2004 FDSN Meeting
13-17 September 2004
Potsdam, Germany

FDSN First Plenary – 13 September 2004
Chairperson Giardini called the 2004 FDSN first plenary meeting to order at 8:20 PM. The chair presented his report as the first order of business. Because the FDSN has grown so much, he indicated that the primary focus of the first plenary meeting would be the new networks that were joining the FDSN at this meeting. From the beginning the FDSN organization was a scientifically motivated organization but the new networks have a primary focus in earthquake monitoring. This may have an impact on certain aspects of the FDSN. As in previous years the majority of the work of the FDSN is done by the FDSN Working Groups and we will continue coordinating on traditional activities this year.

Giardini presented a list of the 19 networks that had indicated an interest in joining the FDSN. That list includes: Puerto Rico, Egypt, Romania, Bulgaria, ReNaSS, Norway, Georgia, Azerbaijan, Austria, Iceland, Sweden, Slovenia, Hungary, Iran, INV-Italy, Greece, Slovakia, CISN, and OGS in Italy.

Giardini next highlighted several topics that the working groups should pay extra attention to at this meeting.

- Given the continued reluctance of the CTBTO to even respond to the FDSN requests for release of the IMS data should we change our approach to this issue? Should FDSN WG IV on CTBT issues be disbanded?
- In the arena of real time data, should the FDSN embrace this as a goal for the FDSN?
- We have established a new working group on portable instruments? This is a new focus of the FDSN. How should we encourage progress to take place rapidly in this arena?
- What should the role of the FDSN be in the area of strong motion data? Perhaps we should not become heavily involved in sensors in buildings but the area of free field and reference strong motion sites is perhaps of FDSN interest.
- At this meeting we will discuss the general area of synthetic seismogram data. Should the FDSN take an active role in the development of synthetic data and metadata standards?
- Ocean bottom seismometers are a general area of interest. At present there is no permanent backbone of OBS observatories. Is there a way the FDSN can pool regional resources to create a permanent backbone of OBS stations?
- Large international initiatives such as the Global Earth Observation System of Systems (**GEOSS**) and the Integrated Global Observing Strategy (IGOS) are beginning to form. The World Meteorological Organization (WMO) has been closely aligned with seismology for years.

These issues raise several questions that we should address at this FDSN meeting.

- Should the FDSN expand its mandate to participate in groups such as GEOSS and IGOS?
- Should the FDSN consider other data types such as strong motion data?
- Should we revise some of the decisions that were made when the FDSN was organized 15 years ago?

With these issues raised by the FDSN chair we moved to the portion of the meeting where each of the new networks was asked to present a very brief (2-3 minutes) summary of their network. The following minutes highlight just a few aspects of the reports as most of them can be found on the FDSN web site at http://www.fdsn.org/FDSNmeetings/2004/reports.htm.

Puerto Rico Seismic Network Report: Christa Von Hildebrandt
The PRSN will soon consist of 16 broadband stations. They use the Earthworm system. The longer-term goal is to have a larger permanent network of seismic stations. In addition to the weak motion network they also have a Strong motion program that uses Antelope for its data management system. The data are available through the IRIS DMC and work is continuing on producing all of the valid SEED metadata for this effort.

Austria Report: Peter Melichar
The Austrian seismic network uses Antelope to operate its seismic network. Currently the network consists of 5 broadband and several strong motion stations. They are very involved with bilateral data exchange with surrounding countries. Melichar highlighted the new installation at the Conrad observatory.

Romania: Constantine Ionsecu
There are currently 45 K2 stations recording strong motion data. Additionally there are 14 analog stations, 6 K2 stations recording broadband seismic information. There is one AFTAC array located in Romania. They use the Antelope system and ingest data from several surrounding networks.

Bulgaria: D. Solakov
Bulgaria currently operates 14 seismic stations that are analog and use S13 sensors. They have 3 digital stations. They are acquiring a Quanterra Q330 data logger soon. They exchange data with Romania and Italy.

