Library of Congress
Portals Applications Issues Group*

**Functional Requirements for an OpenURL Resolver
for the Library of Congress**

November 4, 2003

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(LCPAIG), visit the LCPAIG Web home page at: http://www.loc.gov/catdir/lcpaig/paig.html

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Functional Requirements for an OpenURL Resolver
for the Library of Congress
(M: Mandatory; D: Desired)

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1. General Requirements

1.1	M	Provision of context-sensitive linking services to Library users in a manner understandable to the novice user
1.2	M	Ability to accept and parse OpenURLs from heterogenous sources/referrers
1.3	M	Ability to use heterogeneous electronic resources as target content providers (e.g., unrestricted web resources, restricted web resources, citation databases, databases with digitized full content, local databases, etc.)
1.4	M	Ability to configure service requests sent to target content providers using whatever protocols or mechanisms are appropriate
1.5	M	Ability to populate services menu with links to digital full content and a variety of extended services
1.6	M	Ability for the Library to customize its resolver knowledge database
1.7	M	The OpenURL resolver must run as an independent application
1.8	M	Vendor commitment to implement the proposed OpenURL standard version 1.0 (as developed by the NISO Standards Committee AX and in a trial use period through October 2003) within six months after approval by the NISO process
1.9	M	Vendor commitment to ensure that backwards compatibility with the current OpenURL version 0.1 is supported after implementation of OpenURL version 1.0
1.10	D	For Library users following citations containing DOIs in full text resources, ability for the resolver to interact with DOI registration agency servers to redirect OpenURLs with DOIs back to the Library's OpenURL resolver, enabling users to access the "appropriate LC copy" of the cited full text or other services

2. Knowledge Database Requirements

2.1 Knowledge Database: General Structure and Administration

2.1.1	M	Provision of a knowledge database initially populated by vendor-maintained knowledge database metadata
2.1.2	M	Provision of a knowledge database initially populated with at least 25 sources/referrers, 50 target content providers, and at least 10,000 target journal titles
2.1.3	M	Ongoing support for reliable vendor-maintained knowledge database metadata
2.1.4	M	Ability to load vendor-supplied records of knowledge database metadata in both batch and online modes
2.1.5	M	Ability to load the Library's customizations to vendor-supplied records of knowledge database metadata in both batch and online modes
2.1.6	M	Ability to load records of knowledge database metadata created by the Library in both batch and online modes
2.1.7	M	Ability to load knowledge database metadata expressed in an open format (e.g., through specified XML schema) in a batch mode
2.1.8	M	Ability to export the contents of the knowledge database in an open format (e.g., into specified XML schema)

2.1.9	M	Ability to manage knowledge database metadata customized by the Library, including the ability to protect the Library's customizations when regularly refreshing metadata from files received from vendor and other commercial sources (e.g., Serials Solutions, TDNet, electronic resource management systems, etc.)
2.1.10	M	Ability for Library applications to access the knowledge database using SQL and ODBC
2.1.11	M	Ability for the Library to manage the process of adding, merging, and deleting knowledge database metadata
2.1.12	M	Full Unicode compliance in the knowledge database, providing support for multiple languages and character sets
2.1.13	M	Ability for administrators to browse lists of sources/referrers, target content providers, target journal titles, and services. This includes the ability to view a list of individual target journal titles contained in a target content provider.
2.1.14	D	Ability for administrators to search descriptions of sources/referrers, target content providers, target journal titles, or services by keyword
2.1.15	D	Ability to integrate knowledge database metadata received by the Library from more than one source, including metadata received from the vendor and other commercial sources (e.g., Serials Solutions, TDNet, electronic resource management systems, etc.)
2.1.16	D	Ability to identify duplicate sources/referrers, target content providers, target journal titles, and services. Identification of duplicates should not, however, prevent the Library from creating records for different versions of resources (e.g., the East Coast and West Coast versions of a newspaper which are indexed by different aggregators)
2.1.17	D	Support for tools to programmatically calculate embargo periods or "moving wall" coverage dates for holdings/coverage information, which can be overridden if necessary
2.1.18	D	Vendor-supplied parsers and configuration files should be written in non-proprietary programming languages and be available as templates for local customization or support for new sources/referrers, target content providers, and services
2.1.19	D	Ability to match an incoming OpenURL which contains either a print or electronic ISSN to the appropriate target journal title
2.1.20	D	Ability to enhance incoming OpenURLs with appropriate knowledge database metadata (e.g., to supply missing ISSNs to incoming OpenURLs, to provide full titles when incoming OpenURLs only carry abbreviated titles, etc.)
2.1.21	D	Support for OpenURL resolver-to-resolver communications. This includes the ability to exchange knowledge database metadata to enhance incoming OpenURLs which contain only identifier metadata (e.g., by requesting reverse lookups for metadata such as title, author, and referent from services such as CrossRef, PubMed, etc.)
2.1.22	D	Ability to add local knowledge database metadata elements defined by the Library
2.1.23	D	Ability to harvest resource descriptions using OAI-PMH
2.1.24	D	Ability to export knowledge base metadata for OAI-PMH harvesting
2.1.25	D	Ability for users to access services through processes other than OpenURL requests from sources/referrers (e.g., through web forms that create OpenURLs from citation information keyed by users, web search forms that query the knowledge database for specific metadata such as target journal title information, etc.)

