GEOFON Status Report for the FDSN Meeting Hawaii June 2002

Winfried Hanka, GeoForschungsZentrum, D-14473 Potsdam, Germany, hanka@gfz-potsdam.de

Network

The permanent GEOFON network consists presently of 48 stations (table 1). New stations were installed in 2001 in Al Marj (Libya) and Helgoland Island (Germany). The San Fernando (Spain) station was moved to another location due to vandalism. The station Mt. Meron (Israel) had to be closed and another North Israeli station (Kfar Sold) was chosen for the GEOFON network instead. In Spain, another station (Sierra Elvira, Granada) became part of GEOFON. At three stations, Piszkes (Hungary), Helgoland (Germany) and Summit Camp (Greenland), the new Earth Data digitizer was installed instead of the former Quanterra dataloggers (or Reftek in case of Summit) with great success. But the main activity in terms of network upgrade was the installation of in total 45 SeisComP communication systems in 35 stations and 10 data collection centers. Even from the Greenland ice cap real-time data are transmitted now in real-time to the GEOFON DC. A small, low power, PC/104 based SeisComP box with Linux OS was specially developed at GFZ and is now commercially manufactured by a German company and sold also to other customers worldwide.

Data Center

The complete data from 34 permanent stations are meanwhile transmitted to the GEOFON DC through SeedLink connections in (near) real-time (Fig. 3). The achieved time delays range between a few seconds (Internet or dedicated lines) over a few minutes (up to 30) for fast dial-up and up to 24 hours (resource saving overnight transfer). The incoming SeedLink data are immediately forwarded to several other data centers like the IRIS DMC, the ODC and several more. An automated NRT data processing and archival system checks the data for quality problems, runs an event picker and copies the data into the online NRT data base. A new software package (AutoLoc) takes the picks, associates arrivals, locates events and distributes the results for the most important events as alert emails and web page entries in less than 2 minutes after the first arrivals.

In replacement of the old SPYDER system, a new event window data base named QuickFARM was created. It is triggered by NEIC alerts and supplemented by Harvard CMT solutions. The windows are cut from the NRT data base and the window criteria are those of the former FARM system. Presently the QuickFARM MiniSEED event files are only available by ftp links through the GEOFON web site.

A twin Linux PC system with a total capacity of 2 TB disk for holding the entire data archive of the GEOFON DC online was installed in the beginning of 2002. The tape robot system is still used as backup medium. New archiving software was developed for automatic processing and archiving of the incoming online (NRT) and offline data (DCP) into the new
data base architecture (Fig. 4). The complete GEOFON data archive is being reprocessed and the most important part of the archive (e.g. the full permanent GEOFON network data) is available now online. The rest will be as well soon. Data requests can be fulfilled much quicker now. The required operator time could substantially be reduced another time with the new processing and archival software and the increasing amount of SeedLink data.

The IRIS DMC email based request processing system NetDC was successfully implemented the GEOFON DC. The present usage is still very low compared to the more common breq_fast.

**Fig. 1:** GEOFON stations in Europe and the Mediterranean and data communication scheme.

**Fig. 2:** GEOFON stations worldwide and data communication scheme.
Fig. 3: SeedLink data flow within the GEOFON network

Fig. 4: Data processing scheme of the GEOFON Data Center
## GEOFON Station Summary Permanent Network (Status June 2002)

