LTER

*Network
Information
System*

LTER Network Information System Strategic Plan

Network Information System Advisory Committee – Version 2.9 as approved
by the LTER Coordinating Committee, September 2005.

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Re: Version 2.9
1 September 2005

1 Introduction

Data and synthesis products resulting from research activities across the Network of LTER sites and their partners are raw material for the generation of new ecological knowledge. The LTER Network Information System (NIS) seeks to accelerate the development and use of these products. Functionally, this will be achieved by implementing shared standards, confederating site data repositories, developing software tools, training, and support to integrate and provide compatibility across the Network of sites, institutions, and researchers. The NIS will serve the LTER scientific community and collaborators, and provide a "portal" to LTER data products for the broader scientific community, natural resource managers, policymakers, and the general public. Conceptually, the NIS is a process that will enhance flows of information among data, synthesis and knowledge about ecological systems, will depend on the science and Information Management (IM) participants at the site and network levels for implementation, and will both rely upon and contribute to informatics expertise and IM systems outside of LTER (Figure 1).
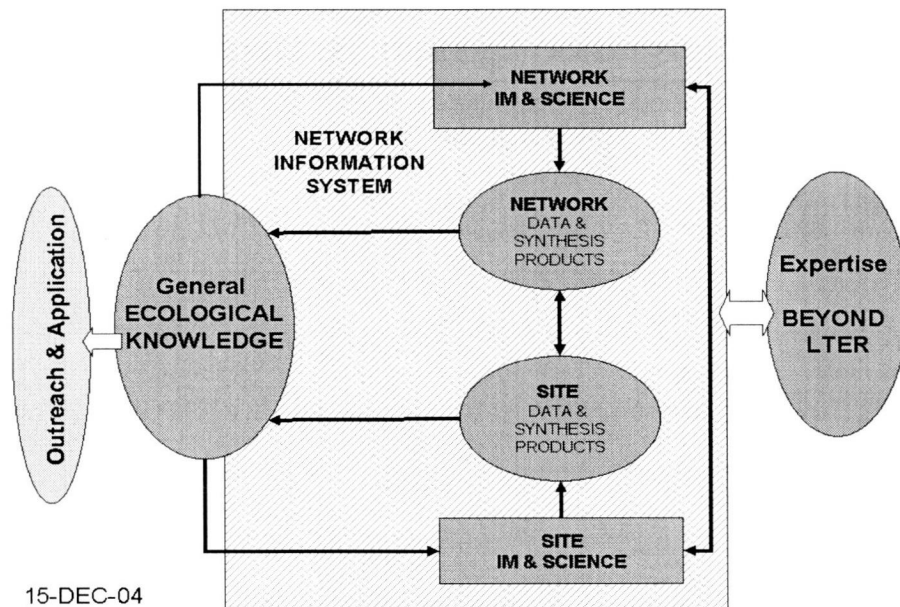

Figure 1 – Schematic diagram of NIS conceptual framework.

In this process, the NIS efforts will seek to balance development of short-term, priority products with development of long-term, generic solutions and improved network-wide infrastructure. With these functional and conceptual views in mind, this plan defines the mission and goals of the NIS effort and elaborates the strategies necessary to make progress over the next 4 years.

2 Mission Statement

The mission for the LTER Network Information System (NIS) is to provide the Information Management and Information Technology infrastructure to facilitate and promote advances in collaborative and synthetic ecological science at multiple temporal and spatial scales.

3 Goals

To realize the stated mission it is recognized that the Network Information System (NIS) needs to improve the overall quality of site information systems, confederate these systems, and then enable the use of these systems for the advancement of scientific knowledge. In this highly linear representation of NIS goals, the tasks at hand are seen as completely interdependent – i.e., knowledge cannot be achieved without confederated databases. Realizing that progress must be made simultaneously on many fronts, a non-linear planning approach to produce measurable progress along a tiered trajectory has led to the following goals that support the core research objectives of the LTER Network as well as being vital to fulfilling the stated NIS mission. These goals are structured along the natural progression from data to knowledge as described above. Strategies that support these goals have been elaborated (Section 5) and focus on promoting standards and providing software tools, training, and support.

