LTER DataBits
Information Management Newsletter of The Long Term Ecological Research Network

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EML: Augmenting Research Tools and Capabilities

- John Porter, Virginia Coast LTER

The development of standards-based ecological metadata has broad implications for LTER research. Currently it is difficult or impossible to develop tools that will work (without extensive modification) at multiple LTER sites because of site-focused approaches that result in heterogeneity in site software, hardware and metadata needs.

The ability of sites to create EML (Ecological Metadata Language) standard metadata makes possible the creation of general tools to support ecological research. During a recent workshop aimed at the implementation of EML at LTER sites, tools and capabilities (all made possible by the availability of EML metadata) were identified.

For the individual researcher, EML makes possible:

BOX 1: Individual Research*
A sudden beep from her palmtop computer brought Shirley Wright, graduate student, back from her

musings on the role caterpillar frass could play in the local nitrogen cycle. Looking at her display, she saw an error message that the pH value in the data record she was entering was out of the bounds she had specified when she prepared the metadata for her data set weeks before. She had estimated an appropriate pH range by querying an online analysis engine for pH values from data collected on the same soil type. Someone told her that the data came from three different LTER sites and that GIS software had been used to select the data points that corresponded to the loam soil type and that the range had then been determined using a separate statistical package, but she didn't know the details - performing the analysis had just required hitting the right buttons and filling in a few fields in a form. The actual analysis had been done on a computer at some other site. Details of the analysis were available to her, but for simply determining a reasonable range, there was no need to click on the "analysis log" icon to retrieve them. Although time consuming, the preparation of the metadata for her study had been a useful exercise. It allowed her to think through which variables would need to be measured and what units of measurement should be used. Metadata preparation could have been put off until the end of the study, but then she wouldn't have a customized data input program for her palmtop, because the program that automatically generates the data input programs needed the metadata to construct the input forms and quality checking features (like the one that was now beeping at her for some reason). A cold gust of wind reminded her that it's starting to get colder and that it might be important to add a variable for snow depth to her dataset. Fortunately, all she needs to do is make an addition to the metadata of a new variable for snow and download a new input program for her palmtop. The program that automatically generates the data input program is a collaborative effort between the information manager at her site and information managers at two other sites. They can collaborate on a program that will be useful at multiple LTER sites because the EML-formatted metadata is standard across sites. However, they aren't there to help her with her current problem. Why the beep? Inspection of the pH value indicates that she had mistakenly entered two 8's instead of one in her reading of sample pH. Having a measured pH of 88 could definitely have caused problems in the model she is working on. Glad the program caught it now!

- Access to online analytical engines that integrate a variety of "back end" analytical tools such as SAS, MATLAB etc. with "point and click" access to LTER data from multiple sites
- Seamless, automated preparation for analysis of data from different LTER sites
- The ability to search, browse and locate available LTER data
- Automated production of customized data input forms that check data for errors or inconsistencies as data is being entered, either in the laboratory or on palmtop-computers in the field
- Use of metadata development as a tool for research design

For the individual site, EML makes possible:

- Use of generic software for metadata and data management. These may include:
  - Sophisticated programs for tracking changes in data
  - Easy-to-use metadata entry forms
  - Powerful search, query and retrieval interfaces
  - Tools for managing model and application data
  - Tools for providing data in a variety of forms (e.g., spreadsheet, statistical package, GIS)
  - Tools for production of alternative forms of metadata that allow the site to easily participate in national databases and clearinghouses (e.g., Global Change Master Directory, Mercury, National Biological Information Infrastructure, ISO TC211)
  - Reductions in software and personnel costs through use of generic software

For the LTER Network as a whole, EML makes possible:

Box 2: Putting it Together*

Things have not gone well for Dr. Publis R. Parish today. The working group he assembled to study the effects of caterpillar frass on aquatic nitrogen levels is spending all their time dealing with issues of data formatting and unit conversions, leaving no time for real analyses. Moreover, a real rift is developing in the group between people who want to analyze the data using Excel and those who want to use MATLAB. Unfortunately, it is excruciating enough to import the data into one or the other. Doing both is out of the question! However, things are starting to look up. His new graduate student, Shirley Wright has been working with the participants searching the LTER Data Catalog, which is based around the EML metadata standard. There group members are able to access data from all of the LTER sites using a common interface, one that gives them the option of receiving the data either as an Excel Spreadsheet or a MATLAB file, among other options. They don't even need to worry about the fact that some of the underlying data was originally archived as comma-separated ASCII, others as tab separated and yet others using column formatting. Since that formatting information is stored in the metadata, automated programs written at different LTER sites can read the data in its raw form and transform it into the forms requested by his group. One member of the group is even trying out an online data integration engine. It allows him to identify equivalent variables in different datasets through a point and click process. Possible "matches" are identified based on similar units and he can read the specific methods for each variable to see if they should, or should not, be matched with one another. Once he has identified the appropriate matches, a new dataset (along with its own set of metadata and citations for the original datasets used) will be produced in the format he requests. It was never like this in the old days!

- Improved facilitation of intersite synthesis
- "Lowering the bar" for development of software useful to multiple LTER sites
- Easier development of Network Information System Modules that regularly integrate data from multiple LTER sites

All of these tools and capabilities have three things in common. First, they will increase our ability to conduct cutting-edge ecological research. Second, they are virtually impossible to create without LTER site participation in the development of EML-compliant metadata. Finally, they will still demand additional work and imagination by software developers at LTER sites and elsewhere. EML metadata is a foundation we can build on, but we still need to erect our structures atop it!

Note: The tools and capabilities described in these boxes are not currently in existence, although in a few cases prototypes are actually under construction. All rely on development of EML formatted metadata to provide the common platform for sharing metadata among sites. Additional development regarding use of information from EML data sets to directly access data itself will be required.

A Quick Introduction to XSLT

- Christopher Jones, Marine Science Institute, University of California, Santa Barbara

Many institutions within the ecological community have been working together in order to create a

common syntax for sharing ecological data and metadata. The effort has produced the Ecological Metadata Language (EML) , which is a formalized specification for expressing information about ecological resources. The language that EML itself is expressed in is the Extensible Markup Language (XML), which is an open, internet-based standard that was designed to enable the creation of discipline specific languages such as EML.

One of the many advantages of using XML is that it allows for a separation of the presentation of a particular resource from its structure. For instance, a research station may want to store metadata in XML text documents, or in an XML database, and present the contents of the XML as HTML (HyperText Markup Language) on a website, or perhaps as published 'data reports' as PDFs (Portable Document Format). An open standard used to enable this sort of functionality is the Extensible Stylesheet Language (XSL), particularly it's XSL Transformation Language component (XSLT).

