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Abstract

This report details the organization of the course on Building a Geospatial Digital Library and the manuals written for and distributed at the course itself. The complete documentation has been made available to the public through the D-Lib Center web site (http://dlibcenter.iei.pi.cnr.it/).

Executive Summary

This course was of interest to individuals or institutions with geospatial digital content who wish to publish for structured search and retrieval over the Web. The course was based on software developed by the Alexandria Digital Library Project (ADL; http://webclient.alexandria.ucsb.edu), which facilitates the creation and management of distributed digital library collections. ADL collections can operate stand-alone for use by individual users, or optionally and seamlessly switch into a distributed mode for web-based information sharing and publication.

Geospatial collections are typically heterogeneous in content and can span items as diverse as maps, historical photographs, field data, remotely sensed images or archeological data. The ADL software allows structured search and retrieval on such heterogeneous data collections, combining the simplicity of Dublin Core with the specificity of a full Boolean query language.

The aim of the course was to familiarize participants with the overall technology and with the specific procedures and software involved in setting up a stand-alone or distributed ADL node. As a case study, the teaching staff of the course focused on a collection of USGS Digital Raster Graphics (DRG) maps. However, the technology presented is much more general: it can be applied to collections of any georeferenced library objects and, further, to collections of any objects to which a structured discovery technique can be applied. Based on Open Source components and open protocol standards (including Java, Tomcat, XML, JDBC, SQL), the ADL software is freely available and can be installed on all common software and hardware platforms.

In this course the basic steps and procedures in creating a geospatial library node from existing content that may or may not yet be online were covered. It was also demonstrated how to integrate this node with other collections on the Internet in order to create distributed collections of complementary content. Using the example of a set of USGS Digital Raster Graphics (DRG) maps, two case studies of users with very different needs were examined, a) a user with content she/he wants to organize and publish, either for personal use or for public consumption, but has no online metadata or collection objects yet; and b) an institution with a large existing online catalog in the form of a relational database (e.g. MARC, Oracle) as well as a mix of online and offline collection objects.

Outline of course

1. Introduction and problem background
2. Brief demonstration of existing digital library nodes based on ADL technology
    a. ADL at the California Digital Library, a production library node with approximately 2,500,000 georeferenced collection items which demonstrates the scalability of the ADL technology
    b. A federated library of distributed nodes for combined access to the Scripps Institute of Oceanography, San Diego (3 collections: and historic photographs, oceanographic datasets, seamount geomorphology), and the Environmental Information Lab at the University of California, Santa Barbara (2 collections of remotely sensed images, Landsat and MODIS).
    c. A stand-alone node on a laptop computer at the course site for search and retrieval of USGS Digital Raster maps.
3. Overview of systems architecture
    a. Overall ADL architecture
    b. Server
    c. Middleware
    d. Client(s)

4. Case study of a collection using USGS Digital Raster Graphics maps
    a. Create collection metadata
    b. Create metadata mappings
    c. Collection database design
5. Populating collections.
    a. Populating metadata
    b. Access mapping
    c. Populating reports
6. Software configuration
    a. Work flow of components the installer configures or otherwise interacts with
    b. Database selection and setup
    c. Middleware configuration
7. Collection access modes
    a. Stand-alone operation, local access only
    b. distributed operation
8. Searching collections for digital objects.
9. Viewing digital collection objects and metadata