3.1 Data: Increase data quality through standard approaches

Data are the legacy of the LTER Network. NIS will seek to improve the overall quality of site infrastructure to efficiently manage, archive and curate this heritage in a standardized way. NIS will need to promote and support standardization in the management of information content including primary data observations, models (conceptual design, implementation code, input and output data), secondary data products, syntheses of existing data, and knowledge representation (ontologies).To build on the strength of the existing autonomous but heterogeneous site data repositories the NIS will need to facilitate improvements in metadata quality and site information systems in a tiered and measurable approach.

3.2 Synthesis: Increase data available for synthetic activities

Discovery, access, and use of LTER data will be enabled by facilitating the communication and interoperability between heterogeneous systems. NIS will need to develop and deploy applications that accommodate LTER information content, including an on-line data catalog and applications to exploit discovery of these data for reuse. NIS will need to develop and maintain shared software solutions for the integration of local site information systems(middleware). NIS will need to support multiple interfaces to 1) search and discover all site databases and 2) make the information resources of the entire Network available to the tools used by scientists in synthetic research.

3.3 Knowledge: Increase knowledge discovery through synthesis

NIS will be used to make new scientific discoveries and provide new data resources by enabling semi-automated integration, modelling and forecasting. NIS will need to support the creation of Network-based synthetic information products by implementation of relational database technology, shared middleware, community-based applications and scientific collaboration. NIS will need to participate in the development and/or adoption of standards for managing metadata associated with models and forecasting. To make an impact at this level, NIS will need to pursue this goal in close coordination/collaboration with the broader IT/IM and ecoinformatics communities.

4 Implementation

4.1 Process

The LTER Network Coordinating Committee (CC) established the Network Information System Advisory Committee (NISAC) in April 2003 to formalize the process of developing a Network Information System (NIS) for LTER. This committee, made up of representatives from site principal investigators (PI), information managers (IM), and the LTER Network Office (LNO), took on as its first responsibility the development of a strategic plan for the NIS. Sites, LNO, the CC, the IMC, and the NISAC each has a role in the successful design, development, and implementation of NIS. Additionally, the NIS process will include informatics partners from inside and outside LTER. NISAC has defined the following initial roles and responsibilities.

4.2 Roles

NISAC – NISAC is responsible for planning and evaluation of NIS activities. NISAC will present clear and effective goals and strategies to the CC and Network community to educate and garner support for NIS initiatives. The NISAC will present NIS advances to funding agencies for continued support of activities and define roles and create informatics partnerships. Additionally, NISAC will regularly assess LNO/SITE/IMC performance and progress towards NIS goals and evaluate the effectiveness of strategies toward achieving NIS goals. NISAC will modify the strategic plan and take iterative action as necessary.

LNO – LNO will provide person-effort and leadership in the design, development, deployment, and support of NIS infrastructure. LNO will collaborate with sites and informatics partners to develop NIS data products, new resources for implementation of Network standards, and Network specific information technology and training. LNO will provide timely feedback to NISAC and will demonstrate NIS capabilities to scientists, information managers, and other stake-holders to gain broader participation in Network data synthesis.

CC – The coordinating committee will direct NISAC to undertake activities and approve and endorse the goals and strategies elaborated in the NIS strategic plan.

SITE – Sites will implement Network standards, provide access and timely updates to sites research data and metadata in formats that have been agreed upon by the CC. Sites manage the sites research data, including assuring data quality, preparing metadata for sites research data, maintaining a local archive of sites research data, and providing for security of site research data. Sites participate in NIS as a node in the distributed data network, being both data consumer and data provider and may also be in the role of informatics partner.

IMC – The Information Management Committee will review NIS strategic plan action items and communicate feedback in the form of comments and recommendations to NISAC. The IMC will plan for the implementation of Network standards at sites including the development of cost and time estimates. The **IMEXEC** will survey and communicate status of sites' progression along the tiered trajectory to NISAC as requested.