Sweden: Reynir Bodvarsson
The Swedish network consists of 45 stations running Guralp 3T seismometers. They also have one station equipped with an STS-2. They provide moment tensor solutions for all events.

Iceland: S. Jakobsdottir

Iceland runs a network very similar to Sweden. Currently there are 41 stations, including 7 broadband stations. The IRIS station BORG runs a Guralp sensor.

Slovenia: Mladen Zivcic
The Slovenian network will eventually include 25 stations. They use the Quanterra Q730 and CMG 40T sensors. Slovenia sends their data to ORFEUS.

Slovakia: Peter Labak
Slovakia operates a network of 12 stations, four of which are broadband. They have access to their data using real-time satellite transmission. They exchange data with 7 other centers. They get a total of 27 stations, some of which are from other networks. They nominated three stations as FDSN stations, VYHS, CRVS, and ZST.

Georgia: Misha Elashivil
Georgia is presently installing new stations. Currently there are 7 digital stations, 2 of these stations are broadband using Guralp CMG 3-ESP sensors.

Italy- ING-V: Salvatori Mazza
The Italian National Network is a new Italian Network in addition to the MedNet effort. In 2000 there were 92 short period stations. In 2002 they began switching to digital satellite systems and now 23 out of 30 systems are deployed. They have a total of 50 broadband and 10 very broadband stations now operating. They are using the GAIA digitizer that is made in Italy. By 2005 they are looking at 140 3-component stations.

ReNaSS: Anne deChamps
ReNaSS is the French National Network. It currently consists of 10 stations and data from 7 of them are received in real time.

Norsar: Johannes Schweitzer
There are three IMS arrays in Norway and there is one auxiliary IMS station on Jan Mayen Island. The Norsar data are open data without any restrictions. They provide data in CD 1.0 and now CD1.1 format. Jan Mayen Island may be an excellent selection for an FDSN station.

Hungary: (Presented by W. Hanka of Geofon)
Hungary has 3 broadband stations now and they have significant expansion plans.

Croatia: Marijan Harak
They are using Antelope to operate their network. Other details of the Croatian effort are missing in these minutes.

Egypt: Hadidy
Egypt has 63 seismic stations including 4 broadband STS-2 stations, 1 Trillium, 57 short period sensors and one Very broadband sensor. They also have 24 portable recording systems and 25 strong motion stations.

Southern California/SCSN (Presented by Tim Ahern of IRIS)
The SCSN report can be found on the web pages. The SCSN is a very large broadband network in southern California with a total of 155 broadband seismic stations deployed. They use primarily STS-2 or CMG-3 type seismometers but also have a significant backbone set of stations equipped with STS-1 seismometers. Caltech also operates the Southern California Earthquake Data Center (SCEDC) through which data can be accessed in SEED format.

FDSN Archive for Continuous Data: Tim Ahern
At this point Tim Ahern gave a report about the FDSN Archive for Continuous data. Since the previous FDSN meeting in Sapporo all FDSN networks contributed data to the IRIS DMC. Most networks have submitted data from 2004 with only Japan and Taiwan not having 2004 data in the archive. Taiwan is presently working with the IRIS DMC to send data from stations in real time using Antelope. The archive continues to grow steadily, in 2002 the archive was 24 terabytes and as of the end of July 2004 the archive is now more than 56 terabytes. Roughly 7 terabytes of the archive is data from the FDSN networks. At the current rate a bit more than 2 terabytes of data will come from the FDSN networks during 2004.

At the current rate, we are projecting roughly 100,000 requests for data will be serviced this year from the IRIS DMC. We are also seeing a significant increase in data shipped by the DMC in real time. More than 5 terabytes of data is projected for shipment from the IRIS DMC this year, roughly half in real time. These data will be contained in roughly 200,000,000 seismograms. Approximately 25,000 of the 100,000 requests will go to researchers outside the United States. Great Britain, France and Germany are the three largest users of the DMC outside the US.

