

System Level Specification for the Digital Library System

Whitepaper
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Version 1.2

Revision History

Version #	Author	Date	Change History
Version 1.0	K. Cooper	July, 2001	-Initial version
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1 Introduction

The introduction section describes the scope of the Digital Library System (DLS), provides an overview of the system, and describes the conventions used in the document. The introduction section does *not* contain testable requirements. It is meant to provide a high level view of the specification and the system's behaviour for the reader.

1.1 Scope

This specification establishes the design, development, maintenance, performance, quality, delivery, and test requirements for the DLS.

The objectives of the DLS are to:

- a. support diverse items such as multimedia, music, performing arts, and visual art collections
- b. provide a paperless (digital) library of items that can be used by up to 500 remote users concurrently
- c. make library staff members more accessible to borrowers for reference assistance by providing remote meeting capabilities
- d. provide a modular system which can grow in function with minimal change to previously certified hardware and software.

The DLS will not be integrated with a conventional library system.

The DLS collection will be located at one site.

The DLS will interface with the Internet 2 by a gateway.

This specification covers the requirements for system performance and the technical characteristics of data processing, CHI, and digital communications. It does not cover the operational requirements for the system.

1.2 System Overview

A digital library is composed of diverse items including music, movies, visual art collections, electronic serials, and books (visual or audio). In the DLS, the digital items will be organized in a hierarchical structure (refer to Figure 1). At the top of the hierarchy, the digital library will be composed of one or more collections. A collection will be composed of one or more containers. A container will be composed of one or more items. For example, one of the collections may be a movie collection. In the movie collection, the containers may include comedy, drama, horror, action, and western. In the drama container, the items may include "Citizen Kane", "The Usual Suspects", or "The Negotiator".

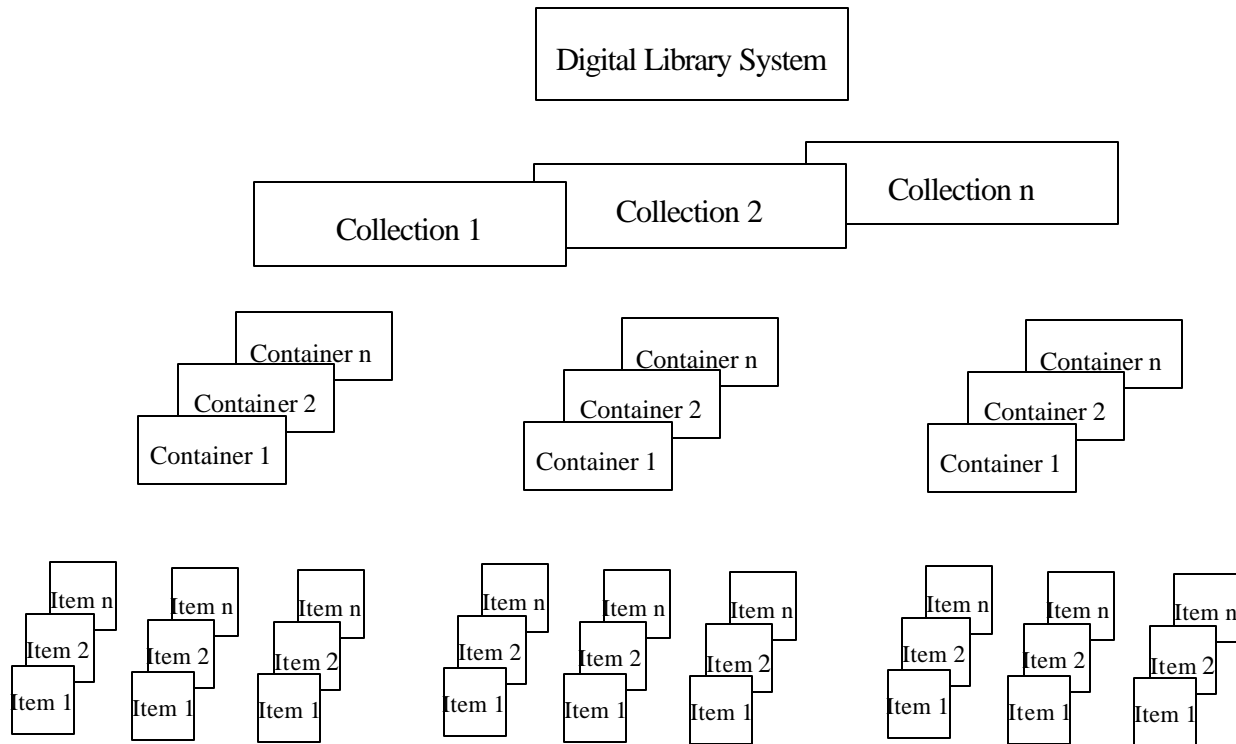


Figure 1. Hierarchical Organization of the DLS

The purpose of the DLS is to provide an integrated DLS that provides the following capabilities:

- a. circulation
- b. collection maintenance
- c. acquisitions
- d. reference service support
- e. statistical gathering and analysis on library operations
- f. system administration
- g. system security

The capabilities will be configurable for a specific type of library user. The types of library users shall include borrower, librarian level I, librarian level II, and system administrator. The account identifier and password will be used to control access to the system and identify the type of user.

The DLS will use Dublin Core, XML, EAD, and Z39.50 standards to describe, index, and search electronic resources.

In a digital library system, there is no need for some of the traditional library capabilities such as discharging, fines and overdue, booking, or holding an item. An item in the digital library may be

“charged” by many borrowers at the same time, unlike a physical copy of a book, for example, that can only be charged to one borrower at a time.

In addition, the digital items do not need to have some of the status options that a traditional catalogue item may need. For example, digital items that are charged to borrowers are not damaged and do not need to have a status option of “MENDING”. Digital serials do not get sent out to be bound and do not need to have a status of “BINDING”. Another difference in the status options is that a digital catalogue item is not “ON SHELF”. Instead, the status option “IN CATALOGUE” is going to be used.

In a traditional library system, the on-line catalogue is a separate database that is used to index the physical items (books, journals, maps, etc.) in the library. In a digital library, the metadata (catalogue) and items are integrated.

The DLS has four major components:

- a. Library Data Processing System (server)
- b. Library Station (client)
- c. External Interfaces
- d. System and Data Communications.

Each of these components is described in a section below.

1.2.1 Library Data Processing Subsystem

The Library Data Processing System (LDPS) will be a subsystem that supports the security, circulation (searching, browsing, charging one or more items from the digital library), collection maintenance, acquisitions, reference service support, statistical gathering and analysis on library operations, and system administration. The LDPS will be a server that can support a large number of users concurrently.

1.2.2 Library Station

The Library Station (LS) will be an integrated operational station where a library user logs on, interacts with the system, and then logs off. The LS provides a rich CHI for library users including a touch screen display, keyboard, pointing device, headset jack (headphone, microphone) for voice recognition and response, and a camera. The LSs will support all of the client functionality needed in the DLS including security, circulation, collection maintenance, acquisitions, reference service support, statistical gathering and analysis on library operations, and system administration. The LS will support the library user paying fees with a reloadable, smart card system.

The LSs will be located in University reading rooms and technical libraries across North America.

1.2.3 External Interfaces

The DLS will interface to other digital libraries and on-line reference databases with the Internet 2 via a gateway.

The DLS will allow access to and from the following digital libraries for interlibrary loan services:

- a. Techno-Digital-Library

- b. Artsy-Digital-Library
- c. Commerce-Digital-Library.

If a fee is required to charge an item using the interlibrary loan service, then the library user at the requesting library will pay the fee.

The DLS will interface with the following pay-per-use, electronic, reference databases:

- a. Everything for Arts reference database
- b. Computing reference database
- c. Commerce reference database.

The requesting library user will pay the fee for using a pay-per-use electronic, reference database.

The operational requirements for setting up the inter-library loan or pay-per-use agreements are beyond the scope of this document.

The DLS has an external interface to Smart Card Inc. The charging information for the fees will be collected in the Smart Card System and periodically submitted to collect the payment.

1.2.4 System and Data Communications

The DLS data communications environment will include a high speed, local area network and a gateway to connect the Internet 2. The DLS network will be secured using a two-tier firewall.

1.3 Context Diagram

The Context Diagram for the DLS shows the 12 actors (external interfaces) for the system. The actors are a mix of humans and other computing systems.