Teaching Staff:
Rudolf W. Nottrott (http://alexandria.ucsb.edu/~rnott/) brings twenty five years of experience in academic, environmental and commercial information technology to his present position as software engineer with the Alexandria Digital Earth Prototype (ADEPT) project. His present work focuses on the implementation of distributed digital collections based on the Alexandria Digital Library (ADL) technology, and related software development. Prior to joining the ADEPT group, his work focused on information systems development for the University of California Natural Reserve System, and development of software tools for distributed data management at the National Center for Ecological Analysis and Synthesis (NCEAS). He founded the network information systems of the U.S. Long-Term Ecological Research Network (LTER) and served as the networks information systems manager from
1989 to 1997.
Gregory A. Janée (http://alexandria.sdc.ucsb.edu/~gjanee/) is technical leader of the Alexandria Digital Library project and principal author of the library software.
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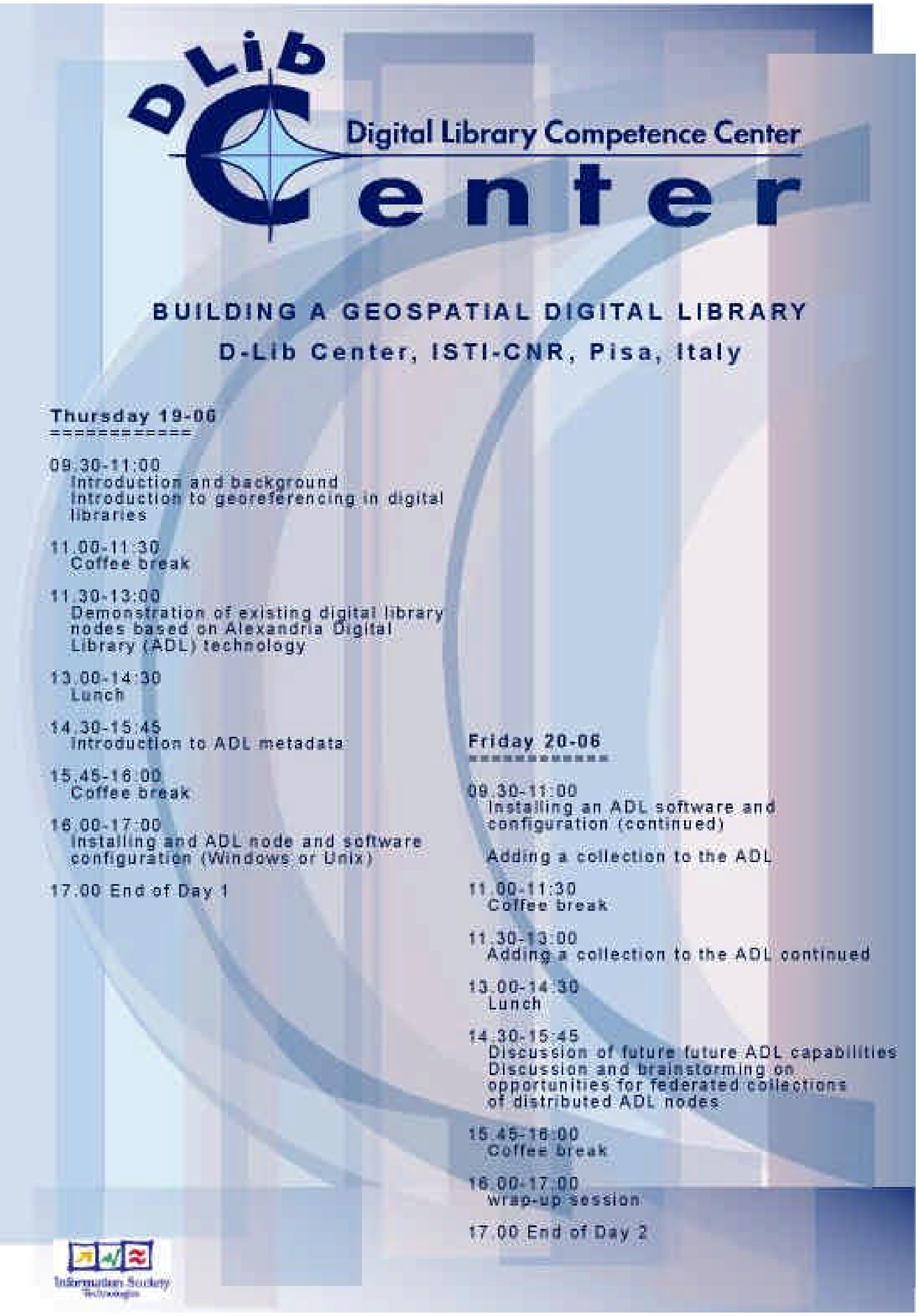
Table of Contents

Agenda



D-Lib
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Information Society Technologies

BUILDING A GEOSPATIAL DIGITAL LIBRARY

D-Lib Center, ISTI-CNR, Pisa, Italy

Thursday 19-06
============

09.30-11:00
Introduction and background
Introduction to georeferencing in digital libraries