Oceans and the FDSN: Rhett Butler
Rhett Butler began by saying that while the global community is doing a wonderful job in installing stations on land we are doing a very poor job in the oceans. Projects such as Neptune, moored buoys and other large initiatives such as ORION (http://www.orionprogram.org) was getting started.

Butler indicated one approach might be for the FDSN membership to take advantage of “Ships of Opportunity” to deploy and retrieve OBS systems.

Progress could be made in the area of coordinating the international activities in this area and the FDSN could play a significant role in this coordination.

He felt that one key tenant of the ocean effort should be the free and open access to data. This will encourage the scientific community to use the data and better understand the importance of providing their support to such efforts.

Global Earth Observing System of Systems: R. Butler
Butler indicated that very large inter-governmental organizations now exist and agreements between nations have created such initiatives as the Global Earth Observation System of Systems (GEOSS). Can we strengthen seismology through close collaboration with these other initiatives such as GEOSS? Butler encouraged the FDSN to work together with these larger international initiatives.

REGIONAL UPDATES
Europe: T. van Eck
In Europe there are 40 countries and roughly 100 seismic observatories. ORFEUS is aware of roughly 450 broadband stations in Europe. The Virtual European Broadband Seismic Network (VEBSN) now has 116 broadband stations from 35 different observatories.

Japan: Seiji Tsuboi
In addition to other activities that we are familiar with, Tsuboi indicated that they are working on real time networks for hazard mitigation coordinated with the GEOSS effort.

United States: R. Butler
The two largest new initiatives in the US are the Earthscope project funded by the National Science Foundation (NSF) and the Advanced National Seismic Network (ANSS) of the USGS. Earthscope is fully funded and the ANSS is funded while not at the full level.

Earthscope consists of three components; 1) USArray is the seismic component, 2) The Plate Boundary Observatory (PBO) is the component containing GPS, strain and seismic sub-components, and 3) the San Andrea Fault Observatory at Depth (SAFOD) which is a drilling project that will actually place sensors in the active fault.

USArray consist of three components. The USArray Backbone is closely coordinated with the backbone of the ANSS which when completed will consist of 100 stations.

The Transportable Array will consist of 400 stations that will occupy a location for 18 months and then move to a new location.

The Flexible Array will consist of 200 portable broadband stations as well as 2000 high frequency sensors that can be deployed in PI led detailed investigations.

Since the hour was getting late, Chair Giardini deferred several agenda items to the second plenary meeting on Friday and assigned the areas of special focus to the various working groups.

FDSN Second Plenary – 17 September 2004

The second FDSN Plenary was called to order at 18:38. We then moved quickly to the reports of the FDSN Working Groups.

WG I – Stations and Instrumentation by S. Tsuboi
The ISC has raised the issue related to coordination of naming of stations with ISC, NEIC, and the EMSC. The FDSN WG I recommends that a special group should be formed and this issue should be discussed.

The FDSN station list will be updated and will include new stations and add two columns indicating the Data Center(s) holding the data and the Access Methods.

In the area of the FDSN Network it was decided that the current concept of the FDSN stations should be continued but the permanent network of globally distributed high quality stations should start being referred to as the FDSN Backbone (FDSN-BB). All new networks joining the FDSN should designate 1 or more of their stations to be part of the FDSN network.

The issue of the lack of STS-1 sensor was discussed but no resolution to the problem was found.

In the area of OBS it was decided to attempt to obtain directly available OBS systems in a few example cases.

WG II – Data Centers and Formats
A presentation was prepared by B. Dost but presented by T. Ahern. A few SEED issues were discussed. The instrument code F was reserved for magnetic field intensity. For electrical potential the code J was reserved unless this could be met by using the existing code Q. After a review of the manual it will be updated as needed. It was identified that the code O for water current measurements and W for Wind Velocity are already reserved.