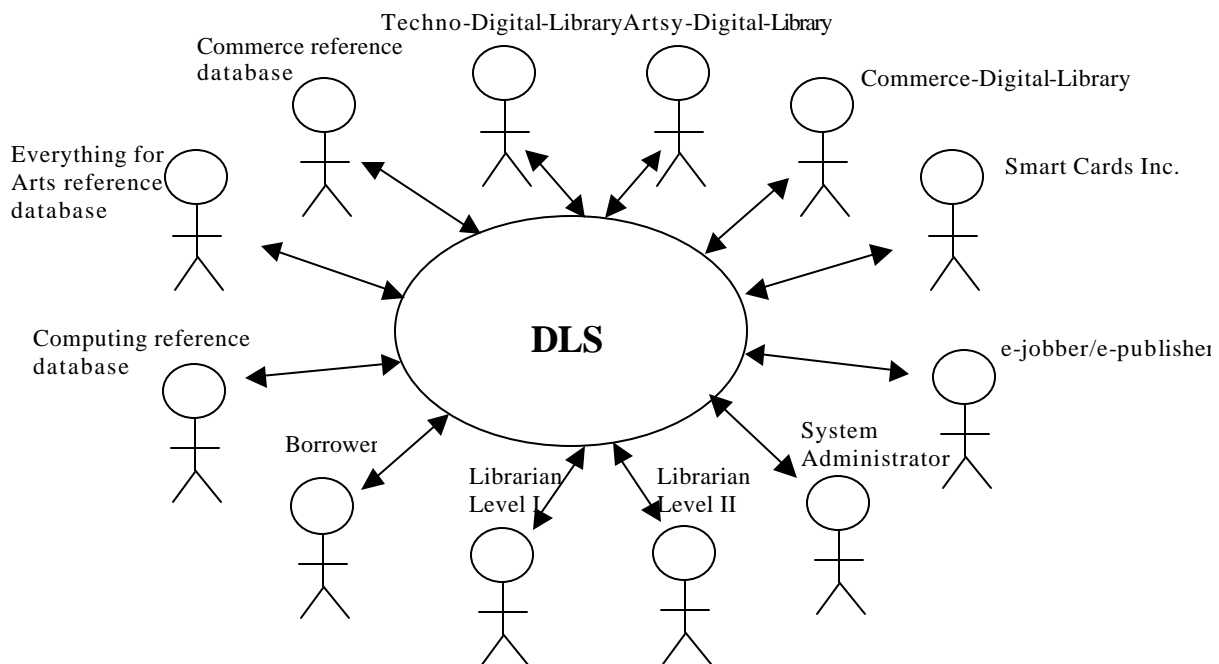


Figure 2. Context Diagram for DLS

1.4 System Concepts

1.4.1 Commercial off the Shelf Products

The DLS will use commercial off-the-shelf (COTS) products in the development wherever practical and possible. A COTS product refers to equipment or software that is available on the market, is listed in a commercial catalogue, is in stock by the contractor or a distributor, and has an established market. The market must not include beta testers.

A COTS product has complete documentation such as field reliability data, manuals, user guides, publications, engineering drawings, and part lists available.

COTS hardware that has minor modifications, such as drilling mounting holes, remains a COTS product.

COTS software that is modified by the development team (not the vendor) becomes a NON-COTS product.

1.4.2 Adaptation Data

This specification uses adaptation data to provide a flexible and dynamic capability to tailor the system. Adaptation data provides a means for designating the on-line allocation of specific set of functions or capabilities to workstations. For example, a librarian level I logging onto the system has access to capabilities (e.g., catalogue maintenance) that a borrower does not.

1.5 Conventions

This section describes the conventions used in this document.

1.5.1 Will vs. Shall

A statement that contains a testable requirement contains the word “shall”. A statement that contains a non-testable requirement contains the word “will”. The non-testable requirements typically provide additional information such as the intended definition of a term.

1.5.2 Requirements in a List Format

Requirements listed in a list format are a conjunction of the requirements in the list. For example, the following requirement:

[0090] The system shall provide the following circulation functions:

- a. Inquiry (searching)
- b. Browsing
- c. Charging
- d. Interlibrary loan.

is interpreted as:

The DLS shall provide the following circulation functions: inquiry (searching) and Browsing and Charging and Interlibrary Loan.

2 Functional Requirements

[0010] The functional areas of the DLS will include logging on/off, circulation, maintenance, acquisitions, reference, statistical summaries of how the library is used, and system administration capabilities. [0020] The functionality the DLS will provide in each of these areas is described in the following sections.

2.1 Logging On/Off

[0030] The DLS shall provide the capability that allows a library user to log onto the system with an identifier and a password. [0040] The identifier and password shall be used to determine which type of user is logging on (borrower, librarian level I, librarian level II, system administrator).

[0050] The DLS shall provide the capability that allows a library user to log off of the system.