XML documents consist of a hierarchy of elements (tags/fields), their attributes (properties), and the text content within the elements. The elements, attributes, and content are all referred to as 'nodes' of an XML tree. A simple example would be:

```xml
<?xml version="1.0"?>
  <dataset>
    <identifier system="knb">
      altstatt.2.1
    </identifier>
    <title>Abalone abundance within the California Bight</title>
    <originator>
      <individualName>
        <givenName>Jessica</givenName>
        <surName>Altstatt</surName>
      </individualName>
      <role>owner</role>
    </originator>
  </dataset>
```

The XML syntax specifically allows for machines to parse the information, but because it is text-based, it is also human readable. However, its presentation could be much more human readable with some formatting. The following schematic diagram shows the components involved in the transformation of an XML document using XSLT.
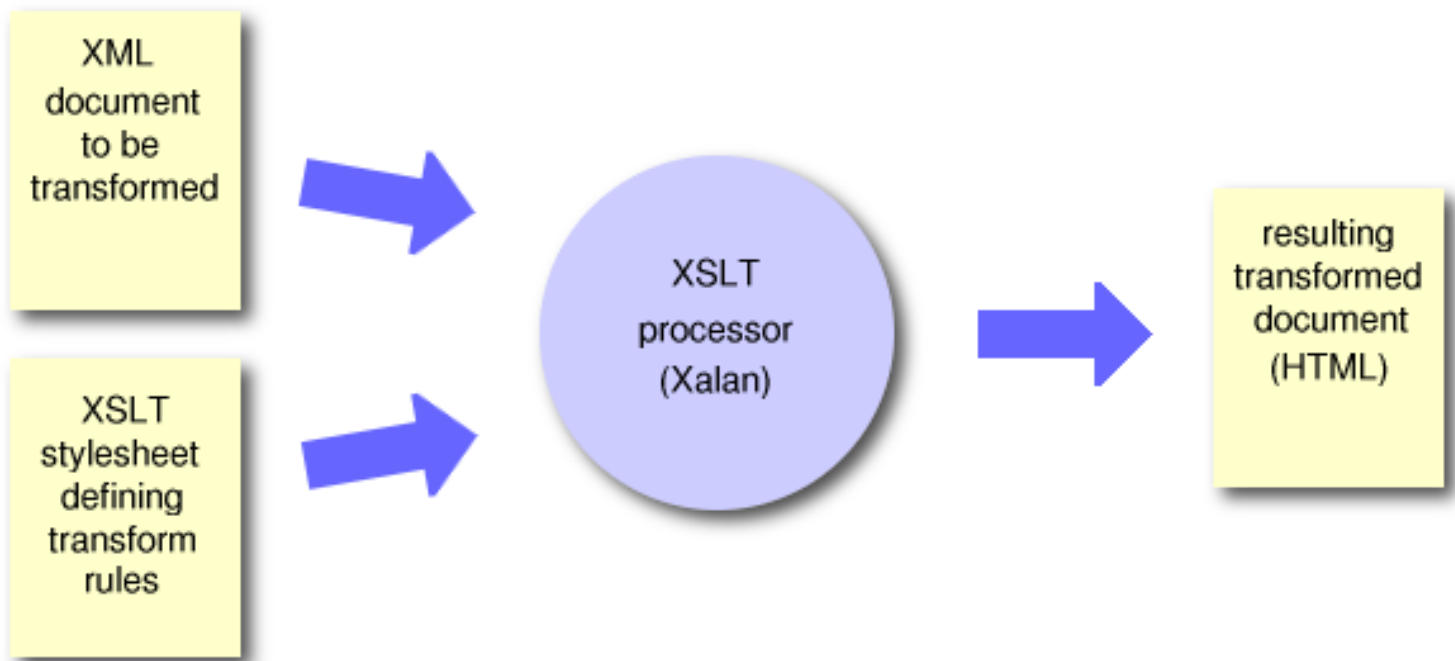
An XSL Transformation processor is a piece of software that takes both the original XML document and an XSL stylesheet as inputs, and produces the resulting transformed document. In the above case, the output format is HTML. There are a number of XSLT processors on the market today, written in many programming languages. One to note is the Xalan processor, which is a robust, open-source processor from http://xml.apache.org that is implemented in Java.

The XSL stylesheet that is used in the transformation is also expressed as an XML document, but one that describes the transformation rules. Basically, as the processor traverses all of the nodes in the original XML document, it will encounter specific patterns that are described in the stylesheet. Based on the pattern that is found, the processor will perform the transformation that is associated with the matched pattern. The pattern matching is expressed as one or more 'templates' in the stylesheet, which is basically a reusable block of XSLT code that can be applied in multiple places during the parsing of the XML document. An example snippet of code from an XSL stylesheet would be:

```
<?xml version="1.0"?>
  <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
    <xsl:output method="html" indent="yes"/>

  <xsl:template match="/">
    <html>
        <head>
          <title>Data Catalog</title>
        </head>
        <body>
          <h3>Data set description</h3>
          <xsl:apply-templates/>
        </body>
    </html>
  </xsl:template>

  <xsl:template match="title">
```

```
        <xsl:text>Title: </xsl:text><xsl:value-of select="."/><br/>
    </xsl:template>

    <xsl:template match="identifier">
        <xsl:text>Identifier: </xsl:text><xsl:value-of select="."/><br/>
    </xsl:template>

    <xsl:template match="originator/individualName">
        <xsl:text>Originator: </xsl:text>
        <xsl:value-of select="./givenName"/>
        <xsl:text> </xsl:text>
        <xsl:value-of select="./surName"/><br/>
    </xsl:template>

    <xsl:template match="role">
        <xsl:text>Role: </xsl:text><xsl:value-of select="."/><br/>
    </xsl:template>

</xsl:stylesheet>
```

The above stylesheet specifies four templates (<template>...</template>) that have associated pattern matches. The first matches the 'root node' of the document, or '/', which is the <dataset> tag, the seconds matches the <title> tag, the third matches the <individualName> tag nested within the <originator> tag, and the fourth matches the <role> tag nested within the <originator> tag. Text values are then taken from these nodes and formatted into the following html within each respective template:

```
<html>
<head>
<META http-equiv="Content-Type" content="text/html; charset=UTF-8">
<title>Data Catalog</title>
</head>
<body>
<h3>Data set description</h3>
    Identifier:
      altstatt.2.1
    <br>
    Title: Abalone abundance within the California Bight<br>

      Originator: Jessica Altstatt<br>
      Role: owner<br>


</body>
</html>
```

Which gets rendered as:

Data set description

Identifier: altstatt.2.1
Title: Abalone abundance within the California Bight
Originator: Jessica Altstatt
Role: owner

Today, most implementations of XSLT processors run on server-side systems, such as web servers that need to transform XML into HTML pages for a particular site. An example of such a system is the Metacat database, which is a flexible, open source XML database being developed for the ecological community. Metacat uses XSLT to transform XML for different clients, including web browsers and an XML editing tool written in Java, called Morpho. As web browsers mature in the future, we will see more XML documents being sent straight to the web browser, which will do the transformation locally if they have a reference to the appropriate stylesheet.

What You'll Need

This page provides a very short example of XSLT, however, there are many other pages that provide much more in depth, step by step tutorials on using XSLT. The following sites are extremely useful for both understanding XSLT and for using the Xalan processor.

- Tutorials, including the Introduction to XSL and the Hands-on XSL guide.
- The W3C, where the Internet Recommendations for XML, XSL , and XPath are published.
- The Apache XML Project, home of the Xalan and Xerces XML tools.
- java.sun.com, if you don't already have the Java JDK 1.3.1_02 needed to run Java code that calls the Xalan processor.

To download a sample Java class that calls the Xalan processor via the command line, along with the above sample XML and XSL documents, please visit the ecoinformatics.org posting of this article at ecoinformatics.org .

