

**Minutes from 2003 FDSN Meeting  
Sapporo, Japan  
7-10 July 2003**

**First Plenary Meeting 7 July 2003**

Chairman Domenico Giardini called the 2003 FDSN First Plenary meeting to order at 7:45PM. He commented that the format of this meeting would be different than previous FDSN meetings. Since all FDSN network operators had been requested to submit their network reports well in advance of the meeting, oral network reports (see Attachments H-W) would not be given and the FDSN would focus on strategic issues.

The agenda for the meeting was approved (See Attachment A). The minutes of the 2002 meeting in Hawaii were approved without modification.

**Chairman's Report:** Domenico Giardini gave a brief report. He first thanked past chair of the FDSN Fukao and the former FDSN Executive committee. He indicated that the only new member of the FDSN since last year was New Zealand. Giardini briefly reviewed two global coordination initiatives; the GOLD initiative involving IRIS, JAMSTEC and ORFEUS and the NERIES proposal. Ahern of IRIS gave a very brief review of the status of GOLD proposal indicating that its funding success or failure should be known soon. GOLD is an attempt to seamlessly integrate global data centers using modern information technologies. Giardini indicated that the NERIES proposal was a European initiative that focused on real time information transfer of seismic waveforms. Giardini indicated that he transmitted another letter from the FDSN to the CTBTO in March 2003 requesting full and unrestricted release of data. This letter has not yet been answered and is waiting for the next meeting of Working Group B. Giardini reported that IASPEI will no longer have a separate liaison to the FDSN and instead the Chair of the FDSN will act in that role.

**Current Status and New Initiatives:**

**North America**

Jim Lyons reviewed the current situation in Canada (See Attachment H). Basically there are four initiatives, 1) the Canadian National Seismic Network (CNSN), 2) The Canadian High Arctic Seismic Experiment (CHASME), 3) A temporary deployment monitoring the British Columbia slip event and 4) the POLARIS project. The CNSN has upgraded 5 stations (SCHQ, ULM, HAL, QCG, and VGZ) and a new station was installed at Whistler Mountain. CHASME is a temporary deployment trying to improve the knowledge of the velocity structure in the high arctic and also to determine receiver functions. POLARIS now has installed 13 new stations with a total of 18 stations currently operating in three arrays in various locations in Canada. The plans are to move POLARIS from the Nanometrics LIBRA system to something like a Nanometrics Orion system.

Ahern summarized the USArray component of the recently funded NSF Earthscope project. There are three major components of USArray, a 400 station temporary network where stations will be occupied on a roughly 70 km grid for 18 to 24 months. Over the course of 10 years 2000 sites will be occupied in the continental United States including Alaska. A Flexible component of USArray will support PASSCAL type deployments with 200 broadband systems and 2000 high frequency systems. Finally a permanent network of 40 stations funded by NSF and 60 stations funded by the USGS ANSS initiative will add 100 stations to the permanent recording network in the United States. Paul Earle of the NEIC in Golden added that the ANSS is currently funded at only 10% of its proposed level but preliminary work is proceeding steadily.

## **Japan**

Seiji Tsuboi presented an overview of several of the activities taking place in Japan. He indicated that after the 1995 Kobe earthquake significant new resources were made available for promoting earthquake research.

HINET is a high sensitivity network of 600 stations of 1-second short period stations mostly in boreholes. All 600 stations store their data at JAMSTEC and at NIED and data are available through those organizations.

J-Array is a university network of stations using satellite telemetry, presently totaling roughly 300 stations, some of which are broadband and some of which are short period.

F-net is a network of broadband stations including the former FREESIA network. The network consists of roughly 60 stations and the data are archived at NIED. It requires a user account to access the data but they are available through NIED.

Kyoshin-net is a strong motion network at NIED with more than 1000 stations.

Tsuboi also indicated that there is a GPS network of several hundreds of stations. The GPS network is operated by Geographical Survey Institute and data are distributed from [http://terras.gsi.go.jp/inet\\_NEW/index.html](http://terras.gsi.go.jp/inet_NEW/index.html).

There is a submarine cable data center located at JAMSTEC where data from 2 cable systems are currently available. One cable has 3 OBS stations and the other has 2 OBS stations. The data from these OBS systems are available through the JAMSTEC Data Center.

The Institute of Frontier Research for Earth Evolution (IFREE) supports data center activity. IFREE also supports the activities of the Chikyu drilling ship of the IODP. IFREE also manages the data from the Western Pacific Network that includes the data from the Ocean Hemispheres Project (OHP) of ERI (Professor

Fukao). IFREE also has access to the Earth Simulator. OHP has data from Superplume joint stations of IRIS and NIED. Pacific 21 stations are moving to real time transmission of data to IFREE Data Center.