[0060] If a library user remains idle for a period of time, then the DLS shall automatically log the library user off the system. [0070] A librarian level II and system administrator shall have the capability to configure the amount of time. [0080] The default value shall be 10 minutes.

2.2 Circulation

[0090] The system shall provide the following circulation functions:

- e. Inquiry (searching)
- f. Browsing
- g. Charging
- h. Interlibrary loan.

2.2.1 Inquiry (searching)

[0100] The DLS shall provide the capability that allows a library user who has successfully logged onto the system to make an inquiry request.

[0110] The DLS shall provide the capability that allows a librarian level I or librarian level II to make an inquiry into the customer database.

[0120] The DLS shall provide the capability that allows a library user to make an inquiry into the library collection.

[0130] The DLS shall provide the capability that allows a library user to select the computer human interface (CHI) that is used to make an inquiry.

[0140] The DLS shall provide the capability that allows a library user to select the computer human interface (CHI) that is used to provide the results of an inquiry.

[0150] The DLS shall provide the capability that allows a library user to make an inquiry request using a using either keyboard and pointing device or voice recognition.

[0160] The DLS shall provide the capability that allows a library user to print the results of an inquiry returned to the display on a printer. The printer shall be attached directly to the Library Station.

[0170] The DLS shall provide the capability that allows the library user to use basic Boolean operators (not, and, or) in the inquiries. The Boolean operators shall have the standard precedence.

[0180] The DLS shall provide the capability that allows a library user to make a new inquiry.

[0190] The DLS shall provide the capability that allows a library user to make an inquiry that applies to the results of a previous inquiry.

[0200] The DLS shall provide the capability that allows a library user to make an inquiry on all objects in the library.

[0210] The DLS shall provide the capability that allows a library user to make a hierarchical inquiry in the library.

[0220] The DLS shall provide the capability that allows a library user to make an inquiry for the set of collections in the library.

[0230] The DLS shall have the capability that allows a library user to make an inquiry for the set of containers in a collection in the library.

[0240] The DLS shall have the capability that allows a library user to make an inquiry for the set of objects in a container in the library.

[0250] The DLS shall provide the capability to retain the results of a maximum of 20 inquiries. After the maximum number of inquiries is reached, the results of the oldest inquiry will be lost.

[0260] The DLS shall provide the capability that allows the library user to select the maximum number of results displayed on a single page as 10/page, 15/page, or 20/page. The default value shall be 10/page.

[0270] The DLS shall provide the capability that allows the library user to clear the results of all inquiries from the display.

[0280] The DLS shall provide the capability to display the following for the results of an inquiry:

- a. Title
- b. Subject
- c. Description
- d. Type
- e. Source
- f. Relation

- g. Coverage
- h. Creator
- i. E-publisher
- j. Format
- k. Contributor
- l. Rights
- m. Date
- n. Identifier
- o. Language
- p) Status
- q) Container id
- r) Collection id
- s) Charging fee

[0290] The DLS shall provide the capability that allows a librarian level I, librarian level II, or a system administrator to make an inquiry into the customer (site) database for the following information:

- a. name
- b. address
- c. telephone number
- d. unique site identifier
- e. geographic code
- f. category
- g. status
- h. where registered
- i. date registered
- j. note.

[0300] The DLS shall discard the inquiries of the library user when the user logs off (manual or automatic log off).

[0310] The DLS shall discard the inquiry configuration changes made by a borrower when the borrower logs off.

[0320] The response time for an inquiry shall be Class 1. This performance will be measured from the time the request is made to the time the results are provided to the user.

[0330] There will be no fee for making an inquiry.

2.2.2 Browsing

[0340] Browsing in a digital library will mean to obtain part of the digital copy of an item in the catalogue. The part of the item will depend on the type of the item.

[0350] The DLS shall provide the capability to allow library users who have logged onto the system to browse an item in the catalogue.

[0360] If the library user requests to browse a book, then the table of contents and/or the first chapter of the book shall be provided. [0370] The DLS shall provide the capability to allow the library user to select one or both of the two part(s) to provide.

[0380] If the library user requests to browse a journal or conference article, then the abstract of the journal item shall be provided.

[0390] If the library user requests to browse a journal or a conference proceedings, then the table of contents shall be provided.

[0400] If the library user requests to browse a movie, then the trailer for the movie shall be provided.

[0410] If a library user requests to browse a music album, then the list of tracks and/or the first title track shall be provided. [0420] The DLS shall provide the capability to allow the library user to select one or both of the two part(s) to provide.