Software Tools For Working With XML

- Peter McCartney, Central Arizona-Phoenix LTER

The LTER network is in the middle of adopting eXtensible Markup Language (XML) as its standard format for encoding metadata. Like HTML, XML can be created, edited and read by any text-based program, but its use can be greatly facilitated by new software that provide a friendlier interface. Some of these were demonstrated during the January Metadata workshop at ASU. This article summarizes some of these resources and points out where to get them.

XML Editors

A good XML editor will save you the hassle of keeping tags properly nested and if it supports DTD or Schema, it may also give you contextual help regarding what elements you can or must insert at the current location.

- ***Pollo***, Java Foundry, (http://sourceforge.net/projects/pollo/). This is a graphical Java XML editor that supports DTD and schema. Windows, Mac, Unix. Open-source.
- ***XML Notepad***, Microsoft, (http://www.microsoft.com/xml). This is a simple XML editor that is not longer supported, but can still be downloaded. Windows. Freeware.

Schema and DTD design tools

Schema design tools help you define a content model for your XML files using either Schema or the older Document Type Declaration (DTD) format. They usually provide some means for creating "instance" or sample XML documents that conform to those schemas.

- ***TurboXML***, Tibco Extensibility, (http://www.tibco.com/products/extensibility). Formerly XML Authority, this is now a comprehensive design tool for creating XML schemas, DTD's, and XML documents. XML schemas can be reverse engineered from a variety of sources including relational databases and java classes. Windows, Mac, Unix. Single user license, $269; multi licensing available.
- ***XML Spy***, Altova (http://www.xmlspy.com). This is another XML schema design tool similar to TurboXML. XML Spy offers several editing modes including graphical, tree, and text. It also offers several conversion functions and an HTML documentation tool. Windows, Mac, Unix. Single user license, $199, multi and concurrent licensing available.

XSL design tools

Extensible Stylesheet Language was created to provide two functions: render XML documents into a form that can be viewed such as HTML or text, and transform XML documents from one structure to another. XSL is itself an XML schema and can be created with any text editor. However, the following tools can make the process much simpler.

- ***Stylus Studio***, Excelon, (http://www.stylusstudio.com/). Stylus studio is an eXtensible Stylesheet Language designer. It is specifically made for creating XSLT stylesheets that transform between two XML schemas using a simple drag and drop graphical interface. The source editor interface has excellent syntax support and is also handy for creating stylesheets that generate other kinds of documents. Windows. Single user license, $399.
- ***XML Spy XSLT Designer***, Altova, (http://www.xmlspy.com). This is another XSLT editor that can be used freestanding or together with other Altova products to create user forms that can be hosted by the XML Spy environment. Single user license, $99, multi and concurrent licensing available.
- ***XML Transform***, Tibco Extensibility, (http://www.tibco.com/products/extensibility). This is yet another XSL designer with a graphical drag-and-drop interface. Single user license, $269; multi licensing available.

Development tools

A large number of packages and libraries are available for programmers seeking to build support for

XML into their applications. Those listed below are the most commonly used but there are many, many more.

- **Xerces XML parser** , Apache Project, (http://xml.apache.org). Xerces is a validating XML parser available for Java, C++, and Perl. It will validate XML documents against both DTD's and schemas and provides access to the XML data via the Document Object Model, a node-based syntax for addressing tree-structured data. Most development projects involving Java, JSP, etc. make use of the Xerces parser. Windows, Mac, Unix. Open-source.
- **Microsoft XML parser**, Microsoft Corporation, (http://www.microsoft.com/xml). The Microsoft XML parser is an ActiveX control that provides essentially the same functionality as the Xerces parser, but for ActiveX-aware languages such as MS Visual Basic, MS C++, MS C#, Active Server Pages, etc. Windows. Free (shipped with MS IE and Windows).
- **Xalan XSLT processor**, Apache Project, (http://xml.apache.org). The Xalan XSLT processor is used to build applications that transform XML documents using stylesheets created in XSL. It is available either in Java or in C++. Windows, Mac, Unix. Open-source.
- **JDOM, jdom.org**, (http://www.jdom.org). JDOM is a popular package for java developers that wish to have a simpler and more native interface to the XML Document Object Model. It includes the Xerces XML parser. Open-source.
- **Java XML Pack**, Sun, (http://java.sun.com/xml/javaxmlpack.html). The JavaTM XML Pack is an all-in-one download of Java technologies for XML. Java XML Pack brings together several of the key industry standards for XML -- such as SAX, DOM, XSLT, SOAP, UDDI, ebXML, and WSDL -- into one convenient download, thereby giving developers the technologies needed to get started with web applications and services. Windows, Mac, Unix. Open-source.

XML database and data publishing products

XML is much more "object oriented" than the relational database model. Management of XML data offers a variety of options from new "native" XML solutions or to XML interfaces to "traditional" data storage such as Oracle and Microsoft SQL Server.

- **Xindice**, Apache XML Project, (http://xml.apache.org). Formerly dbxml, Xindice is a Java package that provides native XML data management capability, including indexing and searching using Xpath. Open source.
- **Cocoon**, Apache XML Project, (http://xml.apache.org/cocoon). Cocoon is based on Java servlet technology. It provides web publishing capabilities using XML configuration files, extensible server page technology (XSP), a tag library that interfaces to a variety of traditional data storage systems including relational databases. For example, Cocoon can be used to render the results of SQL queries from a relational database into XML. Open source.
- **Data Junction**, Data Junction (http://www.datajunction.com). Data Junction is a versatile tool for transforming data structure and content. The content extractor module can reverse-engineer data in a variety of formats and transform it into XML. Single user license: inquire.

EML oriented tools

Finally, there are a number of tools under development by the KNB and ASU projects that were designed specifically for managing ecological metadata.

- **Morpho**, NCEAS, USCB, (http://knb.ecoinformatics.org). Mopho is a management tool for EML

metadata. It has editing functions, reverse-engineering structure from data files, and can act as a client for managing data in a Metacat database. Open source.

- **Metacat**, NCEAS, USCB, (http://knb.ecoinformatics.org) Metacat is a node-based data management system for XML files. It was developed for use as a replicated storage system for EML. Windows, Mac, Unix. Open source.

- **Xanthoria**, CES, ASU, (http://ces.asu.edu/bdi/subjects/xanthoria). Xanthoria is an Xpath-based query system for distributed databases. It provides web service access to remote data sources using XSLT to translate content to a standard schema. A final release will be available in 2002. Windows, Mac, Unix. Open source.

- **Xylographa**, CES, ASU, (http://ces.asu.edu/bdi/subjects/xylographa). Xylographa is a metadata creation tool that will provide three interfaces - a form-based editor, an interview wizard for users unfamiliar with metadata standards, and a reverse-engineering/import module for extracting metadata directly from data or existing metadata. In development. Windows, Mac,Unix. Open source.

Metadata Management: To Morpho or Not to Morpho, that is the question?

- David Blankman, LTER Network Office

Introduction

When I was first asked to write for Databits, the topic was supposed to be a comparison of using Morpho/ Metacat versus relational databases for creating, storing and sharing metadata. I am shifting the focus somewhat. So rather than "To Morpho or not to Morpho", the question should be "what role should Morpho and Metacat play in an overall information management strategy at a LTER site?"

To answer that question, it is useful to describe what Morpho and Metacat are.

Morpho is an evolving tool that has several components:

1. *Metadata editing*: currently Morpho is designed to create and modify XML documents that are defined by an EML DTD (Document Type Description). By design Morpho can be extended to create other kinds of XML documents. In practice, however, the extension of Morpho is not a simple matter. It would require creating a new DTD, then modifying other XML configuration files inside of Morpho. There are currently no automated tools within Morpho to accomplish this process.