<table>
<thead>
<tr>
<th>Code</th>
<th>Coordinates</th>
<th>Inst.Date</th>
<th>Cooper. with</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Moresby, PNG</td>
<td>PMG 9.409S 147.154E</td>
<td>Sep 93</td>
<td>IRIS/PACIFIC21 phone</td>
<td></td>
</tr>
<tr>
<td>Moravsky Beroun, CR</td>
<td>MORC 49.776N 17.547E</td>
<td>Nov 93</td>
<td>Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Dublin, Ireland</td>
<td>DSB 53.245N 6.376W</td>
<td>Dec 93</td>
<td>phone/SLK</td>
<td></td>
</tr>
<tr>
<td>Walferdange, Luxembourg</td>
<td>WLF 49.665N 6.152E</td>
<td>Mar 94</td>
<td>Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Bar Glora, Israel</td>
<td>BGIO 31.722N 35.088E</td>
<td>May 94</td>
<td>GII +++ May 96</td>
<td></td>
</tr>
<tr>
<td>Ny Alesund, Spitsbergen</td>
<td>KBS 78.915N 11.938E</td>
<td>Nov 94</td>
<td>IRIS/AWI Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Kilimambogo, Kenya (rep.NAI)</td>
<td>KMBO 1.274S 36.804E</td>
<td>Jan 95</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Michnevo, Russia</td>
<td>MRV 54.958N 37.767E</td>
<td>May 95</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Rödersdorf, Germany (rep. LID)</td>
<td>RGN 54.546N 13.364E</td>
<td>May 96</td>
<td>GRSN ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Suwalki, Poland</td>
<td>SUW 54.013N 23.181E</td>
<td>Nov 95</td>
<td>phone/SLK</td>
<td></td>
</tr>
<tr>
<td>Soend. Stroemfjord, Greenland</td>
<td>SFJ 66.997N 50.615W</td>
<td>Dec 95</td>
<td>IRIS/AWI Isdn/SLK</td>
<td></td>
</tr>
<tr>
<td>Piszkes, Hungary</td>
<td>PSZ 47.911N 19.894E</td>
<td>Jun 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>San Fernando, Spain</td>
<td>SFUC 36.637N 6.175W</td>
<td>Jun 96</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Tartu, Estonia</td>
<td>TRTE 58.379N 24.721E</td>
<td>Jun 96</td>
<td>Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Eilath, Israel</td>
<td>EIL 29.670N 34.915E</td>
<td>Jul 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Wanagama, Indonesia</td>
<td>UGM 7.913S 110.523E</td>
<td>Aug 96</td>
<td>Inmarsat</td>
<td></td>
</tr>
<tr>
<td>Isparta, Turkey</td>
<td>ISP 37.843N 30.509E</td>
<td>Oct 96</td>
<td>ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Limon Verde, Chile</td>
<td>LVC 22.618S 68.911W</td>
<td>Nov 96</td>
<td>IRIS Internet/LSS</td>
<td></td>
</tr>
<tr>
<td>Sanae, Antarctica</td>
<td>SNAA 78.915N 11.938E</td>
<td>Nov 96</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Kilimambogo, Kenya (rep. NAI)</td>
<td>KMBO 1.274S 36.804E</td>
<td>Jan 95</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Michnevo, Russia</td>
<td>MRV 54.958N 37.767E</td>
<td>May 95</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Rödersdorf, Germany (rep. LID)</td>
<td>RGN 54.546N 13.364E</td>
<td>May 96</td>
<td>GRSN ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Suwalki, Poland</td>
<td>SUW 54.013N 23.181E</td>
<td>Nov 95</td>
<td>phone/SLK</td>
<td></td>
</tr>
<tr>
<td>Soend. Stroemfjord, Greenland</td>
<td>SFJ 66.997N 50.615W</td>
<td>Dec 95</td>
<td>IRIS/AWI Isdn/SLK</td>
<td></td>
</tr>
<tr>
<td>Piszkes, Hungary</td>
<td>PSZ 47.911N 19.894E</td>
<td>Jun 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>San Fernando, Spain</td>
<td>SFUC 36.637N 6.175W</td>
<td>Jun 96</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Tartu, Estonia</td>
<td>TRTE 58.379N 24.721E</td>
<td>Jun 96</td>
<td>Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Eilath, Israel</td>
<td>EIL 29.670N 34.915E</td>
<td>Jul 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Wanagama, Indonesia</td>
<td>UGM 7.913S 110.523E</td>
<td>Aug 96</td>
<td>Inmarsat</td>
<td></td>
</tr>
<tr>
<td>Isparta, Turkey</td>
<td>ISP 37.843N 30.509E</td>
<td>Oct 96</td>
<td>ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Limon Verde, Chile</td>
<td>LVC 22.618S 68.911W</td>
<td>Nov 96</td>
<td>IRIS Internet/LSS</td>
<td></td>
</tr>
<tr>
<td>Sanae, Antarctica</td>
<td>SNAA 78.915N 11.938E</td>
<td>Nov 96</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Kilimambogo, Kenya (rep. NAI)</td>
<td>KMBO 1.274S 36.804E</td>
<td>Jan 95</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Michnevo, Russia</td>
<td>MRV 54.958N 37.767E</td>
<td>May 95</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Rödersdorf, Germany (rep. LID)</td>
<td>RGN 54.546N 13.364E</td>
<td>May 96</td>
<td>GRSN ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Suwalki, Poland</td>
<td>SUW 54.013N 23.181E</td>
<td>Nov 95</td>
<td>phone/SLK</td>
<td></td>
</tr>
<tr>
<td>Soend. Stroemfjord, Greenland</td>
<td>SFJ 66.997N 50.615W</td>
<td>Dec 95</td>
<td>IRIS/AWI Isdn/SLK</td>
<td></td>
</tr>
<tr>
<td>Piszkes, Hungary</td>
<td>PSZ 47.911N 19.894E</td>
<td>Jun 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>San Fernando, Spain</td>
<td>SFUC 36.637N 6.175W</td>
<td>Jun 96</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Tartu, Estonia</td>
<td>TRTE 58.379N 24.721E</td>
<td>Jun 96</td>
<td>Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Eilath, Israel</td>
<td>EIL 29.670N 34.915E</td>
<td>Jul 96</td>
<td>GII Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Wanagama, Indonesia</td>
<td>UGM 7.913S 110.523E</td>
<td>Aug 96</td>
<td>Inmarsat</td>
<td></td>
</tr>
<tr>
<td>Isparta, Turkey</td>
<td>ISP 37.843N 30.509E</td>
<td>Oct 96</td>
<td>ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Limon Verde, Chile</td>
<td>LVC 22.618S 68.911W</td>
<td>Nov 96</td>
<td>IRIS Internet/LSS</td>
<td></td>
</tr>
<tr>
<td>Sanae, Antarctica</td>
<td>SNAA 78.915N 11.938E</td>
<td>Nov 96</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Kilimambogo, Kenya (rep. NAI)</td>
<td>KMBO 1.274S 36.804E</td>
<td>Jan 95</td>
<td>IRIS Internet/SLK</td>
<td></td>
</tr>
<tr>
<td>Michnevo, Russia</td>
<td>MRV 54.958N 37.767E</td>
<td>May 95</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Rödersdorf, Germany (rep. LID)</td>
<td>RGN 54.546N 13.364E</td>
<td>May 96</td>
<td>GRSN ISDN/SLK</td>
<td></td>
</tr>
<tr>
<td>Suwalki, Poland</td>
<td>SUW 54.013N 23.181E</td>
<td>Nov 95</td>
<td>phone/SLK</td>
<td></td>
</tr>
</tbody>
</table>