IFREE supports the NINJA system, a networked data center concept that allows data to be distributed from primary data centers. Tsuboi summarized several near term plans.

## **Europe**

Bernard Dost summarized some activities in Europe. There are three programs of note, 1) MEREDIAN, 2) EMICES, 3) NERIES. Meridian had a focus of coordinating the acquisition of real time data in Europe. EMICES had as its focus organization of workshops in Europe on matters related to seismological data. There have been three workshops either conducted or planned by this project and these include a real time workshop in Barcelona, an object-oriented workshop in Athens and another workshop planned for Cyprus.

NERIES is a proposal to develop sustainable seismological infrastructure in Europe. This project is still in the proposal stage and has not yet been approved for funding.

MEREDIAN has up to 80 stations returning real time data to the ORFEUS data center. The original MERIDAN members numbered 10 countries and a second phase is adding additional member countries.

## **FDSN Archive (See Attachment B)**

Ahern summarized activities at the FDSN Archive. Significant progress has been made in reducing the time it takes to archive data from member networks and in fact a majority of the FDSN networks that regularly contribute data now provide data in real time. All regular contributors of data to the FDSN archive have data from at least 2002 archived.

The FDSN archive now has nearly 40 terabytes of waveform data and we are on target to archive more data from FDSN networks in 2003 than in any previous year and it should be roughly 1.5 terabytes of new FDSN data in 2003.

Shipments from the FDSN archive to non-US researchers are also increasing. France, Great Britain, Japan and Germany are the largest recipients of data from the FDSN archive. We project that more than 12,000 non-US researchers will request data from the FDSN archive this year.

## **Expanded Membership**

Domenico Giardini would like to see expanding communication with all broadband networks. There was a general consensus that expansion is a good idea and the FDSN will revisit this concept in the 2<sup>nd</sup> plenary meeting.

## **International Ocean Network (ION)**

Barbara Romanowicz gave a brief report about ION. Originally established as a network to extend land based networks to the oceans it now includes all scientists that work in the water column. She indicated that there have been 5-6 holes drilled by the Ocean Drilling Program ((ODP) and it has been concluded that this improves the signal to noise ratio of the data. Various international countries have very significant efforts in drilling. She made reference to the recent cable workshop and the fact that they are encouraging standardization of instrumentation and standardization of data exchange formats as one of the results of the workshop.

The concept of better coordination between the FDSN and ION was raised but no specific items were agreed upon. Communication will be encouraged.

## **Portable Deployments (see Attachment C)**

Domenico Giardini described the history of portable deployments and the FDSN. The possibility of broadening the FDSN involvement to include portable broadband deployments was raised first at the 1994 FDSN meeting and again at the 1997 meeting. It now appears that enough enthusiasm exists within the FDSN and within the portable broadband community that critical mass exists. Paul Denton prepared a proposal based on discussions from the recent meeting in Europe calling for the opening of membership in the FDSN for temporary broadband deployments, the need to establish an inventory for experiments and coordination between data centers.

## **Quality Assurance (See Attachment D)**

Ahern presented the current status of an IRIS initiative related to quality control of data. The motivation for this came from the increasing amount of data received by the IRIS DMC in real time that does not have any formal quality assurance applied to it. Ahern reviewed the Quality Assurance Control Kit (QUACK). He indicated that it is a framework that allows incorporation of various algorithms to estimate parameters from waveforms. Presently parameters such as 1) gaps, 2) RMS values, 3) Mean value and 4) percent data available are being routinely measured for some networks. Results are stored in a relational database and the hope is that users can eventually generate data requests based upon quality assurance values. Near term plans include incorporating Power Spectral Density estimates, Noise estimates, timing quality and the development of alarm capability when parameters fall outside specified limits.

## **Real Time Waveform Distribution**

Dost presented some of the activities taking place within ORFEUS and IRIS as they relate to real time data access. Activities include standard methods of receiving data at data centers including 1) Antelope, 2) Earthworm, 3) LISS and 4) SEEDLink. The automatic building of event waveform products was summarized in the context of POND-type event oriented data repositories. Dost indicated that ORFEUS does not yet offer real time access to data while IRIS

provides real time access by LISS and by Data Handling Interface (DHI). Several issues related to data exchange were highlighted.