WG II discussed support of synthetic seismogram data within the FDSN. It is known that significantly more metadata will be needed in areas such as documentation of things such as velocity models, computer applications used, etc. A working group was formed consisting of S. Tsuboi (Chair), H. Igel, T. Ahern, D. Okaya and J-P. Vilotte. The group will report at the next FDSN meeting. S. Tsuboi presented a summary of how extensions to the XML-SEED concept might be used for synthetic metadata.

A new version of the SEED manual is available at the FDSN web site. Interested parties need to review it and provide comments within one month. At that time IRIS will produce a new version of the manual, make it available on-line as well as printing an appropriate number of copies. One item that needs to be added is that the time ordering of the FIR filter coefficients must be specified and should be in increasing time order.

The issue of Primary and Secondary Data Centers was discussed. It was suggested that it should look at data availability and not just the availability at the data center or not.

Hanka suggested that error checking from NetDC needs to be improved and Ahern indicated it would be but that those finding problems should send specific comments to him.

Several distributed data center approaches were discussed including NetDC, Ninja, Data Handling Interface and the WebDC concept.

Hanka raised the question of "intelligent" wildcarding. WG II suggested that an intelligent client that generates the request such as jWEED could manage this.

The issue of how parametric centers such as NEIC, ISC, and EMSC use and report data sources is causing problems. WG II recommends that those centers propose a solution and the FDSN will review it to see if it has implications for the FDSN.

Hanka indicated that it is difficult to receive new station codes in a timely manner. Bolton indicated that Buland would be willing to help in this area.

J. Lyons indicated that the GSC will continue to develop CSS schema for new areas but he had received no significant interest from other FDSN members in this area.

R. Butler proposed that the FDSN should draft a resolution related to real time data access.

WG III – Software Coordination
T. Ahern as Chair of WG III summarized these discussions.
Manfred Baer discussed the javaSeedLink Monitor written by A. Lomax and available at www.alomax.net/projects/seedlink. Since many of the FDSN networks use SeedLink this may be a very useful utility. He also discussed the QuakeML (Markup Language) being developed at ETH to describe parametric earthquake data. It uses many elements of web service technology. The FDSN will attempt to coordinate QuakeML with the XML SEED effort being led by the Jamstec group in Japan.

L. Calje from Orfeus discussed the SHAPE software development. SHAPE is a way in which metadata can be managed without requiring a database. PDCC 3.0 leveraged the SHAPE effort.

T. Ahern summarized the javaSEED effort undertaken by Rob Casey at the IRIS DMC. These object-oriented classes can accept input from a variety of sources, build and populate objects with SEED blockette metadata. It basically provides an API to information in the objects and acts as an object-oriented toolkit.

The Portable Data Collection Center (PDCC) application is an object oriented, database enabled, SEED metadata management system. It is available as a beta release.

The IRIS Station Information System (ISIS) is an object-oriented, database enabled metadata management system of other types of metadata such as equipment inventories, engineering site visits and data problem reports. There are plans to integrate PDCC and ISIS in the future.

Ahern also summarized the real-time quality assurance framework developed by Bruce Weertman of the IRIS DMC. The framework manages several aspects of QA algorithms when applied to data. It controls when plug-ins are invoked, provides access to the waveform and other information to the plug-ins, it manages all access to the DBMS and supports report generation. The next phase is to begin development of an alarming system. It is currently operating on all data entering the DMC in the real time BUD system.

Ahern also gave a brief overview of web services to see if this might provide a good distributed computing environment for members of the FDSN.

WG IV on CTBT Issues
J. Lyons summarized the discussions related to WG IV. The issue of the CTBT and FDSN interactions was discussed during the FDSN Executive meeting. It was decided that the FDSN should continue to ask the CTBTO for access to the IMS

data (Seismic, Hydro acoustic, and Infrasound) and as such the working group will not be disbanded a this time.

At the same time the FDSN will pursue gaining access to primary and auxiliary data through bilateral agreements for data exchange. During the next year we will focus on getting data into the FDSN archive at the IRIS DMC from

- Canadian IMS Primary and auxiliary arrays and stations
- GERESS array data through AFTAC
- IMS data from Korea

Giardini suggested that we should produce a map showing CTBT/IMS stations that are NOT in the FDSN archive since many stations already reach the archive from the FDSN member networks.

