THE NAML LABNET INITIATIVE

The LABNET initiative of the National Association of Marine Laboratories (NAML) is ready for the next phase of implementation. The results of the LABNET national survey will be used to set up pilot projects in which we hope member labs will participate in this NAML initiative. The following text describes what LABNET is, how it will function, and what is asked of you to help test the pilot projects.

THE LABNET INITIATIVE

LABNET is envisioned as an integrated and interactive network displaying selected environmental databases from participating coastal laboratories. The purpose of LABNET is to go beyond a simple indexing of data into an environment where data collected and residing at separate coastal laboratories can be integrated and exchanged in a nearly seamless visualization and analysis environment. Technologies such as the World Wide Web are necessary but not sufficient to make such data integration possible, LABNET seeks to provide the additional infrastructure needed to support such integration.

The concept of LABNET is to network and integrate specific data from local monitoring programs at coastal laboratories that provide information needed to answer specific research, management, and educational outreach needs at a variety of system, regional, and national scales of interest. Most coastal laboratories emphasize studies of organisms and environmental systems in the laboratory's immediate locale; data sets at a coastal laboratory are therefore typically confined to a small geographic region. However, if it is possible to somehow collate and integrate the data sets collected independently by separate groups, then we shall be able to address scientific, management, and educational outreach questions at broader spatial and temporal scales.

ENVISIONED PARTICIPATION AND SUPPORT FOR LABNET

Continuing support for the basic backbone technical infrastructure of LABNET will be solicited from our agency partners. As particular environmental questions are identified that could use spatial/temporal visualization of specific data sets, proposals to financially support implementation, including funds for participating laboratories, will be submitted to interested agencies.

A key feature of LABNET's design is that it explicitly recognizes that there are a number of levels at which a NAML member laboratory may participate in the evolution and advancement of LABNET. Each organization determines its participation level based upon its available resources and its local mission and focus. Some organizations will have substantial technical resources available to support LABNET-related projects, while other organizations' technical resources may

be severely limited. LABNET's concept is based on the "Internet model" of development, where a few lead organizations with substantial technical resources pioneer the development of LABNET and provide the support infrastructure that other organizations can use to participate in LABNET.

A key component of the fully-implemented LABNET program that will emerge is agency budgetary support to maintain the LABNET infrastructure and client budgetary support for laboratories participating in specific LABNET projects.

THE PROPOSED INFRASTRUCTURE BEHIND LABNET

The proposed LABNET infrastructure is based on a layered approach utilizing standard protocols for transferring data. A four-layered model will help in providing an overview:

Layer 1: The data source layer.

The layer represents the actual data that will be incorporated into what we call LABNET. Data files are stored on a physical machine that is accessible via TCP/IP (the Internet). These files might or might not be served to the Internet via other separate query mechanisms that are independent of the LABNET initiative. Part of the LABNET infrastructure will be means for hosting data sources that are currently not available due to limited Internet connection issues for some NAML members.

Layer 2: The data description layer.

LABNET will not attempt to define or limit the data represented in Layer 1 (the data source layer) to a particular standard. The data should exist in its native, original format. The data manipulation tools that will be developed as LABNET will rely on a metadata layer which will describe the data set attributes to a degree that will be sufficient for the LABNET tools to properly address and retrieve the data. This meta-data will use the FGDC metadata format, a robust data description standard. The meta-data will be stored as a file which can be retrieved through standard means (HTTP, Z39.50) by the LABNET tools.

Layer 3: The LABNET integration tools

Most of what LABNET is will reside at this layer and where most development will occur. The LABNET "tool" will serve both as a custom client and server and will use HTTP as the means by which it communicates with other computers. This tool or tools will provide the following functions.

1. Contain a database of known data sources that compose a LABNET integrated data set.
2. Possess the means to locate and communicate with, the data description layer that describes the data source.

3. Possess the means to query and extract relevant data from the data source using the information provided in the metadata.
4. Possess the ability to normalize these different data sources according to the information provided by the metadata layer.
5. Process these data into a form suitable to an output layer which will present the processed data to an end user.

Layer 4: The Output Layer

LABNET has as its goal the normalization and visualization of dispersed information. The fourth layer will be responsible for displaying the output of the LABNET tool. This layer might be represented by a web front-end to a GIS system such as Map Objects or it might be a more customized graphical tool. It might simply pass the processed, integrated information to the end user as a file.

TESTING LABNET: THE PILOT PROJECTS

We need your help and support in testing the proposed LABNET pilot projects. We plan to conduct a few pilot LABNET projects beginning in the fall of 1998. The purpose of these pilot projects will be to demonstrate the viability of the LABNET concept among NAML laboratories at various levels of sophistication. Therefore, we are looking for participation by laboratories at each of the following levels:

User or browser level. This category includes those groups that make use of LABNET capabilities but do not provide additional data sets to LABNET itself. Examples of groups in this category might include K-12 and undergraduate education, public outreach efforts, etc.

Level 1 supplier. This category includes those laboratories and organizations which have some data they desire to make available to LABNET, but cannot serve or do not wish to serve such data from their own computing facilities (which may be limited). Groups in this category will typically collaborate with a level 2 or higher supplier to make their data available to LABNET.

Level 2 supplier (data server). A level 2 supplier is a laboratory or organization that has some data to provide and is willing to support the minimum resources and expertise needed to make the data available to LABNET. The additional resources needed to index, locate, and integrate the data sets from a level 2 supplier will typically be supplied by a collaborating level 3 or level 4 supplier.

Level 3 supplier (data and index server). A level 3 laboratory is like a level 2 laboratory in that it provides data to LABNET, but it goes beyond the minimum resources needed to supply data by also providing the indexing and descriptive resources required to effectively locate and integrate the data with other data sets.