### **Charge to Working Groups**

Domenico Giardini summarized the specific items that he would like to have addressed in the Working Group meetings

#### **WG I – Stations**

- Global Coverage
- Enlarging FDSN Representation
- Replacing STS-1 sensor

#### **WG II – Data Centers and Data Access**

- Real Time Data Access and Distribution
- Access to Data from Regional Networks

#### **WG III – Software Coordination**

- Quality Assurance
- Real Time Data Access

#### **WG IV – CTBT**

- Release of IDC Data

It was decided that WG I and IV will meet together on Tuesday 8 July and WG II and WG III will meet together on Wednesday 9 July. Ahern indicated he would obtain rooms for the working group meetings and their location would be posted on the IUGG message board. The FDSN Executive Committee will meet at 7:30 AM on Thursday 10 July for a breakfast meeting in the Sapporo Royton Hotel's cafeteria on the first floor.

First Plenary Meeting Adjourned at 22:20 PM.

### **Second Plenary Meeting 10 July 2003**

The second plenary meeting was called to order promptly at 19:30 by chair Domenico Giardini. The agenda was reviewed and no additional items were added.

**WG I. (Attachment E)** Seiji Tsuboi summarized the work of Working Group I, Stations and Instrumentation.

- Global Coverage Issue – WG I decided to keep the concept of the FDSN network intact but that clear criteria for FDSN stations should be established. The FDSN station list maintained by WG I should be expanded to include 2 additional information items. The first is a Data Center Code indicating where the data from a particular station can be found. An additional column will indicate whether or not real time data are available from the station. The IRIS DMC will develop a web-based form where FDSN networks can enter or update information about new or existing stations in the station list.

- WGI recommends expanding the terms of reference to include all broadband networks. It was recommended to survey the FDSN membership to identify all potential broadband networks. The FDSN will then write a letter inviting all networks to formally join the FDSN and name a representative to attend FDSN meetings.
- STS 1 Issue – It was recommended that members identify their needs for STS-1 seismometers and the FDSN will approach Streckheisen in order to indicate the size of possible STS-1 orders and perhaps convince him to resume manufacturing of the STS-1.

Benson asked why the STS-1 production stopped. Giardini indicated some of the issues.

Giardini clarified that data from all FDSN stations should still be sent to the FDSN archive.

**WG IV. (Attachment G)** Jim Lyons summarized the work of WG IV on CTBT Issues.

- Ahern had indicated that, consistent with recommendations from the last FDSN meeting, Australia and Canada were contacted to see if they would provide real time data feeds to the FDSN Archive. Data are now coming routinely from Australia and discussions are continuing with Canada.
- The GCI test to demonstrate non-interference of FDSN data traffic over the satellite circuits has been completed successfully. Both Geoscope and IRIS have short term plans to use this infrastructure.
- There has been no response yet from the CTBT with respect to the letter from Domenico Giardini sent in March 2003.
- Lyons indicated that WG IV recommends taking small steps to see if data can now be released by the CTBT to the FDSN. Possible options include asking for data only from larger events (>6.0) or by accepting a delay being introduced in continuous feeds. Lyons and Giardini will draft a letter to send to the Working Group B of the CTBT.
- Florence Riviera was invited to join WG IV to represent the CTBT and she has accepted.
- Giardini reported that the IUGG approved a resolution to release partial data in near real time for catastrophic earthquakes and for delayed access to continuous waveforms.
- The letter to the CTBT will request both types of data release, near real time event based and delayed access to continuous data.

**WG II & III. (Attachment F)** Bernard Dost summarized the deliberations of WG II and III related to data centers and software coordination.

- SEED Issues
  - The concept of assigning permanent codes for temporary deployments in a specific region was discussed. It was decided to issue temporary codes (not permanent codes) for an extended

- period of years. This was in response to the request for a permanent code for use in Southern California portable experiments.
- Issue of Q330 use of Blockette 500 and 2000. It was decided to identify two new data types (90 and 91) to deal with these data blockettes. It was also decided to strongly discourage introducing things into miniSEED that can be represented in full SEED.
  - The need to clearly identify which characters can be considered in the P (Punctuation) designation needs to be documented; specifically we wish to insure that underscore (\_) is a valid punctuation character.
  - The issue of representing DDL on little-endian machines was resolved by requiring that DDL be specified as big-endian.
  - In blockette 52 it was decided that the depth and elevation fields could be specified without a decimal point or decimal place in order to record depths that would otherwise exceed the field width.
- Real Time Data Exchange
    - It was decided that there was no need to try to standardize protocols for real time data exchange from stations to centers. It was recommended that a page be added to the FDSN web site that indicates which data loggers have plug-ins available for various real time protocols.
    - It was felt that the FDSN should specify minimum functionality for real time data exchange methods. These might include latency issues as well as quality issues such as buffering.
  - NetDC, autoDRM and WILBER
    - NetDC is fairly stable. The only significant development will be the development of a web portal where users can easily generate the NetDC request. It was noted that the PDCC software will have NetDC capability. The only significant change with WILBER is that a new plotting method has been included that uses php to generate the plots and that new record section plotting will be added in the near future.
  - XML Developments
    - XML SEED. JAMSTEC has been actively pursuing XML SEED. They now have two utilities that work in this field.
      - Seedconv converts existing binary SEED to XML SEED
      - Xrdseed, provides rdseed functionality to XML-SEED.
      - WG II recommends that all FDSN data centers actively test the XML SEED utilities before the next meeting.
    - QuakeML. Parametric data using XML. It was felt that a workshop was needed to discuss the developments in this area. Much larger representation than the FDSN was clearly needed.
  - Quality Control
    - The IRIS QUACK initiative will most likely take another year before it can begin to be distributed. All software will be made available, including the quality control algorithms themselves.