[0430] If the library user requests to browse a visual art collection, then a description of the collection and a random selection of five images in the collection shall be provided. [0440] The description shall be either audio or textual.

[0440] The DLS shall provide the capability that allows the library user to select one or more items for browsing from the results of an inquiry.

[0450] The DLS shall provide the capability to retain the results of a maximum of 20 browsed items. [0460] After the maximum number of browsed items is reached, the oldest browsed item will be lost.

[0460] The library user will not be allowed to browse two or more items concurrently.

[0470] The DLS shall provide the capability that allows the library user to stop browsing the item. The library user will not be forced to completely browse the part of the item provided.

[0480] The DLS shall provide the capability that allows the library user to select the next item to browse from the results of an inquiry.

[0490] The DLS shall provide the capability that allows the library user to clear the results of all browsed items from the display.

[0500] The DLS shall discard the browsed items of the library user when the user logs off (manual or automatic log off).

[0510] The DLS shall provide the capability that allows the library user to display the fee for charging a browsed item.

[0520] The response time for browsing an item shall be Class 1. [0530] This performance will be measured from the time the request is made to the time when the browsed item starts to be provided to the library user.

[0530] There will be no fee for browsing.

2.2.3 Charges

[0540] The DLS shall provide the capability that allows library users who have logged on to the system to charge items. [0550] Charging an item in a digital library will mean to request a complete, digital copy of an item.

[0560] The DLS shall provide the capability that allows library users to charge one or more items that are selected from the results of an inquiry.

[0570] The DLS shall provide the capability that allows a library user to charge one or more items that are selected from browsing.

[0580] The DSL shall provide the capability that allows a borrower to charge an item if all of the following conditions are met:

- a. DLS client account exists
- b. DLS client's account status is valid
- c. item exists in the catalogue
- d. item's status is "IN CATALOGUE"
- e. there are sufficient funds on the library user's Smart Card to pay the charging fee.

[0590] Each item that is charged shall have a unique identifier. [0600] The system shall provide audible and visual signals to indicate the successful completion of a charge operation.

[0610] The DLS shall provide the capability to support charging fees when an item is charged.

[0620] The fee for charging shall be defined for each item in the library.

[0630] The DLS shall provide the capability that allows a library user to print out a charged item.

[0640] The DLS shall provide the capability that allows a library user to save a copy of the charged item.

[0650] There will not be a loan period for items charged out.

[0660] The system will not have the capability to maintain a historical list of the items charged out by a particular borrower.

[0670] The system shall produce Audio-Visual error signals during charging when:

- a. the record does not exist for the unique DLS client account identifier
- b. the item record does not exist for the unique item identifier entered
- c. the item has status other than "IN CATALOGUE"

- f. there are insufficient funds on the library user's Smart Card to pay the charging fee.

[0680] The system shall provide an indication of which of the above errors occurred.

[0690] The response time for each charge shall be Class 1.

2.2.4 Interlibrary loan

[0700] The DLS shall provide the capability that allows a library user to inquire, browse, and charge an item that belongs to one of the following digital libraries:

- a. Techno-Digital-Library
- b. Artsy-Digital-Library
- c. Commerce-Digital-Library.

[0710] The DLS shall provide that capability that allows external libraries with borrowing privileges to inquire, browse, and charge items remotely. [0720] The library user at the external library will be responsible for paying the fee for charging an item.

[0730] The DLS shall provide the capability to maintain the following, separate statistics for interlibrary loan usage on a per library basis:

- a. number of borrowing transactions
- b. number of lending transactions.

2.3 Catalogue Maintenance

[0740] The DLS shall provide the capability that allows a librarian to add an item and its metadata to the digital library database.

[0750] The DLS shall provide the capability that allows a librarian to modify the metadata.

[0760] The DLS shall provide the capability that allows a librarian to delete any item and its metadata.

[0770] The DLS shall provide the capability that allows a librarian to use forms to edit when adding, modifying, or deleting metadata.

[0780] The DLS shall provide the capability that allows a librarian to use forms to edit when adding or deleting an item.

[0790] The DLS shall provide the capability that allows a librarian to select one or more items from the results of an inquiry to edit or delete the catalogue entries.

[0800] The DLS shall conform to the Dublin Core standard.

[0810] The DLS shall conform to the XML standard.

[0820] The DLS shall conform to the EAD standard.