11.00-11:30
Coffee break

11.30-13:00
Demonstration of existing digital library nodes based on Alexandria Digital Library (ADL) technology

13.00-14:30
Lunch

14.30-15:45
Introduction to ADL metadata

15.45-16:00
Coffee break

16.00-17:00
Installing and ADL node and software configuration (Windows or Unix)

17:00 End of Day 1

Friday 20-06
============

09.30-11:00
Installing an ADL software and configuration (continued)

Adding a collection to the ADL

11.00-11:30
Coffee break

11.30-13:00
Adding a collection to the ADL continued

13.00-14:30
Lunch

14.30-15:45
Discussion of future future ADL capabilities
Discussion and brainstorming on opportunities for federated collections of distributed ADL nodes

15.45-16:00
Coffee break

16.00-17:00
wrap-up session

17.00 End of Day 2

1 Introduction

Welcome to Alexandria Digital Library in a Box (ADLIB). This software lets you publish geospatial digital content for structured search and retrieval over the Web.

Alexandria Digital Library collections can operate in standalone mode for use by individual users, or optionally switch into a distributed mode for web-based information sharing and publication. Distributed means you can search different databases at different locations and of different types.

This chapter covers:

- What is a Digital Library?
- Why Should I Use ADL Software?
- What is ADL in a Box?

What is a Digital Library?

A digital library is a focused collection of digital objects, including text, video, and audio, along with methods for searching, access and retrieval, and for selection, organization, and maintenance[1].

Many digital objects can have a geospatial reference. Geospatial collections are typically heterogeneous in content and can include items as diverse as maps, historical photographs, field data, remotely sensed images or archeological data.

Geospatial & Georeferenced Information

While an Alexandria Digital Library node lets you search using standard library semantic concepts, such as author and keyword, it also lets you search for both *geospatial* and *georeferenced* information.

Geospatial information is directly referenced by longitude and latitude coordinates that locate its footprints on the face of the Earth, for example maps and remote-sensing imagery.

Georeferenced information references a geographic location without explicit geospatial representation. Any kind of document that is about a particular geographic place, (*A Tale of two Cities* or *History of the Decline and Fall of the Roman Empire)* is potentially an example of georeferenced information.

Why Should I Use ADL Software?

ADL has features that make it unique:

- The ability to search for fundamentally different document types in the same way. For example, a search of a specified location will return text documents, maps, or multimedia about the area.
- The ability to search using standard library terms, such as author, title, and keyword.
- A simple query language.
- Support for distributed searches across heterogeneous collections and instances of ADL.

Distributed searches means you can search different databases at different locations and of different types. ADL has the potential to develop into a worldwide network of databases with geographically referenced information.

- A gazetteer service for translation between place names and geographic coordinates. The large international gazetteer database allows for a less coordinate-dependent client. It also has a standard for the content of a gazetteer and an XML-service to allow you to add new elements to the gazetteer.
- A thesaurus is used to solve semantic ambiguities, such as many words for the same phenomenon.
- The ability to use existing metadata. ADL defines a general architecture that makes it possible to use with totally different types of databases and representation of data. It can be used with a wide variety of databases without changing the content or metadata of the database.

What is ADL in a Box?

ADL in a Box is a single application package that is based on Open Source software and open protocol standards, such as XML, JDBC, and SQL. The ADL software is freely available and can be installed on all common software and hardware platforms.

[1] *How to Build a Digital Library* by Ian Witten and David Bainbridge.

2 Quick Start

Alexandria Digital Library in a Box consists of the following components:

- ADL middleware configured to connect to UCSB's Map and Imagery Lab-hosted collections
- Apache Tomcat server
- Apache Ant tool

Overview of setting up a Digital Library

This section provides an overview of the steps required to set up an ADL node. Detailed installation instructions are provided in Chapter 3, Installing ADL Software. For detailed instructions on adding your collection to ADL, see Chapter 4, Adding Collections.