- The FDSN membership will be surveyed to identify quality control algorithms that currently exist.

### **ISC Report by Ray Willemann**

Much more data is now being analyzed and it is being done nearer to real time. A preliminary report is now available about 1 day behind real time. Willemann summarized the current activities at the ISC. He drew attention to several Internet Access Tools. He indicated that the ISC is actively pursuing special projects catalogues such as those from PASSCAL, OBS-IP and the SEIS-UK projects.

Willemann displayed a system that provides direct links to waveform data centers based upon searches of the ISC event database. This resulted in a lengthy discussion about whether the ISC "should" be acting as a waveform broker. There was no consensus reached.

The issue of phase picking at data centers was raised and the need for close coordination was identified. It might be wise to have a committee define the algorithms needed to routinely perform phase picking. Derived parameters must be well attributed to the person/institution that make the readings.

### **Report of FDSN Executive Deliberations and Strategy Discussion**

#### **Topics**

1. General consensus to extend FDSN membership to all broadband networks.
2. Portable and Temporary Experiments
3. Code of Conduct

#### Item 3. Code of Conduct

With data going to multiple centers how can the community be disciplined enough not to report or over report hypocenters? Perhaps the Council of the National Seismic System (CNSS) can be used as an example of how such a system can work since the concept is working fairly well within the United States with its multiple regional networks.

#### Item 1. FDSN membership

A list of networks to be invited to join the FDSN will be generated by the existing FDSN membership. The networks will be asked to appoint a new representative.

#### Item 2. Portable Deployments

It is recommended to form a working group V for Portable broadband deployments. Paul Denton will be asked to recommend membership and develop a specific charge for the working group. It is expected that it will be involved in coordinating information about portable experiments including an inventory of past and future experiments.



The new terms of reference were discussed with slight modifications made. The 2003 Terms of Reference were adopted unanimously.

Domenico Giardini asked if there were any other items to discuss and there were none.

The next meeting will be in September 2004 in conjunction with the EGS meeting in Potsdam. Rainer Kind agreed to host the next meeting at GFZ in Potsdam.

The meeting was adjourned at 21:25.

Respectfully submitted  
Tim Ahern, FDSN Secretary

### List of Attachments

<b>Attachment</b>	
<b>A</b>	Agenda
<b>B</b>	FDSN Archive
<b>C</b>	Portable Deployments
<b>D</b>	Quality Assurance
<b>E</b>	Working Group I
<b>F</b>	Working Groups II & III
<b>G</b>	Working Group IV

### Network Reports

<b>Attachment</b>	<b>Country</b>	<b>Organization</b>	<b>NETWORK</b>
<b>H</b>	Canada	GSC	CNSN
<b>I</b>	China	CSB	NCDSN
<b>J</b>	Czech Rep.	CAS	CZNet
<b>K</b>	UN	CTBTO	IMS/IDC
<b>L</b>	Denmark	DNS	DNSN
<b>M</b>	France	IPGP	GEOSCOPE
<b>N</b>	Germany	GFZ	GEOFONE
<b>O</b>	Italy	ING	MEDNET
<b>P</b>	Italy	ING	Extrema
<b>Q</b>	Italy	ING	Italian NDC
<b>R</b>	Japan	JAMSTEC/ERI	Pacific 21
<b>S</b>	Portugal	IST	ISTP Net
<b>T</b>	Switzerland	ETH	SNSN
<b>U</b>	Taiwan	IES	BATS
<b>V</b>	USA	IRIS	GSN
<b>W</b>	USA	USGS	USNSN/ANSS