2. *Query tool:* Morpho can be used to create either broad or very targeted queries without having to understand anything about the underlying query language as long as one is querying an XML document that is based on an EML module. Expanding Morpho's search capabilities to interact with the new DTD would require java programming to develop an interface to query the new DTD.

3. *Data retrieval tool:* Once one has used Morpho to query either a user's own computer (local search) or a Metacat (catalog search), Morpho can retrieve a data file that is described by the metadata that has been searched.

Metacat is a server system that is composed of several components. Functionally Metacat combines a java servlet and a database backend. The database stores the XML documents. The basic information flow is: Morpho talks to the servlet and the servlet talks to the database. The servlet also talks to an

authentication system such as a LDAP server. While a Metacat can store any kind of XML document, the Morpho/Metacat interactions are tightly coupled with EML.

Having described the essential features of Morpho and Metacat, I will describe several scenarios that illustrate the role that Morpho and Metacat can play in a site's information management system.

Scenario 1 - Site with Text-Based data and metadata

Assume that the site wants to continue with its current system. The site has developed custom applications that work effectively internally, and the site wants to contribute its metadata and data to the KNB's (Knowledge Network for Biocomplexity) centralized Metacat. A site could use Morpho to hand-enter metadata, but this is inefficient. The Network Office will soon start work with text-based sites to provide automated solutions to transforming their text-based metadata into EML compliant XML. The Network Office is also developing a Harvester that will inject the XML/EML metadata into a Metacat.

Is there a role for Morpho for this site? In this case, Morpho as Query and Data File Retrieval Tool can be used effectively by researchers to discover and download datasets of interest to them, assuming that the datasets are registered with the Metacat. There is another potential role for Morpho at this site. Let us say that the site's text-based metadata does not include adequate descriptions of a data table's attributes or the descriptions are adequate but are so unstructured that an automated conversion script cannot be developed. One of Morpho's most powerful features is its ability to assist an information manager in creating attribute-level metadata. Morpho can look at a data file with some consistent structure (e.g. tab, comma, space delimited file), parse the data file and then provide an easy-to-use form to create the attribute level metadata in EML/XML form.

Scenario 2 - Site with Text-Based Metadata Desires to Create Integrated Information Management System

There are many administrative functions that a site might want to include in an integrated data management system that are outside the domain of EML. For example, a site might want to track vehicles or supplies or grant information. There are no EML modules for this kind of information. Because Morpho is a specialized tool, it is not something that can be easily adapted to a broader information management system.

While XML databases and tools are evolving rapidly, the tools are not at the level of maturity or ease of use as those that are available for relational database systems. It is interesting to note, however, that Oracle's next Database release will contain native XML support. *"Oracle XML DB: learn how this Oracle9i Database Release 2 feature gives you all the advantages of relational database technology plus the advantages of XML. Also, read the spotlight article "Querying XML in a Standard Way", on the emerging standards for querying XML: SQL/XML and XQuery.* (http://technet.oracle.com/tech/xml/)

For this site, Morpho is still useful for researchers as a query and data retrieval tool.

An argument can be made that research metadata and administrative metadata are sufficiently distinct that they can be managed by separate systems. While that argument can be made, there is no compelling reason to have separate systems. The modular system of NCEAS EML requires sophisticated programming to create an analog to a normalized relational design.

Scenario 3 - Site with Relational System Wants Researchers to Enter Their Own Metadata

Supposing that a site has contributed metadata to a Metacat. Can Morpho be used to modify existing metadata? Yes, but there are data consistency problems. Currently the Harvesting system being developed by the Network Office is a "one-way road" from "site space" to "Metacat space". If Morpho were used to edit a document in "Metacat space" then those changes would not be synchronized back to the database. In the future the Harvesting system might be expanded to provide bi-directional data consistency.

Scenario 4 - Site that is just interested in research metadata

An OBFS site or an LTER site might adopt a Morpho/Metacat system to manage research metadata. In this scenario, the site is either not interested in managing administrative data or more likely this function is performed by some other entity. In this case Morpho and Metacat together are perfectly adequate for managing ecological metadata.

Scenario 5 - Site manages metadata in a relational system, but uses text (ascii) format for data

In this case the site might have an integrated relational information management system, but use a local Metacat to manage the "packaging" of data and metadata. The relational system would be the source of the metadata with a one-way harvesting to a local Metacat and replication to the central KNB Metacat.

To Morpho or Not To Morpho revisited? Yes, there is a role for Morpho in any kind of LTER site. Should your site maintain its own Metacat? Hopefully the scenarios have been drawn with enough detail for you to answer that question for yourself.

My Search for the Perfect Windows Email Client

- James Brunt, LTER Network Office

In a completely non-altruistic attempt to find the perfect Windows email client I've reviewed a number of the more popular and a few obscure clients that I thought I would share with you. The results were not startling or conclusive. My journey began when MS Outlook 2000 began showing signs of being unstable when accessing very large mail folders via IMAP - you see, I like to keep all my mail on the server so that I can always access it even when I don't have my own computer handy. IMAP4 was designed for this but most of the clients I reviewed are not robust in their implementation of IMAP4 - Netscape 6.22 was the clear winner in this regard. The clear loser was Eudora Pro 5.1.

I've always liked Outlook's organization, presentation and the clustering of various tools like calendar, contacts, etc. and I also really like its filtering and manipulation features. Netscape is very limited in terms of filtering. The other clients I evaluated were 'The Bat' 1.49, Mulberry 2.05, and Opera 5.02. What I was looking for in order of priority was: 1) robust IMAP4 support, 2) full SSL and SMTP authentication, 3) rich set of mail manipulation, searching, filtering tools, 4) support for multiple mail accounts (mixed POP3 and IMAP4), and 5) support for multiple content types. Below are the results of my survey.

Eudora Pro 5.1 - This is a big chunk of code for what it has to do and it moves like it. Very slow on most functions and the biggest drawback of Eudora is still the biggest drawback of Eudora - if you want to

access multiple mail accounts you have to create new instances of Eudora and there is no drag and drop capability between them. Biggest plus: none. Biggest negative: no support for multiple account configurations.

Mulberry 2.05 - Mulberry is the choice of the UNM campus for email support. It has some nice features like unlimited numbers of mixed POP3 and IMAP4 accounts, drag and drop between folders, lots of look and feel customization, but hasn't implemented SSL or SMTP authentication and doesn't display HTML although this is promised in a future version. Biggest plus: support for multiple account configurations; Biggest negative: lack of security features.

Netscape 6.22 - This is clearly the most robust of the IMAP4 clients I looked at - it easily loaded the headers for my 20,000+ messages in less than a minute and then cached it for later. It's very quick to retrieve messages and has a good SSL and authenticated SMTP implementation. For the very basics of an email client this makes a good one. There are more features in Netscape 6.2.2 than there were in the Messenger 4.76 - like LDAP addressing lookup and multiple independent mixed IMAP/POP3 accounts. If the Netscape browser dies, which it does frequently, it takes mail with it as did its predecessor. Filtering is much easier to use but it doesn't do things like let you move mail around based on age or other characteristics - it's pretty much applied when mail comes in. Biggest plus: Robust IMAP4 support; Biggest negative: limited filtering and fragility.