WG V – Portable Instrumentation

T. Ahern presented a summary of the results from the first working group meeting of Working Group V in P. Denton's absence. The working group was well attended with representatives from the USA, UK, Canada, France and Germany.

He identified the objectives of WG V which include the promotion of uniform data archive formats and access methods, promotion of an open access to data after an exclusive use period and the ability to share best practice among the FDSN members.

Short term action items include the establishment of an inventory of available equipment at the FDSN web site, the maintenance of an archive of metadata about past projects at the FDSN web site, the establishment and maintenance of planned large scale projects through links from the FDSN web site and the maintenance of a list of links to ocean bottom seismometer pools.

Chairman Giardini highlighted several additional points as discussed below.

Data Distribution

The goals of the FDSN remain to increase and improve access to data. One way to do this is by supporting distributed models of data centers. The FDSN-BB network will remain to be archived at the IRIS DMC. Regional FDSN stations will be managed in a system of distributed data centers.

Ocean Bottom Seismometers

The FDSN should stress the deployment of permanent OBS. FDSN will make a goal of establishing permanent OBS using instruments from the US, Japan and Europe. We will request that data from one OBS from all OBS deployments be released in an open manner as a beginning. We will establish links and

inventories to OBS pools; Tsuboi in Japan, Van Eck in Europe, and IRIS in the US will coordinate this.

Real Time data is becoming a goal of the FDSN and whenever possible the FDSN members should embrace it.

We should continue to expand FDSN membership. Van Eck and Giardini in Europe and the Middle East, Tsuboi in Asia, and by IRIS and Puerto Rico in the Americas will coordinate this. It was suggested that we have a one-day workshop the day before the next FDSN meeting takes place.

The FDSN Archive (IRIS) will establish an FDSN partner page on the FDSN web site where all current and new members will be able to provide updated information about their networks as well as their FDSN contact information.

Giardini mentioned that GEOSS would be discussed in a resolution.

With that the FDSN then discussed slight additions to the FDSN Terms of Reference. The following two points were added to the FDSN Goals in the terms of reference.

- Pursuing free and open access to data
- Improving access to data in real-time.

Three resolutions were passed by the FDSN. The text of these resolutions is included at the end of these minutes. R. Butler discussed the first resolution concerning GEOSS. The background was provided, it was discussed and it was passed unanimously.

R. Butler again discussed resolution 2 and it too was discussed and approved by the FDSN.

G. Roult discussed resolution 3. Slight modifications were made to the resolution and it was approved by the FDSN.

The next FDSN meeting will be held in conjunction with the 2005 IASPEI meeting in Santiago, Chile. The dates of the IASPEI meeting will be October 2-9, 2005. The exact dates and times of the FDSN meeting will be determined later.

A list of Action Items will be produced and distributed from this meeting.

Chairman Giardini adjourned the meeting at approximately 20:35.

Respectfully Submitted

Tim Ahern
FDSN Secretary

2004 FDSN Resolution #1

17 September 2004

Group on Earth Observations (GEO): Global Earth Observing System of Systems (GEOSS)

Statement:

The Federation of broadband Digital Seismograph Networks (FDSN) supports the GEOSS Vision and Goal for societal benefits in the GEO topic of Disasters. The FDSN member Networks exist and are *in situ* operational resources providing extensive coordinated global and national seismic coverage with real-time data. FDSN member Networks are a principal source of data and information for earthquake locations, earthquake hazard mitigation, earthquake emergency response, and tsunami warning response, and FDSN member organizations serve as a principal resource for public education and outreach, and technical training in earthquake science. The FDSN is a leading proponent of free and open data access, using an established data and metadata format, through an existing system of Network data centers. In situ spatial coverage of the Earth on land by FDSN Observatories is excellent, with few remaining gaps; and *in situ* seafloor coverage is progressing or planned. Many FDSN Networks are multi-use systems with substantial logistical and infrastructure resources that may be shared with other co-located GEOSS *in situ* sensors.