[0830] The DLS shall provide the capability that allows a librarian to add a container.

[0840] The DLS shall provide the capability that allows a librarian to rename a container.

[0850] The DLS shall provide the capability that allows a librarian to move a container to a different collection.

[0860] The DLS shall provide the capability that allows a librarian to delete a container.

[0870] The DLS shall provide the capability that allows a librarian to add a collection.

[0880] The DLS shall provide the capability that allows a librarian to rename a collection.

[0890] The DLS shall provide the capability that allows a librarian to delete a collection.

[0900] The DLS shall provide the capability that allows a librarian to traverse the hierarchical structure of the library.

2.4 Acquisitions

[0910] The DLS shall provide the capability that allows a librarian level II to order new items for the library system. [0920] The new items will include digital books, audio books, digital serials, movies, music, digital art collections, and special collection additions.

[0930] The DLS shall provide the capability that allows a librarian level II to access e-publisher's on-line databases through the Internet. [0940] The e-publishers will provide access to their databases.

[0950] The DLS shall provide the capability that allows a librarian level II to copy and paste the data displayed from these databases into the current acquisition list.

[0960] The DLS shall provide the capability that allows a librarian level II to modify the contents of the acquisition list.

[0970] The DLS shall provide the capability that allows a librarian level II to create, modify and delete an acquisition plan.

[0980] The DLS shall provide the capability that allows a librarian level II to select items from the current acquisition list to include in the acquisition plan.

[0990] The information for each item shall include:

- a. e-jobber/e-publisher
- b. list price
- c. order type (rush, normal)
- d. payment type (bill, prepayment, standing order)
- e. title

- f. author or artist
- g. copyright date
- h. unique identifying number (OCLC/RIN, ISBN, ISSN,...)
- i. note.

[1000] The DLS shall provide the capability to maintain a discount matrix available for a minimum number of e-jobbers. [1010] The minimum number of e-jobbers shall be adaptable in the system and have a default value of twenty. [1020] The DLS shall provide the capability to edit this matrix.

[1030] The DLS shall provide the capability to calculate the cost of purchasing all of the items on the acquisition plan. [1040] The system shall calculate the cost using the discount matrix.

[1050] The DLS shall provide the capability to sort the acquisition plan by e-publisher and create a purchase order for each e-publisher.

[1060] The DLS shall provide the capability to enter a cancellation date on the purchase order.

[1070] The DLS shall provide the capability to update the status of an item on order. [1080] The status codes shall include:

- a. OO on order
- b. BOS back order, temporarily out of stock
- c. BON back order, not a stocked item
- d. BOWR back order, title is not available and will be shipped when ready
- e. BOPO back order, e-publisher out of stock
- f. RES back order received; will be shipped in next back order shipment
- g. PEND pending, title is in the process of being shipped and billed
- h. OP out of print , canceled
- i. OD order direct, canceled
- j. S subscription, order direct, canceled
- k. PNS e-publisher not supplied, canceled
- l. TNS title not supplied, canceled
- m. PFR e-publisher failed to respond, canceled
- n. PC publication canceled, canceled
- o. CF cannot find, canceled
- p. NOP not publication of e-publisher, canceled
- q. POS e-publisher out of stock
- r. TOS temporarily out of stock, canceled due to cancellation date on order
- s. REC received.

[1090] The DLS shall provide the capability to automatically generate a claims notice for items order but not received within a claim notice period from an e-jobber/e-publisher. [1100] The claim notice period shall be adaptable in the system and have a default value of thirty days.

[1110] The DLS shall provide the capability to automatically generate a cancellation notice for items on order but not received within the cancellation notice period from a e-jobber/e-publisher.

[1120] The cancellation notice period shall be adaptable in the system and have a default value of forty five days.

[1130] The DLS shall provide the capability that allows a librarian level II to record the receipt of ordered items in a receipt report. [1140] The DLS shall provide the capability that allows the librarian level II to enter the receipt of damaged items or incorrectly filled orders and the status of back-ordered, pending, or canceled items.

[1150] The DLS shall provide the capability that allows a librarian level II to print or e-mail the acquisition list, acquisition plan, purchase orders, claims notice, cancellation notice, and the receipt report.

[1160] The DLS shall provide the capability that allows a librarian level II to maintain a list of e-jobbers/e-publishers. [1170] The required information for each e-jobber/e-publisher shall include:

- a. e-publishing company's name
- b. e-publishing company's code
- c. e-publishing company's electronic address for sending orders
- d. e-publishing company's postal address for sending orders
- e. e-publishing company's postal address for sending payments.