Opera 5.02 - There is a mail client with the Opera browser but the developers obviously didn't spend much time on it. It's very rudimentary and doesn't even support IMAP although the documentation said it did. Biggest plus: compact code; Biggest negative: lack of IMAP4 support.

Outlook 2000 SP1 - Outlook has all the extra features I'd like to have in a mail client without being the best basic mail client. It's just not robust. Frequent locking up or crashing reading headers, inability to create or manage IMAP4 subfolders on the server, header caching gets confused and doesn't update properly when new mail comes in. Biggest plus: rich set of manipulation tools, nice look and feel; Biggest negative: lack of robust IMAP4 support.

The Bat - Here's one I tried after I read a recommendation for it. Nope! It looks like it's a pretty functional POP3 mailer but it doesn't handle IMAP4 properly. By default it treats IMAP4 folders like new mail folders and will only show you the new, unread messages. I was never able to turn this off. Security wasn't implemented on the version I tested. Biggest plus: nice interface and compact code; Biggest negative: lack of robust IMAP4 support.

So here I am trapped in the hinterlands still looking for the perfect Windows email client. All comments about this less than scientific study are appreciated. I can read them while I'm trying to get all these email clients off my computer. Good idea to keep a copy of Norton Cleansweep around.

Using the LTER LDAP Server

- James Brunt, LTER Network Office

The LTER LDAP (Light Directory Access Protocol) server has been in existence for a few months and we've been testing out the variety of ways that we intend to use it to make life easier for everyone in the

LTER Network. LDAP can serve basic directory information like personnel with great and standardized ease; combined with Openssl it can provide the backbone for a secure authentication system as well. We are currently experimenting with some of these but for now you can use our LDAP server to do email address lookups via a variety of web-enabled email clients and standalone LDAP clients.

The LTER LDAP directory is currently synchronized with the personnel database but this happens one-way only. If you change your personnel database information it gets sent to the LDAP automatically but if you change your LDAP information (which some clients allow you to do) it will get overwritten the next time the personnel database changes.

LDAP-aware email clients:

- Eudora Pro - Commercial version of the original popular Internet email client.
- Netscape Communicator and Netscape Mail 6.2
- Outlook Express and Outlook 2000 - POP3/IMAP client
- Mulberry - Commercial email client.
- QuickMail Pro - Internet version that works like their original LAN product - commercial.

Standalone LDAP clients:

- LDapper - Standalone LDAP client. Can be used with any email program! Freeware.
- Ernestine - Scriptable, general purpose LDAP client engine. Control with AppleScripts, FaceSpan, FileMaker, Excel, 4D, or other apps that can send AppleEvents. Freeware.

  All clients tend to deal with the LDAP service a little differently. Hopefully from these two examples you can figure out how to connect to it from your favorite client.

MS Outlook 2000:

Tools -> Accounts -> Internet Directory Service Tab -> Add -> Directory Service:

Enter "ldap.lternet.edu" in the box -> Next

Don't select a user name and password ->

Select "yes" for address lookup -> Next -> Finish

ldap.lternet.edu ->Properties -> Advanced Tab:

Enter "o=lter,dc=ecoinformatics,dc=org" (without the quotes) in the search base box. -> OK.

Now you can click on the "To:" button in a letter composition window -> then Find -> select "ldap.lternet. edu" in the pull down and do a search. For example, if you type John in the Name field and select "Find Now" you get a list of all the Johns in the LTER database. You can then add it to your address book, or put it directly into the "To:" field or look up his phone number. Or, you are supposed to be able to type a name in the "To:" line of a composition window, then tab to the next field, and when the little red line appears under the name you can right click on it to see the entries in the LTER database that correspond to what you type. For example, if I type John in the To: field and right click I'm supposed to get a select list

of all the Johns but this doesn't work and appears to be a bug, I mean an unimplemented feature, in Outlook.

Netscape 6.2 Mail

Edit -> Preference -> Mail & Newsgroups -> Addressing -> Address Autocompletion

Check the "Directory Server" checkbox. -> Edit Directories -> Add ->

Name: LTER LDAP
Hostname: ldap.lternet.edu
Base DN: o=lter,dc=ecoinformatics,dc=org

Select OK -> then OK again -> select LTER LDAP from the pulldown beside "Directory Server"
Now, you can type a name in the "To:" line of a composition window and it will automatically (sometimes you have to wait a couple of seconds for the connection) show you all the completions that you can scroll through. For example, if I type John in the "To:" field, all the Johns in the LTER database appear in a scroll box below - the ldap entries can be visually separated from the local address book entries by a different icon.

The Netscape address book does not currently work with LDAP but I'm sure it will in the future. For now it only does address completion.

Other Tools

There are a number of free LDAP clients available that you can use to look up addresses on the LTER LDAP server. Some will be fairly intuitive and others might require that you do some mapping of fields if it has a preconceived notion of what it wants. For a variety of these try doing a web search in your favorite search engine for "LDAP client free".

Security
Currently we do not require you to log in to use the ldap server but in the near future we will secure the server and require your LTERnet password to login. There is a secure LDAP server running through open SSL but it is being deprecated in favor of TLS so no need to get you used to using it.

Finally, I'll post this to a new thread on the discus forum so that you can share your experiences in working with LDAP and connecting with the LTER LDAP server.

News Bits

2002 LTER Annual IMEXEC Winter Meeting at the San Diego Supercomputer Center

- Emery Boose, Harvard Forest (HFR)

The annual IMEXEC Winter Meeting, which was held February 5-8, 2002, and hosted by the San Diego Supercomputer Center (SDSC) (http://www.sdsc.edu). This year's participants included John Anderson (JRN), Karen Baker (PAL), Barbara Benson (NTL), Emery Boose (HFR), James Brunt (NET), Don Henshaw (AND), Peter McCartney (CAP), John Porter (VCR), Susan Stafford (SGS), and Kristin Vanderbilt (SEV). Also attending was Helena Karasti (postdoctoral fellow from Finland) who is conducting an ethnographic study of how information flows and work is accomplished in the LTER Network, in collaboration with Karen Baker and Geoffrey Bowker (UCSD).

IMEXEC Meeting Highlights:

- ***San Diego Supercomputer Center (SDSC) Interactions***
  One afternoon was devoted to a series of presentations by SDSC scientists: (1) the HPWren project (http://hpwren.ucsd.edu), a high-speed wireless network for research and education in San Diego county (Hans-Werner Braun), (2) the San Diego State University field station program (http://www.scec.sdsu.edu/BFS), which utilizes HPWren and shares many goals with LTER (Sedra Shapiro), and (3) the Information Integration Testbed (I2T) and related projects, which seek to build an information integration infrastructure (Chaitan Baru). Tony Fountain (LTER-SDSC) also discussed the Spatial Data Workbench (http://www.sdsc.edu/skidl), a collaborative project between SDSC and NET to provide access to large spatial datasets. In addition we had several informal discussions with Peter Arzberger (Executive Director, National Partnership for Advanced Computational Infrastructure, SDSC) and others on possible future collaborations between LTER and SDSC. There was a consensus that a successful collaboration will require a defined research goal, careful planning, and personnel dedicated to the project.