## **Attachment A**

### **Plenary 1**

**July 7, 2003 (Monday)**

**19:30 – 22:30**

**Royton Hotel (SITE A), Emerald D (Room#13)**

1. Adoption of Agenda
2. Adoption of 2002 FDSN minutes from Hawaii
3. Chairman's Report
  - New members 2002-03
4. Current Status and New Initiatives
  - 4.1 Americas (J. Lyons) (15 min.)
  - 4.2 Europe-Mediterranean (T. vanEck) (15 min.)
  - 4.3 Japan (S. Tsuboi) (20 min.)
  - 4.4 Federation network and archive (T. Ahern) (10 min.)
5. New directions for the FDSN (D. Giardini)
  - 5.1 Expanding FDSN participation and membership (D. Giardini) (15 min.)
  - 5.2 Relationship to ION (B. Romanowicz) (15 min.)
  - 5.3 Temporary deployments (P. Denton) (15 min.)
  - 5.4 Quality Control of Data (T. Ahern) (15 min.)
  - 5.5 Real-time access to waveform data (B. Dost) (15 min.)
6. Specific Charges to the Working Groups

### **Plenary 2**

**July 10, 2003 (Thursday)**

**19:30 – 22:30**

**Royton Hotel (SITE A), Emerald C (Room#12)**

7. Reports of the Working Groups
  - Working Group I - Station Siting and Instrumentation (S. Tsuboi) (15 min.)
  - Working Group II - Data Format and Data Centers (B. Dost) (15 min.)
  - Working Group III - Software Coordination (T. Ahern) (15 min.)
  - Working Group IV - CTBT Coordination (J. Lyons) (15 min.)
8. Reports of other organizations
  - 8.1 ION (B. Romanowicz) (10 min.)
  - 8.2 ISC (R. Willemann) (10 min.)
  - 8.3 CTBTO (L. Astiz) (10 min.)
  - 8.4 IASPEI (Rob van der Hilst) (10 min.)
9. Report of the ExeCom and strategy discussion (1 hour)
10. Next FDSN Meeting
11. Adjourn

### First FDSN Plenary Attendance – 7 July 2003

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### Second FDSN Plenary Attendance – 10 July 2003

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## 2003 TERMS OF REFERENCE

### Federation of Digital Broad-Band Seismograph Networks

The International Seismological Community recognizes the new opportunities within its field for improved understanding of the internal structure and dynamical properties of the Earth provided by seismograph network technology.

It also recognizes that rapid access to seismic data networks of modern broad-band digital instruments wherever they might be is now possible.

The developments include greatly improved broad-band seismographic systems that capture the entire seismic wave field with high fidelity, efficient and economical data communications and storage and widely available, powerful computing facilities.

The federation is open to all programs committed to the deployment of broad-band seismographs and willing to contribute to the establishment of an optimum global system with open and timely data exchange.

#### I. Goals

In view of the above and to take advantage of existing and developing global and regional networks the "Federation of Digital Broad-Band Seismograph Networks (FDSN)" provides a forum for:

- developing common minimum standards in seismographs (e.g. bandwidth) and recording characteristics (e.g. resolution and dynamic range);
- developing standards for quality control and procedures for archiving and exchange of data among component networks;
- coordinating the siting of stations in locations that will provide optimum coverage.

#### II. Institutional Frame

The Federation is an independent international association and has commission status within the International Association for Seismology and Physics of the Earth's Interior (IASPEI).

### III. Membership and organization

- Membership in the FDSN is open to programs committed to both the development and operation of the broad-band digital networks and achievement of the goals of the Federation.
- The structure of the FDSN includes a steering committee and an executive committee.
- The members of the FDSN steering committee will consist of one representative per network who will be appointed or selected, by the network, from within the organization they represent.
- Between meetings of the steering committee, the activities of the federation will be coordinated by an elected executive committee whose membership may not exceed one representative from any program.
- The FDSN executive committee, elected for a four-year term, will be headed by a chair, assisted by not more than three members, and a secretary. The chair of the executive committee will preside over the meetings of the steering committee. Members of the executive committee shall be elected from within the steering committee or the member organizations.
- The FDSN steering committee will form all necessary working groups or special technical committees as required to achieve the objectives of the FDSN.
- The FDSN steering committee will deliberate at least once a year. Special meetings may be called by the chair as necessary for the progress of the FDSN.
- Concerning all recommendations made and actions to be taken, each member of the FDSN will have one vote, with the limitation that no one country may have more than two votes. In the case of more than two members from a single nation present, the two voting members must be identified to the chair in advance. A majority of 2/3 voting members will be required for an affirmative vote. Five members of the FDSN will constitute a quorum for FDSN steering committee meetings.
- No fees are imposed but voluntary contributions may be requested to cover costs for communications.
- Any member may resign at any time by giving written notice to the chair.