2.2 Knowledge Database: Sources/Referrers

2.2.1	M	Knowledge database metadata for sources/referrers must include, at a minimum: source name and fixed unique identifier
2.2.2	M	Ability for the Library to modify vendor-defined parsers for incoming OpenURLs
2.2.3	M	Ability for the Library to create parsers for incoming OpenURLs

2.2.4   M   Support for character encoding transformations for vendor-supported sources/referrers, as appropriate

2.2.5   D   Support for fuzzy logic which improves the matching of incoming OpenURLs to the knowledge database. This logic should not, however, generate false matches.

2.3 Knowledge Database: Target Content Providers

2.3.1   M   Knowledge database metadata for target content providers must include, at a minimum: name of target content provider, fixed unique identifier, linking information, supported services (such as availability of full digital content, abstracts, or tables of contents; web searches; OPAC searches; etc.), and sufficient access management metadata to enable the generation of service requests which recognize user roles. If appropriate, contact and activation information must also be provided.

2.3.2   M   Ability for the Library to modify vendor-defined configuration files for outgoing service requests to target content providers

2.3.3   M   Ability for the Library to create configuration files for outgoing service requests to target content providers

2.3.4   M   Ability to create more than one record for the same target content provider to enable the generation of service requests using different protocols or search parameters (e.g., for testing alternatives to vendor-provided search configurations)

2.3.5   M   When sending service requests to a target content provider, support for character encoding transformations, as appropriate, for vendor-supplied target content providers

2.3.6   M   When sending service requests to a target content provider, ability to normalize, as appropriate for the target content provide, the punctuation and spacing present in selected metadata elements (e.g., for ISSNs and ISBNs)

2.3.7   M   When sending service requests to a target content provider, ability to transform, as necessary, the character encoding present in an incoming OpenURL to an encoding supported by the target content provider

2.3.8   D   When sending service requests to a target content provider, ability to retain or transform (as appropriate for the target content provider) the case, punctuation, spacing, diacritics, special characters, and non-Roman characters present in an incoming OpenURL for selected metadata elements (e.g., authors and titles).

2.4 Knowledge Database: Target Journal Titles

2.4.1   M   Knowledge database metadata for target journal titles must include, at a minimum: journal title, fixed unique identifier, alternate title(s), publisher, standard identifiers (ISSNs) for electronic and print versions, activation information, local electronic holdings, and local print holdings

2.4.2   M   Ability to associate target journal titles with appropriate target content providers

2.4.3   M   Ability to construct appropriate links for outgoing service requests at the target journal title level or the journal article level

2.5 Knowledge Database: Services

2.5.1   M   Knowledge database metadata for services must include, at a minimum: name of service, fixed unique identifier, type of service, and OpenURL metadata required by the service

2.5.2   M   Ability to link to full digital content, where reasonably implemented by target content providers. If target content providers have not implemented full digital content links, the service must support the most granular link available (e.g., journal issue-level link, then title-level link, and finally a link to target content provider-level search page).

2.5.3   M   Ability to link to digital full content accessible through the Library (i.e., appropriate local copy) as well as to digital full content available through other means
2.5.4   M   Ability to link to common web services (e.g., OPACs, web search engines, tables of contents, abstracts, online bookstores, fee-based document delivery services, interlibrary loan applications, Library A-Z name/title lists, Library online reference services, etc.)
2.5.5   M   Ability to link to the Library's Endeavor OPAC bibliographic records and holdings information
2.5.6   M   Ability for the Library to add any web-accessible service

2.6   Knowledge Database: Recognition of User Role Information
2.6.1   M   Ability to specify roles or classes of users (e.g., Library staff, Library patrons, Congressional staff, etc.)
2.6.2   M   Ability to configure the services presented to users through the application of user authentication and user role information. Configuration options include the ability to display services and enable user access to digital full content, to display services without enabling user access to digital full content, or to suppress services and access to digital full content.
2.6.3   D   Service requests should securely pass to target content providers only that user information necessary to fulfill the service request. This information should be passed in a manner that takes information only when necessary, takes as little information as possible, and ensures that the information passed does not expose the target content provider to vulnerability.