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Level 4 supplier (lead LABNET laboratory). A level 4 laboratory is essentially a leader in the design and evolution of LABNET. It provides significant expertise and resources in the evolution and promotion of LABNET. It typically provides consultative and training services to groups at the other levels of the LABNET participation.

It is expected that most coastal laboratories participate at levels 2 and 3, with a handful of lead laboratories at level 4, and remote field stations and non-coastal labs participating at the browser or 1 level.

The project steering committees have already identified three lead LABNET laboratories that are willing to coordinate the technical implementation of the pilot projects (Level 4 supplier). They are: the MBL at Woods Hole (Dave Remsen), the NOAA Coastal Services Center at Charleston, SC (Ann Ball), and UT A&M LABNET (Pat Michaud). We would like to identify a west coast institution who is willing to serve as a level 4 supplier.

We are now looking for organizations that can participate at the other levels of the organization. The levels listed above are not intended to be rigid definitions, but instead are simply a guiding design for easy description of the types of participation that will be available. It is entirely possible that an individual laboratory will have aspects of any of the levels described above. This certainly will be the case later on as specific funded LABNET projects are introduced on the LABNET infrastructure. For the time being we need labs who are willing to participate in the pilot tests of the proposed LABNET infrastructure.

Some consideration has been given to the technical capabilities required of organizations for each participation level. Again, these descriptions are intentionally imprecise, and are intended to simply give a rough idea of the types of resources needed for participation in the pilot projects.

User or browser level: Typically has a browser of some sort and some sort of connection to the Internet (which may be dial up or fairly slow). Computing and networking support required are fairly minimal.

Level 1 supplier: May or may not have access to the Internet, but probably has some minimal familiarity or computing resources. Generally relies on the technical resources available at other LABNET sites to make data available via LABNET.

Level 2 supplier: Probably has a dedicated Internet connection and some minimal experience in serving data to the online community. Typically will be familiar with or capable of running and maintaining a web server and providing data, but does not have the resources for ongoing maintenance and support of indexes or other advanced services. This site generally has web server software and some simple translation/conversion software to be able to provide data in a LABNET compatible format.

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Level 3 supplier: Almost certainly has a dedicated Internet connection, and a higher level of technical support and expertise than a Level 2 supplier. Has some expertise and resources for handling metadata, indexing services, and data services.

Level 4 supplier: A technically advanced laboratory with significant support for computer infrastructure and software development to advance the capabilities and evolution of LABNET. May have dedicated LABNET support staff. Provides resources to other members of the LABNET community for retrieving, integrating, and manipulating LABNET data.

The next step is to identify laboratories that can provide data to LABNET at any of the levels listed above. Technical assistance will be available to the laboratories to (1) determine an appropriate level of participation consistent with the goals of the laboratory and the LABNET pilot projects, and (2) implement the project itself.

LABNET PILOT PROJECTS

The committees reviewed potential pilot projects and agreed upon the following two projects to initiate ASAP that will test the proposed methodological and administrative support of LABNET and the technological capabilities and willingness to participate of the NAML members in the LABNET initiative.

NETWORKING NAML--LABNET Pilot Projects: testing the technologies, protocols, and NAML member participation in full scale implementation of LABNET.

PACIFIC COAST WATER TEMPERATURES AND EL NINO CONDITIONS

The surface temperature of near-shore coastal marine ecosystems varies in response to local (e.g., weather), regional (e.g., El Nino), and global (e.g., climate change) scale forcings. Resolving short-term variability from long-term trends is of fundamental importance to understanding and predicting changes in the distributions of benthic and pelagic organisms, including changes in the abundance and catch per unit effort of living resources.

We propose integrating and visualizing on the web on a daily basis and in a weekly time series daily measurements (minimum frequency) of surface water temperatures from WAML members along the U.S. west coast. The scientific goal is to compare time series measurements across a broad latitudinal gradient (California to Alaska) with the goal of using coherence analysis to resolve scales of variability and external forcings (local vs far field effects). The initial focus will be on the period beginning several months prior to the 1997-98 El Nino and continuing through to the present (where such data are easily available) and initiating daily reporting.

HARMFUL ALGAL BLOOMS (HABs) IN THE GULF AND SOUTHEAST U.S. ATLANTIC COASTS

Harmful algal blooms (HABs) that episodically occur in coastal U.S. waters have significant human health and ecosystem effects. HABS include a variety of species whose effects range from water discoloration, oxygen depletion, and food chain alterations from massive blooms to toxicological effects on even low densities of toxin-producing algae.

Historical and current 'real time' information on regional spatial and temporal scales of various HABs would provide an important tool for research, management, and educational outreach. The proposed LABNET pilot project will develop input from coastal laboratories in the SAML region (southeast Atlantic and Gulf coasts) to develop a continually-updated informational source for regional information on the frequency, duration, and spatial extent of HAB events and their consequences (e.g., fish kills, shellfish toxicity and harvesting closures).

WE NEED YOUR SUPPORT IN MAKING LABNET A REALITY AND HOPE THAT YOU ARE WILLING TO HELP US IN IMPLEMENTING LABNET. THIS SUPPORT IS ESPECIALLY CRUCIAL FROM LABS IN WAML AND SAML IN PARTICIPATING IN THE PILOT PROJECT TESTS. YOU WILL BE CONTACTED SHORTLY BY MEMBERS OF THE LABNET STEERING COMMITTEE TO TALK ABOUT DETAILS.

AT THE NEXT NAML AND REGIONAL MEETINGS WE SHALL BE ASKING YOUR IDEAS ABOUT POTENTIAL FUTURE LABNET PROJECTS. ALL OF US ON THE LABNET COMMITTEE THANK YOU FOR YOUR CONTINUED SUPPORT IN MAKING LABNET A SUCCESS