[1180] The DLS shall provide the capability that allows the librarian level II to query the list of e-jobbers/e-publishers that have not been ordered from in the last 24 months. [1190] The DLS shall provide the capability that allows a librarian level II to select from the results of this query and delete a e-jobber/e-publisher from the list.

[1200] The DLS shall provide the capability that allows a librarian level II to query the ordering activity for each e-jobber/e-publisher. [1210] The DLS shall provide for each e-jobber/e-publisher:

- a. e-publishing company's name
- b. e-publishing company's code
- c. Average number of days from order of item to receipt of item
- d. Dollars paid and balance owing
- e. Cost per volume for adult (fiction and non-fiction) and juvenile (fiction and non-fiction) works for year to date.

2.5 Reference Support

[1220] The DLS shall provide the capability that allows library users to access the following pay-for-use reference databases:

- a. Everything for Arts reference database
- b. Computing reference database
- c. Commerce reference database.

[1230] To pay for the fee, the library user shall provide a reloadable, smart card with sufficient funds on it before obtaining the item.

[1240] The DLS shall provide the capability for reference librarians to interact with their clients using remote meeting facilities.

[1250] The remote meeting capabilities shall be implemented using a COTS product.

[1260] The initial deployment of the system shall provide video-conferencing capabilities to satisfy the remote meeting requirements. [1270] The subsequent deployment of the system shall provide tele-immersion capabilities to satisfy the remote meeting requirements.

2.6 User Account Maintenance

[1740] The DLS shall provide the capability that allows a system administrator to add a user account.

[1750] The DLS shall provide the capability that allows a system administrator to modify a user account.

[1760] The DLS shall provide the capability that allows a system administrator to view a user account.

[1770] The DLS shall provide the capability that allows a system administrator to delete a user account.

3 Non-Functional Requirements

3.1 Communications Functional Area

[1280] The hardware for the DLS shall be configured as a multi-user information system with a communications processor.

[1290] The communications processor will be a special purpose computer that manages the transmission and receipt of data between the main computer and the library-service stations. [1300] The communications processor will also serve as a lan/wan gateway to connect the DLS with the Internet 2.

[1310] The DLS shall use a 100 Base T local area network.

[1320] The DLS shall use the Z39.50 standard.

[1330] The Z39.50 standard shall be implemented using a COTS product.

3.2 Library Station Functional Area

[1340] 10 LS units shall be deployed in the DLS. [1350] Each shall have a monitor, keyboard, built-in pointing device, optical scanner, microphone headphone jack, soundboard, speakers, high density floppy disk drive, zip drive, DVD-ROM, and camera.

[1360] A laser printer shall be provided with each LS. [1370] The laser printers shall:

- a. be black and white
- b. have 1200 dots per inch resolution
- c. print at least 12 pages/minute.

[1380] The printers shall support an accounting device that uses reloadable smart cards. [1390] The use of this accounting device for print fees shall be optional.

[1400] The hardware shall be COTS products.

3.3 Firmware

[1410] The system shall use the NT operating system.

[1420] The operating system shall be implemented using a COTS product.

3.4 Database

[1430] A single database shall be implemented to store the items and metadata for the system.

[1440] Circulation, maintenance, public catalogue services, acquisitions, serials, and reference services shall use the same database.

[1450] The DLS shall provide the capability that allows a system administrator to backup and restore the database.

[1460] The database shall support the XML standard.

[1470] The database shall support the SQL standard.

[1480] The database shall support 10,000 transactions per second.

[1490] The database shall support storing 500,000 items and their metadata.

[1500] The database shall be implemented using a COTS product.

3.5 CHI

[1510] The computer human interface shall include the following devices:

- a. QWERTY keyboard with built-in pointing device
- b. voice recognition system that shall be speaker independent and continuous-speech
- c. touch screen monitor shall be an integrated unit using five-wire resistive technology and a stylus
- d. standard jack for headphones
- e. thirty two bit sound board.

[1520] Users will provide their own headphone set.

3.6 Performance

[1530] Class 1 performance has a mean response time of two seconds and a maximum response time of five seconds.

[1540] Class 2 performance has a mean response time of four seconds and a maximum response time of seven seconds.

[1550] Class 3 performance is for batch type operations, such as backing up or restoring a database.

3.7 Capacity

[1560] The system shall be capable of managing at least 500,000 items of the library collection.

