

# **The DIAL network for supporting global change research in the Asia-Pacific Region (APN 2000-14)**

## **Final Project Report**

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### **APN Funding**

\$46,647

### **Participants were funded from the following countries**

China, Malaysia, Thailand, Vietnam, USA

### **Introduction/Background**

DIAL is a web-based data and information system that enables scientists and small data producers in Earth science to format, document, and distribute data through their desktop computers. The system allows data users, by using common Web browsers, to interactively search and select data in DIAL sites, manipulate and visualize the selected data, and download selected data in their favorite forms in terms of spatial and temporal coverage and resolution, parameters, and data formats. Multiple DIAL sites can form a network of data providers through DIAL's interoperability protocols. While maintaining the independence of individual DIAL sites, a network of DIAL nodes can provide a unified information space, which would enable data users to search and access data in all sites in the network by querying just one of them. DIAL was developed by a team led by the PI of this APN project with more than \$2.5 million of funding from NASA. Currently more than 2,000 copies of DIAL software system have been distributed to scientists and data producers around the world.

The objective of this APN project is to build sustainable data and information system (DIS) capacities and activities in the Asia-Pacific region for supporting key global change studies in individual countries and across the region by using the DIAL system. The activities include 1) establishing a DIAL-based network of interoperable data and information systems in the Asia-Pacific region; 2) training staff in the collaborating institutes on data and information management; and 3) providing user support on DIAL system and data preparation.

Since the submission of the proposal to APN, NASA and Open GIS Consortium (OGC) has funded LAITS to develop a new open, standard-based system called NASA HDF-EOS Web GIS Software Suite (NWGISS). The system provides on-line data accesses and services of HDF and HDF-EOS data located in different countries to users based on open, interoperable OGC standards. Currently, NWGISS consists of following components: a Web Map Server, a Web Coverage Server, a Catalog Server, a Web Coverage Client, and a tool component. Those

components can work both independently or collaboratively. The map server, compliant with OGC Web Mapping Specification 1.0, serves HDF-EOS data as maps. The coverage server, compliant with OGC Web Coverage Specification version 0.5, allows GIS users to access data in the coverage server in interoperable way. The catalog server, compliant with OGC Catalog Interface Implementation Specification version 1.0, provides the catalog search capabilities to GIS clients. The Web Coverage Client enables GIS users to access multi-source data served by OGC compliant web coverage servers. The difference between DIAL and NWGISS is that DIAL is a closed system that uses server-generated client and employs private protocols for communication between client and server while NWGISS is an open system that uses OGC protocols in client-server communication and both clients and servers in NWGISS are independent entities. The prerelease version of NWGISS software has been available since April 2001. In addition to DIAL, both the NWGISS software and training on use of the software were also provided to scientists in China, Malaysia, Thailand, and Vietnam.

### **Outline of activities conducted**

Due to the change of affiliation of the PI and the contractual change with NASA, the contract for performing this project was in place in January 2001, about six months later than originally planned. Subsequently, we were only able to start this project in January 2001. The project was originally planned to be finished in August 2001 but was extended to December 2001 due to the conflicted schedule and the change of host country.

In the original proposal, one of the host countries was Indonesia. However, in May 2001 the local co-investigator, Mr. Hartanto Sanjaya of BPPT Indonesia, noticed the PI about Indonesia government's new policy that did not allow any government agencies below ministry level to set up a web site. Since both DIAL and NWGISS software requires a web server to run, therefore it is impossible for our local host to set up a web server for operating DIAL and NWGISS. With the approval of APN, we changed one of the host countries of this project from Indonesia to Malaysia.

For each host institute, we provide both DIAL and NWGISS software. In addition, we also provided installation help and the technical help for them to ingest data into the systems for distribution.