- ***Conference Call between IMEXEC, Henry Gholz, Jim Gosz, and Bob Waide***
  A one-hour conference call was held with Henry Gholz (NSF Program Officer), Jim Gosz (NET), and Bob Waide (NET). No word yet from the 20-year review committee. LTER is beginning "the decade of synthesis." The LTER Network needs to be visible and well integrated with what is happening elsewhere. We need to scale up our thinking to include the larger ecological community.

- ***Coordination with Network Office (NET)***
  After some discussion, three models were identified for NET projects: (1) projects initiated by the Network Office, (2) projects initiated by NET in collaboration with the broader ecological community (e.g., partners such as NCEAS), and (3) projects initiated by LTER scientists or IMs in collaboration with NET. Recognition of these separate models helped clarify the role of the Network Office, and helped to set more realistic expectations by sites for NET and vice versa, for both current and future projects. It was agreed that IMEXEC should be more proactive in communicating Network needs to NET (especially synthesis and cross-site activities), while NET should better communicate its entrepreneurial activities to the Network. It was agreed that these goals could be accomplished by regular conference calls by Susan Stafford, James Brunt, and Bob Waide, scheduled to follow the monthly IMEXEC conference calls. James Brunt discussed current ecoinformatics projects at NET, including the Spatial Data Workbench, the Resource Discovery Initiative for Field Stations, the Knowledge Network for Biocomplexity, and the Partnership for Biodiversity Informatics. NET is seeking to upgrade its computer equipment, which is about 5 years old. The new equipment would provide metadata services (via MetaCat) and could provide

offsite data backup for LTER sites.

- ***Network Information System (NIS)***
  The NIS has the potential to foster cross-domain, integrative science. We need to be more proactive in planning and implementing NIS modules for the LTER CC science theme meetings. The goals are (1) to archive a valuable data product, and (2) to find scalable solutions that can be applied beyond LTER. Some NIS modules will be one-time, others will be continuously updated. The administrative prototypes at NET (personnel, site db, biblio, dtoc) will be frozen on March 1, 2002, so that work can begin on an integrated system. DTOC may eventually be implemented as a MetaCat.

- ***Metadata Workshops***
  Peter McCartney reported on the January workshop at CAP. All sites that attended now have a path in mind for conversion of their metadata to EML. Two follow-up workshops are planned for this spring: (1) A text workshop at NET (date not set), and (2) An RDBMS workshop at CAP (probably in May). Sites entering data directly into Morpho will not require a follow-up workshop. The goal is to have all sites converted to EML (or able to produce EML automatically, as needed, from another format) this year. Please contact Peter McCartney (peter.mccartney@asu.edu) if you have any suggestions on EML specifications (EML 2.0 will be finalized at a workshop in April 2002).

- ***Site Mentoring Web Page***
  Kristin Vanderbilt and John Anderson are compiling materials for a Site Mentoring web page to be hosted on the LTER Intranet. Major sections will include: (1) Roles and responsibilities of an IM, (2) IM policies, (3) Training opportunities, (4) Expectations and opportunities for intersite interactions, and (5) Available help resources. Other suggestions include a complete IM bibliography, URLs for software tutorials and related information, an event calendar, conference call notes, power point presentations, and links to online historical documents. If you have additional suggestions, please contact Kristin (vanderbi@sevilleta.unm.edu) or John (janderso@jornada.nmsu.edu).

- ***ClimDB***
  Don Henshaw reported on ClimDB, which was recently moved to AND, where the back end was rewritten and a parallel database for hydrological data (HydroDB) was created with funding from the U.S. Forest Service. However the database is not fully populated and the front end requires several improvements. It was recommended that AND apply for supplemental funds (with IMEXEC endorsement) for a ¼ FTE to maintain and develop ClimDB at AND, while a new implementation of ClimDB using a web services approach might be the focus of a workshop and proposal with scientists at SDSC.

- ***Annual IM Meeting***
  Kristin Vanderbilt and John Anderson will prepare and circulate an agenda for the annual IM meeting to be held July 11-13, 2002 in Orlando, Florida. Current agenda items include: (1) Site mentoring web page, (2) Metadata workshop follow-up, (3) Planning for next All-Scientists Meeting (see below), and (4) Intersite databases and the NIS. If you have suggestions, including possible guests or speakers, please contact Kristin (vanderbi@sevilleta.unm.edu) or John (janderso@jornada.nmsu.edu).

- ***SCI 2002 Meeting***
  Please note the following new dates for authors presenting papers at the SCI Meeting (http://www.iiis.org/sci2002) to be held July 14-18, 2002 in Orlando, Florida:

  April 5 - authors send papers to editors, editors send papers to reviewers
  April 26 - editors return review comments to authors, authors prepare final revisions

May 13 - authors send camera-ready papers to editors
May 20 authors / editors submit camera-ready papers

IMEXEC has requested funds from NET to help cover the cost of this meeting for IMs who would like to attend. Registration dates for non-authors will be announced later. Housing information is on the SCI2002 website.

- **All-Scientists Meeting (ASM)**
  The next LTER ASM will be held sometime in 2003. Date and location TBA. The ASM will not be joined with ESA.

- **Ecoinformatics.org**
  The ecoinformatics.org (http://ecoinformatics.org) web page was created by NCEAS and NET as a means to reach out to the larger ecological community. LTER needs to create a presence here by posting activities and accomplishments. IMs are encouraged to check this page regularly.

- **White Paper**
  The White Paper created at the 1999 IMEXEC Meeting will be updated and published in two formats: (1) a short paper for the SCI meeting next summer, "The future of ecoinformatics research in LTER," and (2) a longer paper for submission to BioScience or a similar journal. Lead author = Brunt. Co-authors = Baker, Benson, Henshaw, McCartney, and Stafford.

- **Other Recommendations**
  (1) It is time to start planning and developing software tools to take full advantage of EML metadata. (2) Spatial data, traditionally managed by GIS and remote sensing experts, should be incorporated into IM systems at the site and network level. (3) New proposals should include a network interface component; e.g., travel to ecoinformatics workshops.

News from the March 2002 IMEXEC Conference Call

- Emery Boose, Harvard Forest (HFR)

Here are some highlights from an IMEXEC conference call on March 21, 2002. Bob Waide (NET) joined us for discussion of the NIS, and Todd Ackerman and Mariah Carbone (NWT) for discussion of the Invasive Species Database.

- **NIS (Network Information System)**
  At the February 2002 LTER EXEC Meeting, there were significant concerns expressed about the slow rate of progress on the development of NIS modules. These concerns must be addressed with both short and long-term solutions. In the short run, it was agreed that LTER IMs should make a series of informative presentations at the LTER CC meeting next month to bring CC members up to speed on the NIS (see below). Plans for the NIS should also be included in the implementation plan for the LTER white paper (to be written by J. Gosz, B. Waide, and G. Shaver) that will be presented at the same meeting. In the long run, funding and personnel issues must be addressed before the NIS can move successfully from research and development mode into production mode. Different production models were discussed, including a centralized NIS at the Network Office, a distributed NIS with separate modules at

individual LTER sites, and various combinations of the two. Please contact any member of IMEXEC if you have ideas or suggestions for the future of the NIS and how to communicate that future to the CC.

- **LTER CC Meeting**
  The next LTER CC meeting will be held April 18-20, 2002. LTER IMs attending the meeting will include James Brunt, Don Henshaw, Peter McCartney, John Porter, and Kristin Vanderbilt. James will coordinate a series of presentations that will address the history, successes, problems, and future vision of the NIS. CC members will also be encouraged to support site efforts to develop EML-based metadata.