5 Strategies

Because of the heterogeneity across LTER site information systems, and the need to balance short-term and long-term products, the approaches engaged to achieve the stated goals must necessarily be diverse. For example, in support of one such scientific data product, an approach of harvesting data and aggregating in a central location might make the most of available resources while the nature of a second scientific data product might well lend itself to a more distributed query (Figure 2).
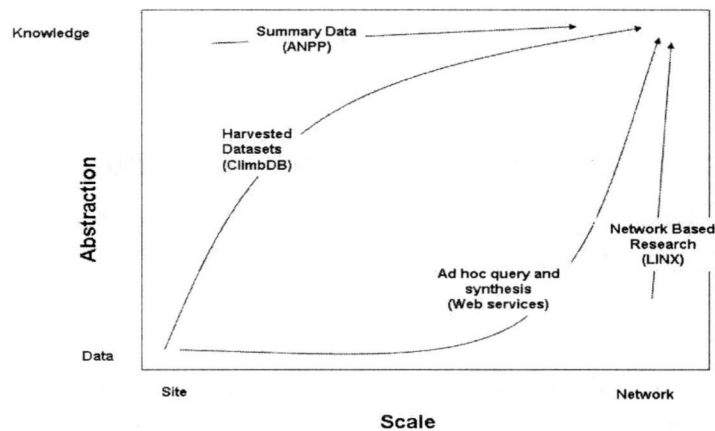

Figure 2 – Graphical representation of the diversity of approaches to synthesis.

The proposed strategies that follow are aligned along a trajectory from site needs to network solutions and follow the natural progression from data to knowledge corresponding to the 3 goals of the NIS (Figure 3). The primary focus in each of these 3 task areas falls on the information managers, the developers, and the research scientists respectively for the data, synthesis, and knowledge goals.

5.1 Data: Increasing data quality through standard approaches

NIS will support standardization in the development and management of information content at the sites through guidance, resources, training, and support.

Strategies:

5.1.1 Increasing the quality of data and metadata by adopting, developing, and implementing standards.

5.1.2 Increasing support for local site information management and information technology to accommodate new standards, infrastructure, etc.

5.1.3 Providing training, guidance, and workshops on new information technology and information management to sites.

5.2 Synthesis: Increasing data available for synthetic activities

NIS will develop and deploy applications that accommodate LTER information content, including an on-line data catalog and applications to exploit these data for discovery of information.

Strategies:

1. Increasing the use of available data by developing and deploying basic applications and interfaces for discovering and accessing LTER data.

2. Overcoming site heterogeneity issues by developing, adopting, or adapting middleware to enable efficient access to site data.

3. Supporting workshops for network developers to integrate specific information technologies.

5.3 Knowledge:Increasing knowledge discovery through synthesis

NIS will support the creation of Network-based synthetic information products through the use of relational database technology, shared middleware, community-based applications and scientific collaboration.

Strategies:

1. Providing education and training to researchers on NIS applications.

2. Supporting exploitation of LTER information products through development of advanced applications.

3. Supporting the creation of Network-based synthetic information products through application development, scientific collaboration, and product-oriented workshops.
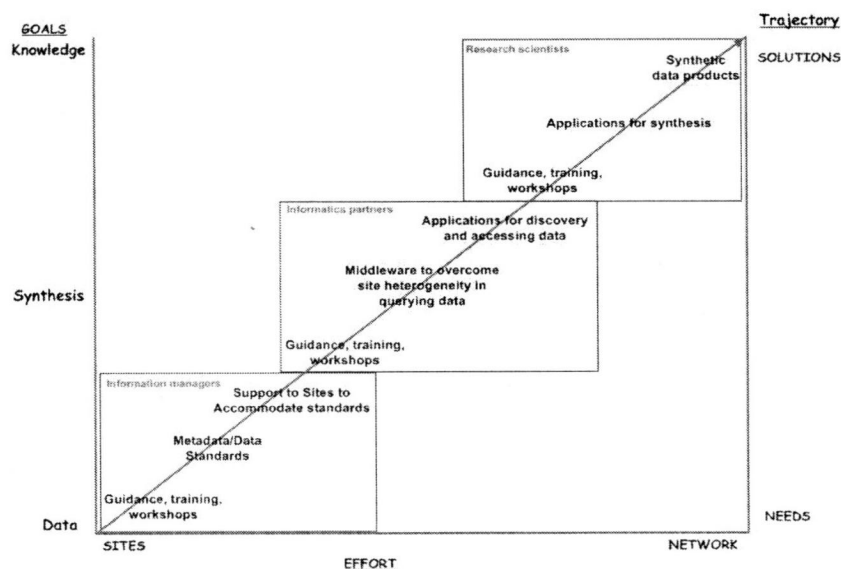

Figure 3: NIS strategies aligned along a trajectory from site needs to network solutions.