Resolved:

As an international scientific organization, the FDSN will engage and participate fully in GEO, and encourages FDSN member Networks to coordinate and participate with GEOSS. The FDSN will approach and make appropriate arrangements with GEO, endorse FDSN member Network participation in GEOSS, and coordinate as requested.

Excerpt from…

Ad hoc Group on Earth Observations (GEO) Implementation Plan Task Team (IPTT)
Draft GEOSS 10-Year Implementation Plan
DRAFT TECHNICAL BLUEPRINT / REFERENCE DOCUMENT
August 2004

Section 4.1 DISASTERS

4.1.2 Vision and How GEOSS Will Help

The overarching 10-year vision in the area of disasters is to build toward coordinated operational observing systems with global coverage. These need to be capable of supporting effective disaster warnings, response, and recovery, and generating information products that enable planning and mitigation, in support of sustainable development. Disparate, multidisciplinary, basic, and applied research must be integrated into operational systems. Gaps in observations, in knowledge, in technology, in capacity, but above all, in organization must be filled. Providing this collaborative framework, together with support for continuity of operations for all essential systems, is precisely the purpose of GEOSS.

2004 FDSN Resolution #2

17 September 2004

Statement:

The FDSN Backbone Network has achieved excellent seismic coverage of the Earth on land with few remaining gaps. However, nearly all of the oceanic coverage of the planet is achieved from island sites, which are not representative of the seafloor. Vast open areas of the ocean have no coverage whatsoever. These oceanic areas of the Earth are international, and efforts to achieve success are necessarily international. In principle, oceanic coverage of the Earth with ocean bottom seismic and hydroacoustic systems (OBSHs) should be comparable to land-based coverage with seismic sensors, of the order of 100 oceanic sites. Most OBSHs currently deployed are for more narrowly focused scientific studies with limited duration, and their data are proprietary for periods of years or not available at all. In order to get more international scientific attention for global seismology in the oceans, more data must be available immediately, so that the inertia in progress due to long-delays in release of data becomes momentum through awareness of the exciting opportunities in oceanic data.

Resolved:

As an international scientific organization recognizing the imperative for better seismological coverage in the oceans in order to understand our planet:

- The FDSN requests that real-time seismic and hydroacoustic data from seafloor observatories using cable and/or buoyed systems be well coordinated with existing FDSN member Networks, so that data may be seamlessly integrated with land-based data, and distributed freely and openly.
- The FDSN advocates the immediate release of data from proprietary restrictions from at least one OBS/H in each scientific deployment or experiment in the oceans and seas, and requests that these data be made available to a FDSN data center for global seismological international data exchange.
- The FDSN recognizes the additional need for a fleet of OBSHs dedicated to global seismological coverage of the oceans and concomitant oceanic seismology, to be deployed via ships of opportunity and coordinated with the oceanographic community, whose data are freely and openly available at FDSN data centers without delay or restriction. The FDSN advocates the creation of an international capability to coordinate and encourage the collaboration of national and international efforts, encompassing OBSH contributions of 10-20 units each from Europe, North America, and Japan, and other interested nations.
- The FDSN will approach and make appropriate arrangements with national and international oceanographic organizations, endorse FDSN member Network participation in these activities, and coordinate as requested.

2004 FDSN Resolution #3 17 September 2004

Resolution Pertaining to Stations at high latitudes

Recognizing
that during the last 20 years, stations have been established in the southern hemisphere, particularly in Antarctica and surrounding regions,

that these stations have provided unique data, broad and important contributions to the scientific literature (tomography of the earth, earthquakes sources studies, Inner core studies,etc.),

Considering
that the global coverage of the earth will be significantly hurt if any of these stations are closed,

the FDSN
encourages all efforts in supporting the existence of these stations and recommends the installation of new stations in the southern hemisphere.