- **LTER EXEC Committee**
  John Porter's term on LTER EXEC will expire at the next LTER CC Meeting and two new members will be elected by the LTER PIs. It was agreed that there are significant advantages to having IM representation on this committee, and that the IM group should select and promote a candidate (ideally someone who is both an IM and a scientist). Please contact Susan Stafford (stafford@cnr.colostate.edu) with nominations.

- **Invasive Species Database**
  The scientific program for the fall LTER CC meeting will address invasive species at LTER sites. So far only six sites have responded to requests for data by Todd Ackerman and Tim Seastedt (NWT). These data will comprise a new NIS module. This is an opportunity to demonstrate network-level cooperation and the viability of the NIS. Please contact Todd (Todda@colorado.edu) and let him know whether or not your site will be able to supply data for this project.

- **SDSC Subcontract**
  The San Diego Supercomputer Center has recently submitted a Statement of Work for the final year of its subcontract with the LTER Network Office. The proposed plan would prototype a web services implementation of the ClimDB database that is currently hosted by AND. Funding would cover one-third of a programmer at SDSC, one month's salary for an LTER IM for project coordination and outreach, and 2.5% salary for Chaitan Baru and Peter Arzberger (both at SDSC), as well as regular project meetings. IMEXEC endorses the proposed plan but recommends that Don Henshaw and Peter McCartney be added as co-PIs with some salary support to represent scientific and technical issues, respectively, for the LTER Network.

- **Metadata Workshops**
  Two follow-up workshops will be held in late May or June (dates to be determined shortly). Peter McCartney will lead a workshop for sites with RDBMS-based metadata, and David Blankman will lead a workshop for sites with text-based metadata.

- **Annual IM Meeting Guests**
  Six guests are normally invited to attend the annual IM meeting each year. There was discussion of names suggested to date. If you have suggestions please contact Kristin Vanderbilt (vanderbi@sevilleta.unm.edu) or John Anderson (janderso@jornada.nmsu.edu). The list of guests will be finalized shortly.

LTER Cross-Site Activity: Documentation of the presence and abundance of non-indigenous species

- Mariah Carbone, Niwot Ridge (NWT)

Niwot Ridge LTER would like to encourage greater participation in a cross-site data analysis activity that will be part of the fall LTER Coordination Committee Science Meeting taking place in September 2002. The project goal is to look at the presence and abundance of non-indigenous species across LTER sites.

The level of activity participation across the LTER Network is as follows:

LTER Site	Participation Level	Data Received
NWT	Community/species List	Yes
KNZ	Summary	Yes
JRN	Summary	Yes
VCR	Summary	Yes
CDR	Summary	Yes
SGS	Summary	Yes
HJA	Species List	Yes
SEV	Community/species List	Yes
FCE	Recent Interest	No
NTL	Recent Interest	No
CAP	Recent Interest	No
KBS	Recent Interest	No
BES	Recent Interest	No
PIE	Recent Interest	No
CWT	Original Interest	No
HBF	Original Interest	No
HFR	Original Interest	No
GCE	None	No
MCM	None	No
ARC	None	No

We would appreciate a response across the entire LTER Network as to whether or not they will be participating in this cross-site activity. Please send your response to Questions and data should be directed to Mariah Carbone (Mariah.Carbone@Colorado.Edu).

We are interested in collecting data sets of species lists of native and non-native species at each LTER site. We will accept either primary data (species lists with native/non-native identifiers provided by your site), or summary data (tables indicating numbers of native and non-native species, by community or

site). Please see examples of summary data posted at: http://culter.colorado.edu/~tims/ltersitedata.html

In our preliminary analysis of these data we will attempt to correlate species numbers and percentages of non-native species with site characteristics similar to those conducted in previous cross-site exercises on species richness and productivity. The long-term goal would be to use these data in a network analysis of factors affecting the invasibility of ecosystems. Questions and data should be directed to Mariah Carbone (Mariah.Carbone@Colorado.Edu).

Greg Shore hired as LTER Network Office Computer System Administrator

- Linda Powell, Florida Coastal Everglades (FCE)

The LTER Network Office welcomed Greg Shore as their new computer system administrator on April 1, 2002. Greg has a degree in computer science and is an expert with Windows and Unix operating systems, network security, virus detection, and programming. Additionally, he has a Forestry degree and has had many years of experience working with Ecologists. He has been affiliated with the Sevilleta LTER site for the past 14 years where he began his career (April 1988 (Pre-LTER site designation)) as a student doing programming work. Throughout his tenure with Sevilleta, he has done work in programming, data management, and system administration. In 1994, Greg transitioned into a position as the Sevilleta GIS Services Manager and has held that position until his recent move to the LTER Network Office.

Greg had quite a 'christening' as the new system administrator due to the Network Office having two disk crashes in his first week on the job- one which adversely affected all the interactive systems on LTERNet's web pages. He showed us that he has a great sense of humor when he wrote in his a recent im@lternet.edu email that he thought the recent spate of system breakdowns was merely an attempt to make him feel needed at the very outset! His email address is gshore@lternet.edu.

◆ Good Reads

Managing Scientific Metadata

- Karen Baker, PAL LTER

Matthew B Jones, Chad Berkley, Jivka Bojilova, and Mark Schildhauer, 2001. Managing Scientific Metadata. IEEE Internet Computing Sep-Oct 2001. (http://computer.org/internet)

This article provides both background into the use of metadata as a method to manage heterogeneous scientific data, summarizing original motivatations, general approaches and community specifics. To cover such ground, the authors adopt an approach that may be regarded as a metaphor reflective of the cross-domain integrative strategies required for information management today. The metaphor, a conversation-within-a-conversation sidebar, highlights metadata standards, XML databases and interoperability issues. An LTER IM Metadata Workshop organized by P.McCarthy (CAP) and supported by the LTER Network Office provided a mechanism for LTER sites to focus on these issues and to consider site metadata transformation strategies compatible with interoperable formats, eg the Ecological Metadata Language. Given LTER Information Management discussions and metadata momentum, this paper provides insight into the broader context.

Is It Time to Bury the Ecosystem Concept?

- Maria Vernet and Karen Baker, PAL LTER

Robert O'Neill, Is it time to bury the ecosystem concept? Ecology 82(12), 2001 pp3275-3284

O'Neill reminds the reader that the ecosystem approach is a model we impose on nature and examines model assumptions including stability, fixed boundaries and homogeneity. Use of the ecosystem model over the past decades has revealed some aspects of natural systems are better explored through alternative methods. One focus is on the importance and impact of local stability and on the equally important concept of long-term sustainability. His framework provides the bigger context, beyond basin to global, so can address questions such as 'what is left in a location after ecosystem flight occurs'.

The statement "Homo sapiens is not an external disturbance, it is a keystone species within the system" suggests that with ecosystem defining characteristics like dispersal range (which in case of dogs and humans is global), we discover the disturbance/recovery of 'spaceship earth' is indeed in the hands of the species with a capacity for

a) information integration
b) organizational memory
c) humor
d) all of the above
e) none of the above

The answer will be forthcoming.

◆ Frequently Asked Questions

Where can I find information about IT terminology and techniques on the

web?