1. Install Java 2 SDK, see http://java.sun.com/j2se/1.4.1/download.html.
2. Download ADLIB software at http://www.alexandria.ucsb.edu/downloads/adllibrary/.
3. Install ADLIB software. See Chapter 3, Installing ADL Software.
4. Determine what collection-level and item-level metadata will be used. See Introduction to ADL Metadata .
5. Map item-level metadata to buckets in query-translator.py. See Adding your collection to ADL .
6. Set up configuration parameters in bucket99.conf, for example database connection string. See Adding your collection to ADL .
7. Define queries for metadata reports in bucket99.conf (scan, browse, full, access). See Adding your collection to ADL .
8. Format metadata reports by editing report templates (access.xml, full.xml, etc). See Adding your collection to ADL .
9. Test the metadata reports using test-form.html.
   Go to HTTP://[your_host_name]:[port]/adl_library/test-form.html. For example:
   HTTP://myhost.myschool.edu:8080/adl_library/test-form.html
10. Test webclient and if problems are encountered, enable query log.

3 Installing ADL Software

This chapter describes how to install the ADL Standalone software on Windows and UNIX operating systems.

To Install ADL Standalone:

1. Determine the fully qualified domain name of the computer on which you are installing the software. For example:

   rosarita.alexandria.ucsb.edu
2. Determine available port numbers for Tomcat operation on your system. Two ports are required for Tomcat and Tomcat administration. If Tomcat is already running on your system, you need ask your System Administrator for available port numbers. If it's not running, you can use the default settings.
3. Install Java 2 SDK, see http://java.sun.com/j2se/1.4.1/download.html.
4. Set the JAVA_HOME environment variable to the directory in which Java is installed.
5. Navigate to http://www.alexandria.ucsb.edu/downloads/adllibrary/ and download:

   ADLStandalone-20030430.tar.gz (*Unix*)

   or

   ADLStandalone-20030515.zip (*Windows*)
6. Untar the file to your home directory (*Unix*) by entering:

   ```
   gunzip
   tar -xvf
   ```

   or

   Unzip the file to the root directory *(Windows)*.
7. It expands to a directory called ADLStandalone. Change your current directory to ADLStandalone.
8. If a version of Tomcat is already running, you need to edit the file library.properties to replace the default port numbers of catalina.port=8080 and catalina.admin.port=8005 with the available port numbers from step 2.

   If no other Tomcat is running, skip to step 9.
9. In a command window, enter:

   adl.sh *(Unix)*

   adl.bat *(Windows)*
10. In the command window, you will be prompted with the following:

    ```
    FirstRun:
    createProperties:
    [echo] No library.properties. This task will help you create one
    [input] server name
    ```
11. Enter the fully qualified domain name that you determined in step 1. For example:

    rosarita.alexandria.ucsb.edu
12. When the "Build Successful" message is displayed, you can start the ADL server. At the prompt, enter:

    adl.sh start *(Unix)*

    adl.bat start *(Windows)*

13. To view the web interface, open a web browser and in the address line, enter:
    http://[yourHostName]:8080/
    Where [yourHostName] is the fully qualified domain name.

4 Adding Collections

Once you install ADL Standalone, you can add your collections to ADL. This chapter describes how to map your metadata to ADL search buckets and add your collections to ADL. ADL search buckets defines a particular set of ten "buckets" that capture key searchable and descriptive characteristics of widely heterogeneous items. For information on ADL search bucket framework, see Appendix B, "The ADL Bucket Framework."

This chapter covers:

- Introduction to ADL Metadata
- Adding your collection to ADL

Introduction to ADL Metadata

Understanding ADL Metadata will help you get started adding your collection to ADL. A collection in ADL consists of a geographically referenced set of items (maps, aerial photographs, satellite images, recordings, etc.), which has:

- **Collection-level metadata** - a standardized description about the entire collection. In the traditional library world, this would be analogous to a description of a specialized library branch, like an Engineering Library.
- **Item-level metadata** - information about each items in the collection, including a unique identifier for each item within the collection. This is analogous to the information on a catalog card in a traditional library card catalog.

Collection-level metadata

Collection-level metadata is an integral part of the ADL philosophy. It helps users determine if the contents of a collection are applicable to a project by providing simple summary information such as title, scope, purpose, and responsible party, as well as aggregated information about the collection such as item counts by format and object type, and histograms describing the spatial and temporal coverage.

The collection developer must always supply the simple summary information; however, in the near future the ADL software will generate the aggregated information automatically. The summary information can be collected or created even before you are ready to load your collection into ADL. Review the Collection-Level Metadata example to see the required and optional information you need to provide in your collection-level metadata.