[1570] The system shall have the capacity for at least 1,000 individual accounts.

[1580] The system shall be capable of processing 10,000 transactions per hour.

3.8 Availability

[1590] The DLS shall provide 4 nines availability.

3.9 Maintainability

[1600] TBD.

3.10 Safety

[1610] TBD.

3.11 Security

[1620] The I/O devices on the LS shall be physically secured against theft.

[1630] The DLS shall be secured with an identification and password authentication.

[1631] The LDPS of the DLS shall be secured with a 2-tier firewall.

3.12 Process Requirements

3.12.1 Delivery Requirements

[1640] The system shall be delivered with a complete set of documentation for the system written in English. [1650] The documentation shall be available on-line.

3.12.2 Implementation Requirements

[1660] The DLS shall be implemented with an object oriented language.

[1670] The process and deliverables for the DLS shall be in compliance with MIL-STD 498.

[1680] The DLS shall be developed using a requirement specification approach that partitions the system from the user's point of view.

[1690] The DLS shall be implemented using an object oriented approach for the design and implementation of the DLS.

[1700] The DLS shall be implemented in an iterative development lifecycle using three iterations.

3.13 External Requirements

3.13.1 Legislative Requirements

[1710] The DLS shall comply with the privacy of information legislation that is current at the time of the final delivery of the system.

[1720] The DLS shall comply with the safety legislation that is current at the time of the final delivery of the system.

3.13.2 External Interfaces

[1730] The DLS shall send and receive data to and from the following external systems:

- a. Techno-Library
- b. Artsy-Library
- c. Commerce-Library
- d. Everything for Arts reference database
- e. Computing reference database
- f. Commerce reference database
- g. Smart Cards Inc.
- h. E-publishers/E-jobbers

4 Bibliography

K. Cooper, "System Level Specification for an Automated On-Line Library System", Engineering notes, available from author.

Michael D. Cooper, Design of Library Automation Systems, John Wiley & Sons, Inc., USA, 1996.

John Corbin, Implementing the Automated Library System, The Oryx Press, USA, 1988.

Edwin M. Cortez, Proposals and Contracts for Library Automation: Guidelines for Preparing RFP's, Pacific Information Inc., USA, 1987.

Department of Defense, "Military Standard Software Development and Documentation", MIL-STD-498, 1994.

David C. Genaway, Integrated Online Library Systems: Principles, Planning, and Implementation, Knowledge Industry Publications, USA, 1984.

Ian Sommerville, Software Engineering, fourth edition, Addison-Wesley Publishing Company Inc., USA, 1992.

S. Weibel, J. Kunze, C. Lagoze, and M. Wolf , “Dublin Core Metadata for Resource Discovery”, RFC 2413, 1998.

Appendix A. Glossary

Dublin Core (RFC 2413)

The Dublin core metadata defines 15 elements fall into three groups: (1) elements related mainly to the Content of the resource, (2) elements related mainly to the resource when viewed as Intellectual Property, and (3) elements related mainly to the Instantiation of the resource.

Content	Intellectual Property	Instantiation
Title	Creator	Date
Subject	Publisher	Format
Description	Contributor	Identifier
Type	Rights	Language
Source		
Relation		
Coverage		

EAD – Encoded Archival Description. The EAD Document Type Definition (DTD) is a standard for encoding archival finding aids using the Standard Generalized Markup Language (SGML).

MARC machine-readable cataloging (MARC) records Z39.2/ISO 2709

DTD – Document Type Description (also called Document Type Declaration). A structured way to describe the contents of a document. A document can be an article, a chapter, a page, or even a paragraph.

XML – Extensible Markup Language. An encoding language designed for structured messages. Consists of paired tags that indicate the beginning and the end of a data element. XML messages are text. XML is based on SGML.

SGML – Standard Generalized Markup Language. A standard for an encoding language for document markup. SGML consists of a series of tags that identify parts of documents, based on a DTD. SGML markup does not prescribe how documents are displayed. ISO Standard 8879.

HTML – Hypertext Markup Language. A series of markup symbols included in a document to define how it displays on the World Wide Web. HTML is based on SGML.

XSL – Extensible Style Language. A style-sheet language for XML documents that determines how they will display in browsers.

Z39.50 – “Information Retrieval (Z39.50) Application Service Definition and Protocol Specification”. Standard is represented as both ANSI/NISO Z39.50 and ISO 23950 (version 3).

Appendix B. Architectural Notes