### Greek Sub Network (longterm)

| Skordalos, Crete | SKD or SKOR 35.412N 23.928E | Aug 96 | GSM |
| Kristallenia, Crete | KRIS 35.178N 25.503E | Aug 96 | ISDN/SLK |
| Santorini, Greece | SANT 36.371N 25.459E | Aug 96 | phone/SLK |
| Gavdos Island, Greece | GVD 34.839N 24.087E | Nov 99 | ISDN/SLK |
| Moni Apezanon, Crete | APEZ 34.977N 24.886E | Apr 00 | GSM |
| Fodele, Crete | POD 35.380N 24.958E | Apr 00 | GSM |
| Apirathos, Naxos, Greece | APE 37.07 N 25.53 E | Aug 00 | GSM |

### Loosely Associated Stations (Data Distribution only)

| Stuttgart, Germany | STU 48.770N 9.193E | Apr 94 | IG Stuttgart Internet/SLK |
| Jerusalem, Israel | JER 31.772N 35.197E | May 96 | GII Internet/SLK |
| Mount Meron, Israel | MRNI 33.011N 35.400E | Mar 98 | GII +++ Jan 02 |
| Sierra Elvira, Spain | SELV 37.238N 3.728W | Nov 01 | IAG Granada phone/SLK |
| Kfar Suld, Israel | KSD 35.659N 33.192E | Feb 02 | GII Internet/SLK |

SLK SeedLink (near) real-time data transfer
* Access denied by Russian authorities
+++ Station closed