ADL collection-level metadata is an XML document that has been rendered into HTML for readability. The ADL-collection-metadata.dtd (XML Document Type Definition) formally defines the semantics of the collection-level metadata. You may view an example of collection-level metadata rendered in HTML as it appears in the ADL webclient.

The collection-level metadata XML files need to be in a web-accessible directory (where your local collection data is or will be located). For further detailed information on installing metadata files in ADL, please see: Adding your collection to ADL .

Item-level metadata

Although ADL has specified a content standard and XML encoding for collection-level metadata, collection developers are generally free to use any item-level metadata. The only requirements are:

- Item-level metadata must be mapped to the ADL metadata views. You can view an example of item-level metadata at the bottom of the Collection-Level Metadata example .
- Each item must have an identifier that is unique within the collection.

Tips for creating unique identifiers

- Avoid spaces in the identifier.
- If using the filename as an identifier, use the base portion only. Do not use the filename with the extension or type attached. For example, if a SPOT satellite image file is named "santa_barbara.tif," a good identifier would be "santa_barbara" (assuming the name is unique in the collection). This is because ancillary information is often associated with the base filename.

For example, the "santa_barbara.tif" might have additional files containing a georeferencing information in a separate file (often "santa_barbara.tfw"), a header file, "santa_barbara.hdr," or even a metadata file "santa_barbara.meta." Using "santa_barbara.jpg" makes it difficult to associate the information without first removing the extension from the filename.

While removing extensions is simple for a homogeneous collection, the variety of extensions present in heterogeneous collections makes this task more difficult. For holders of a single heterogeneous collection, it may seem trivial to handle extension stripping and mapping. However, for library developers, who handle multiple configurations, extension stripping can become complex, since each collection developer might have a different procedure, standard, and set of file types.

Adding your collection to ADL

To add collections to ADL:

1. Create collection-level metadata by entering the required fields in the Collection-Level Metadata form. When the form is completed, click **Insert Record**. .

   The ADL Metadata Listing is displayed.

2. In the ADL Metadata Listing, locate the name of the collection you just inserted and click on it.

   The collection-level metadata you entered in step 1 is displayed in the form.

Important!

If your item-level metadata follows the guidelines of the Appendix A, "ADL Buckets - General Schema," you don't need to map your item-level metadata and can skip to step 9.

3. At the top of the form, click **Add/Edit this Item Level Metadata Information**.

   The Item-Level Metadata Insert form is displayed with the name of your collection.

4. Create or map your item-level metadata by following the instructions in the form and the following guidelines.

Guidelines for creating and mapping item-level metadata

In order to map your item-level metadata to the ADL search buckets, you must compare your schema to the ADL Item-level Metadata schema, see Appendix A, "ADL Buckets - General Schema." As you compare your schema to the ADL schema, note the names of each of your fields. Please note that the first five fields are required.

- Does each item have a unique identifier with no spaces? See Tips for creating unique identifiers .This is a required field.
- Does each item have a Title? Which fields are used to create the Title? This is a required field.
- Does each item have bounding box coordinates? This is a required field.
- If not, you must create decimal coordinates.
- Does each item have a Date or Date Range?
- This consists of the start date and end date in the format of yyyymmdd. The start and end date can be the same.
- Does each item have Assigned Terms? This is from an authority list, such as the Library of Congress Subject Headings?
- Does each item have any subject-related text? This is used for free-text searching.
- Does each item have a Type, such as map, aerial photo? This is a required field.
- Does each item have a Format listed, such as tiff, jpeg, gif? This is a required field.
- Does each item have an Originator? You can have multiple originators.

5. When the form is complete, click **Send Information**.

   The ADL Metadata Listing is displayed.

6. Click on your collection name.

   The Item-Level Metadata Insert form with your collection-level and item-level metadata is displayed.

7. Click **View Collection Level Metadata XML**. Copy the URL of this XML file. You will need it to complete the bucket99.config file.

8. Click your browser Back button to return to the ADL Collection Level Metadata form for your collection. The information on this page will be used to create the configuration files in step 10. You may want to print this page or bookmark it.