The training was concentrated on providing the latest information and knowledge on global change data systems and teaching the trainees on use and management of both DIAL and NWGISS systems. The topics of the training are listed as followings:

1. Introduction to NASA EOS program
2. Introduction to NASA EOS data products
3. Introduction to HDF and HDFEOS data models
4. Introduction to computer programming to access/read/write HDF/HDFEOS data
5. Introduction to OpenGIS Interoperability program
6. Introduction to NASA's Data and Information Access Link (DIAL)
7. Introduction to NASA's Web GIS Software Suit (NWGISS)
8. Installation of DIAL
9. Installation of NWGISS
10. Demonstration of DIAL

11. Demonstration of NWGISS
12. Set up sample data sets in DIAL and NWGISS (e.g., MODIS data covering Southeast Asia)
13. Set up other data set used in the host institute in DIAL and NWGISS so that they can be accessed/queried/obtained through the Web (using DIAL and NWGISS).

Attached to this report are two CD-ROMs containing training materials, software, as well as some sample data. The CD-ROMs, as well as the DIAL CDs, were distributed to all host institutes of this project.

The following paragraphs provided description of training activities in the host countries.

### ***China***

A week-long training in China was hosted by the START Temperate East Asia Regional Center (START-TEA) at the Institute of Atmosphere Physics, Chinese Academy of Sciences in October 2001. Dr. Gang Wen, director of START TEA data and information system division, is the co-investigator of this project and the local coordinator of the training. Two members of DIAL and NWGISS development teams went to China to provide the on-site training.

There are seven trainees, mainly from the data and information system division of the START-TEA. Because START-TEA was one of oldest DIAL users with several years of experience in using the DIAL software for data distribution, the training was concentrated on the new Open GIS standards as well as the NWGISS software. In addition, the training also provided information on the latest development and the new features of the DIAL software. The latest version of both NWGISS and DIAL software were installed at the START-TEA DIS. At the last day of the training, the Executive Deputy Director of the Institute of Atmosphere Physics attended the demo session of both software systems. He was very impressed by the latest DIS software and wanted to continue to support the START-TEA DIS activities for using the latest DIS tools and for participating in APN-funded projects.

In addition to the training in the START TEA, we also gave lectures at the Department of Computer Sciences at Tsinghua University, the Institute of Remote Sensing at Beijing University, and the Department of Geography at Beijing Normal University based on the requests from those organizations. The lectures gave introductions to the latest development in the data and information system research, the open GIS standards, and both DIAL and NWGISS software. A total of sixty students, professors, and research scientist attended the lectures.

### ***India***

Two members of the DIAL development team were sent to India to conduct the DIAL installation and training. The first training session was held in conjunction with the International Conference on Remote Sensing and GIS/GPS (ICORG) meeting at Hyderabad, India, held on February 2-6, 2001. The venue was chosen due to the large number of professionals in remote sensing, GIS and GPS from government agencies (ISRO, SAC, NRSA), universities and industry participating in the conference. The conference was part of International Society of Photogrammetry and Remote Sensing (ISPRS) organization and over 300 people attended the

conference. 50 copies of DIAL software were distributed to the conference participants and a keynote presentation about DIAL was given at the conference.

Because of the large interest shown by people, several small groups of people were shown DIAL installation procedures and demonstrations during the conference. They were from Jawarharlal Nehru Technological University (JNTU), Kuvempu University, Space Applications Research Center, Indian Space Research Organisation, National Remote Sensing Agency (NRSA), Indian Institute of Technology (Guwahati), Geological Survey of India, State Remote Sensing agencies from Uttar Pradesh, Andra Pradesh, and Maharashtra.

A training session was attended by 25 people from various organizations on February 6, 2001. Four hours of training and demonstration was given to the participants. A DIAL presentation and HDF and HDF-EOS presentation was given first. This was followed by installation, hands on training and demonstration of the software. Both DIAL and EDG were discussed during the presentation. Participants were shown how to set up a distributed DIAL system.

DIAL system was also installed on one of the JNTU computers. Dr. I.V.Muralikrishna has agreed to participate in APN activities and has set up the V0/EDG part of the system in his lab. He will be the key person and will organize several DIAL sites within India in universities and other institutions.