- Wade Sheldon, Georgia Coastal Ecosystems LTER (GCE)

The rapid pace of changes in information technology poses a serious challenge to information managers, who often must provide system administration and technical support services to site scientists in addition to their data management responsibilities. Fortunately, there are many sites on the world wide web that can help information managers keep up to date on the latest terminology, technology, and techniques. Links to some IT resources sites I have found useful over the past year are provided below.

Dictionaries and Glossaries of IT Terminology:

- Computing dictionaries from yourdictionary.com: http://www.yourdictionary.com/diction4.html
- High-tech dictionary from ComputerUser: http://www.computeruser.com/resources/dictionary/index.html
- IT-specific encyclopedia from whatis?com: http://whatis.techtarget.com/definitionsSearch/

Web Technology Sites:

- CSS tutorial from EchoEcho.com: http://www.echoecho.com/cssintroduction.htm
- Web developer resources from Webmonkey:http://hotwired.lycos.com/webmonkey/
- Web design and usability guidelines from Fixing Your Web Site: http://fixingyourwebsite.com
- XML resources from O'Reilly: http://www.xml.com/

Network Security Sites:

- Security information from Microsoft TechNet: http://www.microsoft.com/technet/security
- Security advisories from CERT©: http://www.cert.org/advisories/
- Security news from SecurityFocus: http://www.securityfocus.com/
- TCP/IP port knowledgebase from NetworkICE: http://www.networkice.com/advice/Exploits/Ports/

Programming Resource Sites:

- ASP resources from ASPCode.net: http://www.aspcode.net/newaspcode
- Developer resources portal from developersites: http://www.developersites.com
- JavaScript reference from iPlanet: http://docs.iplanet.com/docs/manuals/javascript.html
- Java resources from Sun Microsystems: http://java.sun.com/
- Oracle resources from DB Resources: http://www.dbresources.com/
- Programming resources from the Microsoft Developer's Network: http://msdn.microsoft.com/
- SQL Server news and information from Swynk.com: http://www.swynk.com/sql/

What Are Some of the Current Computing Acronyms Used By the LTER Information Managers?

- Linda Powell, Florida Coastal Everglades LTER (FCE)

ACRONYM	FULL NAME	DESCRIPTION	REFERENCE
DSSSL	Document Style Semantics and Specification Language	'An ISO standard under preparation, addressing the semantics of high-quality composition in a manner independent of particular formatting systems or processes. DSSSL is intended as a complementary standard to SGML for the specification of semantics.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html
DTD	Document Type Definition	'The definition of a document type in SGML or XML, consisting of a set of mark-up tags and their interpretation.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html
SGML	Standard Generalized Markup Language	'A generic markup language for representing documents. SGML is an International Standard that describes the relationship between a document's content and its structure. SGML allows document-based information to be shared and re-used across applications and computer platforms in an open, vendor-neutral format.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html
SOAP	Simple Object Access Protocol	Soap is a way for a program running in one kind of operating system (such as Windows 2000) to communicate with a program in the same or another kind of an operating system (such as Linux) by using the World Wide Web's Hypertext Transfer Protocol (HTTP) and its Extensible Markup Language (XML) as the mechanisms for information exchange.	Definitions taken from the *Whatis?.com:* http://whatis.techtarget.com/definitionsSearch/

UDDI	Universal Description, Discover, and Integration	An XML-based registry for organizations worldwide to list themselves on the Internet. UDDI is often compared to a telephone book's white, yellow, and green pages. The project allows organizations to list themselves by name, product, location, or the Web services they offer.	Definitions taken from the *Whatis?.com:* http://whatis.techtarget.com/definitionsSearch/
WSDL	Web Services Description Language	An XML-based language used to describe the services an organization offers and to provide a way for individuals and other organizations to access those services electronically.	Definitions taken from the *Whatis?.com:* http://whatis.techtarget.com/definitionsSearch/
W3C	World Wide Web Consortium	'The main standards body for the World-Wide Web. W3C works with the global community to establish international standards for client and server protocols that enable on-line commerce and communications on the Internet.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html
XHTML	Extensible Hypertext Markup Language	'A reformulation of HTML 4.01 in XML. Being XML means that XHTML can be viewed, edited, and validated with standard XML tools. At the same time, it operates as well as or better than HTML 4 in existing HTML 4 conforming user agents.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html
XML	Extensible Markup Language	'An initiative from the W3C defining an "extremely simple" dialect of SGML suitable for use on the World-Wide Web.'	Definitions taken from the *Free Online Dictionary of Computing:* http://foldoc.doc.ic.ac.uk/foldoc/index.html

XPath	XPath	'XPath is a language that describes a way to locate and process items in Extensible Markup Language (XML) documents by using an addressing syntax based on a path through the document's logical structure or hierarchy. This makes writing programming expressions easier than if each expression had to understand typical XML markup and its sequence in a document. XPath is a language that is used by and specified as part of both the Extensible Stylesheet Language Transformations (XSLT) and by XPointer (SML Pointer Language).'	Definitions taken from the searchWebservices.com: http://searchWebservices.com
XPointer	XPointer	'XPointer is a language for locating data within an Extensible Markup Language (XML) document based on properties such as location within the document, character content, and attribute values. XPointer consists of a description that comes after the # symbol in a Uniform Resource Locator (URL). XPointer can be used alone or together with XPath, another language for locating data within an XML document.'	Definitions taken from the searchWebservices.com: http://searchWebservices.com
XSL	Extensible Stylesheet Language	'A W3C standard defining stylesheets for (and in) XML.'	Definitions taken from the Free Online Dictionary of Computing: http://foldoc.doc.ic.ac.uk/foldoc/index.html

XSLT	Extensible Stylesheet Language Transformations	'A W3C standard for transforming XML documents into other XML documents or other formats. This was conceived as part of XSL but has been found to have wider applications.'	Definitions taken from the Free Online Dictionary of Computing: http://foldoc.doc.ic.ac.uk/foldoc/index.html

◆ Calendar

April 18-20, 2002: LTER Coordinating Committee Meeting at Sevilleta, New Mexico, http://intranet.lternet.edu/meetings/future/ScienceSymposiumTheme.html
http://intranet.lternet.edu/committees/coordinating/spring02mtg/spring02_cc_agenda.html

April 21-23, 2002: Resource Discovery Initiative for Field Stations (RDIFS) Planning Meeting at Sevilleta LTER, New Mexico

April 24-25, 2002: EML 2.0 Workshop to finalize EML at LTER NET Office, Sevilleta, New Mexico

April 29 (8:30am) - May 1 (12:00pm): Bill Michener's (wmichene@lternet.edu) Wireless Communication Workshops at LTER NET Office, Sevilleta, New Mexico. Instructors: Dave Hughes and Tom Murphy of Old Colorado Communications.

May 1 (1:00pm)- May 3 (5:00pm): Bill Michener's (wmichene@lternet.edu) Wireless Communication Workshops at LTER NET Office, Sevilleta, New Mexico. Instructors: Dave Hughes and Tom Murphy of Old Colorado Communications.

July 11-13, 2002: LTER Annual Information Managers Meeting at Orlando, Florida,
For more information, please contact Kristin Vanderbilt, (SEV)(vanderbi@sevilleta.unm.edu) or John Anderson (JRN) (janderso@jornada.nmsu.edu).

July 14-18, 2002: The 6th World Multiconference on Systemics, Cybernetics and Informatics (SCI) at Orlando, Florida
http://www.iiis.org/sci2002