9. Locate your data objects, thumbs, and browse images.

   Your data objects-the actual images that you will be serving out through ADL, need to be located on a web server. You will also need a small thumb version (no larger than 128 pixels on a side) and an easy-to-view "browse" version (no larger than 512 pixels on a side).

   We suggest you locate your data objects, thumbs and browse images in a directory called ../collections/your-collection-name/distribution_forms/data (thumb, browse). But if your data, browse, and thumbs already exist in their native location, you may prefer to leave them where they are. In either case, you will point to their location via the access.xml and browse.xml reports, which are created in step 10.

10. Create the collection configuration files.

Note

We are working on automation of this process. For now, contact Rudolf rnottrott@alexandria.ucsb.edu for assistance in creating these files. Click to view the following example files:

- bucket99.conf (configuration file)
- query-translator.py (mapping search bucket field names)
- scan.xml (fields required to list result set)
- access.xml (access report, link to data)
- browse.xml (link to thumb and browse images)
- full.xml (full report, complete item level metadata record)
- user.properties (database login id and password)

11. Copy configuration files created in step 10 above into ADLStandalone/collections/[your-collection-name].

    [your-collection-name] is the name you entered in the Collection- Level Metadata form.

12. Go to http://[your_host_name]:8080/adl_library/admin/configuration.jsp.

    You should see your collection in the list of Running Collections.

13. Click on the HTML link for your collection. This creates the metadata.html file. Copy the URL to this metadata.html file into C:\ADLStandalone\hierarchies\ collection_opml.xml (per the example in the comments at the top).

14. Test the metadata reports using test-form.html.
    Go to HTTP://[your_host_name]:[port]/adl_library/test-form.html.
    For example:

    HTTP://myhost.myschool.edu:8080/adl_library/test-form.html

    If problems are encountered, the error messages should indicate which configuration file is causing the error.

15. To view the web interface, open a web browser and in the address line, enter:

    http://[yourHostName]:8080/

    Where [yourHostName] is the fully qualified domain name.

16. Click **Geospatial Search**. Test the web interface by submitting searches. If problems are encountered, enable the query log, which should indicate which configuration file is causing the error.

5 Metadata Administration

Viewing Collections

Adding Collections

UCSB LIBRARIES | Alexandria Digital Library Project

ADL Metadata Listing

Return to Metadata Administration

Select Collection	Title
MILAirPhotos	MIL Air Photos View list of flights
current_events	ADL Current Events Collection View list of current events
bren_eil	UCSB Bren Environmental Information Lab
6minLA	Los Angeles County, California, 6-Minute Topographic Map
amsindexes	Map Depository Catalog
caltopo125	California 1:125,000 Topographic Quadrangles
caltopo15	California 15-Minute Topographic Map Series
caltopo50000	California 1:50,000 Series V795
caltopo62500	California 1:62,500
caltopo75	California 7.5-Minute Series (Topographic)
caltopos	Topographic Quadrangle of California
catalog99	Alexandria Digital Library Catalog (95% hardcopy)
dem75_us	7.5 Minute DEM Collection
doi10	NIMA-DOI-10, [Digital Orthorectified Image 10-meter resolution].
doqq_bw_ca	DOQQs (Black & White) Digital Orthophoto Quarter Quadrangles of California.
doqq_cir_ca	DOQQs (Color Infrared) Digital Orthophoto Quarter Quadrangles of California.

dogq_geotiff_ca	**DOQQs (GEOTIFF) Digital Orthophoto Quarter Quadrangles of California.**
drg_24k_ca	**DRG (Digital Raster Graphics) for California**
EagleNZOrthos	**Eagle New Zealand Orthophotos**
eir	**Environmental Impact Report for Areas in California**
Maya Forest GIS	**Version 1 of the Digital Geographic Database for the Maya Forest Region of Mexico, Guatemala and Belize**
nznasa	**New Zealand Satellite Images**
rumsey	**David Rumsey Historical Map Collection**
sio	**Scripps Institute of Oceanography Data and Images**
us100000	**1:100,000-Scale Metric Topographic Map of the United States**
us250000	**1 x 2 Degree Series (Topographic)**

6 Glossary

AVHRR

Advanced Very High Resolution Radiometer: an image sensor on an earth satellite.