The second training session was conducted at Bangalore University during the second week of February. About 20 students and faculties from the University attended the training.

### ***Malaysia***

Two members of DIAL and NWGISS development team went to Kula Lumpur in November 2001 to provide one-week long training. The local host institute is Malaysia Center for Remote Sensing (MACRES), and the local co-investigator is Mr. Laili Nordin, the head of the Image Processing and Application Division of MACRES. Five trainees, all from MACRES, attended the training.

After the training, we discussed with the leadership of MACRES on their data and information system plan and the future use of DIAL and NWGISS. In November 2001 MACRES was building a satellite receiving station expected to be operational in Year 2002, to receive both high and low-resolution satellite imagery. Once the station is in operation, large volume of remote sensing data will be received, processed, archived, and distributed by MACRES. Therefore, MACRES needs a good data and information system to handle the data. In addition, the Internet connectivity at MACRES, in November 2001, was not adequate to support web-based data systems for product distribution, and an upgrade of network connectivity was in progress at that time. Although in the training time, both NWGISS and DIAL was set for in-house use. The operational use of both systems will likely happen in year 2002 or 2003.

### ***Thailand***

In August 2001, one member of DIAL development team went to Bangkok, Thailand, to provide a week-long DIAL and NWGISS trainings. The host institute named in the proposal was the START South East Asia Regional Center (START-SEA) and the local co-investigator is Mr.

Veerachai Tanpipat. In early 2001, Thailand government created a cabinet level agency called Geospatial Information and Space Technology Development Agency (GISTDA) to manage and coordinate all geospatial information and remote sensing activities in Thailand. Mr. Tanpipat moved to this new organization from the START-SEA. Therefore, the training was hosted by GISTDA.

As the head agency in Thailand responsible for national space and geospatial data activities, GISTDA has collected large amount of geospatial data through satellite remote sensing and other means. Distribution of those data to users in Thailand and around the Southeast Asia nations is one of urgent topics for GISTDA. Both DIAL and NWGISS are the excellent tools for web-based distribution of the geospatial data.

Total of six trainees from three organizations attended the training, including two from GISDTA Headquarters, two from GISDTA Remote Sensing Ground Station, and two from the Asian Center for Research on Remote Sensing (ACRoRS) of Asian Institute of Technology. After training, both DIAL and NWGISS software were installed at GISDTA and ACRoRS. Both sites will use the software to distribute NASA MODIS direct broadcast data to their users.

### ***Vietnam***

Institute of Geological Science of Vietnam is the local host institute for the training, and Dr. Phan Trong Trinh of the institute is the co-investigator of this project. One DIAL and NWGISS developer went to the institute in August 2001 for providing a one-week training. Total of ten trainees, all from the same institute, attended the training.

One problem we found at the training was that the Internet access in the Institute is very slow and the international access is very expensive. Therefore, it is virtually impossible for setting data distribution site in the institute using DIAL and NWGISS for sharing data nationally and internationally. After the training, the trainees found that the software was also very useful for data sharing inside the institute between research projects.

### **Outcomes/Products**

- A group of local scientists trained in data and information management for global change studies as well as DIAL and NWGISS systems
- Multiple interoperable DIAL sites providing data and information for global change studies.
- Information and requirement exchange between the DIS developers and users, especially those from the developing countries.
- Two CD-ROMs containing the lecture materials, software, and sample data.

### **Issues**

The network conductivity is the biggest issue in developing countries of the Asia-Pacific region. For the host institutes in the five countries involved in this project, only those in China and Thailand have relatively adequate internet connection that enables clients in other nations to access data in DIAL or NWGISS servers. The slow internet connectivity harms the Web-based data sharing in the Asia-Pacific region.

**Future directions/follow-up work**

We have finished the proposed work, including DIAL and NWGISS installation and training in all five countries in the APN region. We will continue to support the users in these five countries and provide latest version of the software to them. We will also continue to look for funding opportunity to bring key DIS persons in the host institutes to my lab for workshops and short visits and trainings.

**Project Leader**

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