. Giardini and A. Morelli (Il Cigno, Galileo Galilei Edizioni di Arte e Scienza, Roma), 176-185.

Dost, B. and R. Sleeman (1994): Exchange of digital seismological waveform data in Europe: status as illustrated by data collection for the Roermond, the Netherlands, earthquake of April 13, 1992, *Geol. Mijnbouw,* special issue (accepted).

Kradolfer, U. (1993): Automating the exchange of earthquake information, *EOS Trans. Am. Geophys. Union,* **74,** 442-445.