Channels

Multiple images captured by imaging sensors of the same location, at the same time, but at different wavelengths of light.

Collection-level metadata

A standardized description about a collection.

Datasets

Groups of data objects that may be described as a single unit. for example, the Encyclopedia Britannica.

Desktop Applications

Personal computer applications such as PhotoShop or Microsoft Word.

Gazetteer

Place name index showing an earth feature such as a city along with its geographic location.

Georectified

Spatial data that has been computer processed so as to match Earth locations exactly.

Image Map

A map that has its features presented photographically rather than hand or machine drawn.

Item-level metadata

Information about items in a collection, including an identifier that is unique within the collection.

Metadata

Information about a data object; a bibliographic catalog record describing the data unit.

Thesaurus

A classified list of terms, especially key-words, in a particular field, for use in indexing and information retrieval.

Tiles

Data that has been cut into "pages" so they can be viewed one at a time or stitched together.

Topographic maps

Maps that show contour lines of equal elevation in addition to other Earth features.

Appendix A

ADL Buckets - General Schema

CREATE TABLE ADL_fields_buckets (		
collection	varchar(25)	NOT NULL,
unique_identifier	varchar(30)	NOT NULL,
title	varchar(100)	NOT NULL,
last_updated	timestamp(14)	NOT NULL,
w_b_coord	float(9,3)	NOT NULL,
e_b_coord	float(9,3)	NOT NULL,
n_b_coord	float(9,3)	NOT NULL,
s_b_coord	float(9,3)	NOT NULL,
other_coords	varchar(255)	
subject_related_text	varchar(255)	
assigned_terms	char(1)	
assigned_terms_authority_list	varchar(50)	
originator	varchar(255)	NOT NULL,
type	varchar(25)	NOT NULL,
frmt	varchar(25)	NOT NULL,
beginning_date	date	NOT NULL,

ending_date	date	NOT NULL,
scale	int(11)	
mapname_quadname	varchar(25)	
other_info	varchar(255))	
TYPE=MyISAM		

Appendix B

The ADL Bucket Framework

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The Alexandria Digital Library Project, as part of its Digital Earth Prototype (ADEPT) effort, is developing a distributed digital library for georeferenced information. Key features of the library include a distributed, peer-to-peer architecture; services supporting federation and interoperation of collections and items; personalized "learning spaces" in which collections of pedagogical materials can be built, shared, organized, and incorporated into curricula; and explicit support for both very large and very small (i.e., personal, local) geospatial collections.

A key component of this architecture is a framework-the ADL "bucket" framework-for creating homogeneous views of heterogeneous metadata. The ADL bucket framework supports aggregation of semantically similar, strongly typed metadata fields into high-level "buckets" for the specific purposes of providing higher-level search and description functions. Notably, in mapping metadata fields to buckets, the mappings themselves are formally and explicitly represented by the system, and metadata semantics are preserved and carried throughout. The framework defines standard representations and bucket types, including sophisticated types such as the "geospatial" bucket type which supports description of geospatial regions and searching using spatial operations. The framework also defines a particular set of 10 buckets that have proven successful in capturing key searchable and descriptive characteristics of widely heterogeneous items, while having sufficient global applicability as to be easily populated. For example, the "Originator" bucket is defined to contain textual values (specifically, names) related to the origin of an item. One item may map the tuple (MARC 100 [Personal name], "Mark Twain") to the Originator bucket, while another may map the tuple (FGDC 1.1/8.1 [Citation/Originator], "U.S. Geological Survey") to the same bucket. In general, an item may map any number of typed (field, value) pairs to a bucket. The ultimate effect of such mappings is that clients of the library can choose to 1) operate at the high level of buckets (e.g., a client can simultaneously search multiple collections by Originator), or 2) operate at the native metadata level (e.g., search by and retrieve MARC 100 fields in a collection that supports such native metadata).

Several other approaches to metadata interoperability have been pursued in the past, and it is useful to compare the bucket framework to them. There have been comprehensive metadata standards that attempt to capture most of the nuances and breadth of a domain [MARC, FGDC]. There have been minimalist, high-level metadata standards [Dublin Core]. Other approaches have focused on automated translation of metadata [Stanford Infobus]. And still other approaches emphasize explicit representation of, and operation on, metadata semantics [RDF, Semantic Web].

The ADL bucket framework combines many aspects of these different approaches in a new and novel way. Like the Semantic Web, the bucket framework maintains representations of metadata semantics. But unlike the Semantic Web, the bucket framework provides a mechanism for aggregating metadata into higher-level, uniform abstractions. The bucket framework is notably similar to unqualified Dublin Core in that it provides a standard set of high-level fields. But it differs just as notably: to Dublin Core the bucket framework adds search-oriented fields, strong typing, and well-defined, rich search semantics. The bucket framework provides a refinement mechanism similar to qualified Dublin Core, but unlike the latter, the refined fields are not mandated by the system, but rather are simply discoverable in a standard way. Finally, the bucket framework is similar to automated metadata translation systems in that metadata is mapped from one form to another, but the bucket framework differs from the Stanford Infobus approach in that it is focused on the simpler problem of mapping arbitrary metadata to a common, higher-level form, as opposed to mapping arbitrary forms of metadata to one another.

The ADEPT logical view of the library is that of 1) many, distributed, collections of heterogeneous items, and 2) a central collection discovery service that clients can use to locate relevant collections. ADEPT employs a standard three-tier architecture in which clients connect to collections through a middleware server, which acts as a common access point and as a kind of broker. The middleware provides SDLIP-like search and retrieval services as well as services related to collection development. The ADL bucket framework is a common thread running throughout the tiers that provides a uniform view of the library. Specifically, at the lowest level individual items within collections map their native metadata to buckets. Collections accumulate and index the mapped metadata, thereby providing a search capability over their contents at both the bucket level and at the native metadata level. Collections also aggregate information and statistics about the metadata mappings employed by the items contained in the collection, and include such information in collection-level metadata for the benefit of clients and the collection discovery service. The middleware provides standard representations of arbitrary metadata and metadata mappings. The central collection discovery harvests collection-level metadata and builds a master index.

The ultimate effect of the ADL bucket framework is that clients of the library can, without relying on any *a priori* knowledge or out-of-band agreements, successfully search arbitrary collections at a uniform, high level. Furthermore, the types of search provided are far more capable than just text-based search. At the same time, the richness and semantics of the underlying native metadata are entirely preserved, and are discoverable and exploitable by clients in an entirely regular way.

Questionnaire

Thank you for your help

Your function:

Organisation, please choose one of the following:

□ University
□ Research Institution
□ Public Administration
□ Industry
□ Other

- Could you give us an indication of the frequency of using online digital libraries?:

  daily weekly monthly hardly ever

- Do you find the course valuable overall?

  Yes….. no…..

- Are you interested in the Alexandria Digital Library software for the purpose of managing any institutional or personal digital object collections?

Questions on the course

1. Please assess interest and difficulty of course content by giving the course modules one of the following values: High, Medium, Low.

- Introduction and Problem Background

  Interest High... Medium... Low...

  Difficulty High... Medium... Low...

- Alexandria Digital Library Architecture and technology sessions

  Interest High... Medium... Low...

  Difficulty High... Medium... Low...

- Case study and Hands-on sessions (lab sessions)

  Interest High... Medium... Low...

  Difficulty High... Medium... Low...

2. Any suggestions to improve the course?

- Content……………………………………………………………………………..
…………………………………………………………………………………………

- Form of exposition
…………………………………………………………………………………………
…………………………………………………………………………………………

- Organization………………………………………………………………………
…………………………………………………………………………………………..

3. Do you consider the Alexandria Digital Library software as applicable to your work environment?

   YES... Potentially... NO...

- If YES, please indicate what potential use you anticipate

  ....……………………………………………………
  …………………………………………………………………………………………

- If NO, please explain your negative answer and tell us if you have any suggestions on how to improve applicability of the ADL software

  ....……………………………………………………

……………………………………………………………………………………………

- Further comments

……………………………………………………………………………………………
……………………………………………………………………………………………….

4. Which services do you find most useful or innovative ?

❑ Spatial query/retrieval
❑ Collection management
❑ Distributed collection management
❑ Management of heterogeneous collections
❑ Query/retrieval of heterogeneous collections

5. What functionality, if any, would you like to see added to the ADL software

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……………………………………………………………………………………………….