3.   Services Menu Requirements

3.1   Services Menu: General Requirements
3.1.1   M   Ability for services menu to work in a browser-neutral environment (e.g., with support for various versions of Internet Explorer, Netscape, Opera, Safari, etc.)
3.1.2   M   Ability for services menu to work on a variety of hardware platforms (e.g., PC, tablet PC, laptop, etc.) running various operating systems and versions (e.g., Windows, Mac, Linux, etc.)
3.1.3   M   Compliance with ADA/Section 508 standards, including text equivalents for non-text elements (e.g., "alt" text for icons, graphics, Java applets, etc..)
3.1.4   D   Full Unicode compliance in services menu, providing support for multiple languages and character sets (including support for character set conversions and for non-Roman scripts with right-to-left displays)
3.1.5   D   Support for browser-specified fonts and/or non-standard keyboards (e.g., for non-Roman scripts)

3.2   Services Menu: Configuration Requirements
3.2.1   M   Ability for the Library to create various services menus to support different user communities
3.2.2   M   Ability for the Library to customize labels, buttons, branding (e.g., headers, footers, etc.)
3.2.3   M   Ability for the Library to configure services menu displays in a manner that helps users select the services most useful to their research (e.g., by grouping similar services, controlling the display order of services, etc.)

3.2.4	M	Ability to apply filters to queries sent to search services, as appropriate (e.g., to send an author search to the Library's OPAC or to Amazon, to apply a location limit to a Google search, etc.)
3.2.5	M	Ability for the Library to present a set of services based on metadata elements in incoming OpenURLs (e.g., to present different services if the OpenURL referent is a book, a journal article, etc.)
3.2.6	M	Ability for users to generate more complete OpenURLs for referent citations by editing the citation's metadata in a web form before requesting services
3.2.7	M	When full digital content is available and accessible to Library users, ability to move directly to this content, bypassing a services menu
3.2.8	D	Ability for the Library to suppress selected services dependent on presence of other services (e.g., to suppress document delivery if digital full content is available)
3.2.9	D	Ability for the Library to configure the display of the referent citation in a services menu (e.g., data elements included, case, punctuation, spacing, etc.)
3.2.10	D	Ability for users to export referent citations and OpenURLs to bibliographic management applications (e.g., ProCite, EndNote, RefWorks)
3.2.11	D	Ability to present users with services menus that combine services from multiple OpenURL resolvers (e.g., the ability for the Library's Congressional Research Service to present their users with services from their own SFX resolver and services offered by LC's resolver for target journal titles held jointly by both CRS and LC)

3.3   Services Menu: Navigation Requirements

3.3.1	M	Navigation among service menu choices must be understandable by the novice user
3.3.2	M	Appropriate use of new browser windows (e.g., when linking to services such as OPACs, web search engines, or full digital content)

4.   Help Facilities and Error Messages for End Users

4.1	M	Ability for the Library to provide assistance through context-sensitive help messages or FAQ pages on services menus for different classes of users
4.2	D	Availability for system failures to generate context-sensitive error messages using language understandable by the novice user (e.g., for invalid incoming OpenURLs, for failed attempts to link to services, for access control problems, etc.)

5.   Documentation and Training for Administrators

5.1 Documentation for Administrators

5.1.1		Availability of comprehensive machine-readable documentation, with permission to excerpt and adapt this documentation for Library use, including:
5.1.1.1	M	- functional descriptions of major components (e.g., knowledge database management, services menu configuration, etc.)
5.1.1.2	M	- vendor methods for parsing incoming OpenURLs and configuring outgoing service requests to target content providers
5.1.1.3	M	- Library options for modifying vendor-supplied parsers for incoming OpenURLs and configurations for outgoing service requests to target content providers
5.1.1.4	M	- methods for recognizing user authentication and user role information

5.1.1.5	M	- system-level options for customizing the application, including tools for transferring local customizations to upgraded software
5.1.1.6	M	- system transaction processing, including available statistics
5.1.1.7	M	- system level diagnostic and recovery tools
5.1.1.8	M	- application troubleshooting tools

5.2 Demonstrations and Training

5.2.1	M	Availability of onsite or easily accessible demonstrations and training sessions for the application (e.g., how to use the application, configuration options, etc.)

6. Administration and Vendor Support

6.1 Hardware and Software Requirements

6.1.1	M	Compatibility with the Library's IT security policies and technical environment
6.1.2	M	Provision for complete and robust recovery in case of operating system failure
6.1.3	M	Ability to interoperate with proxy servers and other user authentication systems
6.1.4	M	Ability to interoperate with a variety of portal metasearch applications (e.g., Endeavor's ENCompass, ExLibris' MetaLib, Blue Angel's Metastar, TDNet's TES, etc.)
6.1.5	M	Ability for the Library to host application
6.1.6	M	Identification of software components licensed from third-party sources, to facilitate impact assessments of third-party software on the application's rate of development

6.2 Application Administration

6.2.1	M	Ability to store sensitive information securely (e.g., target content provider passwords, administrative user authentication information, etc.)
6.2.2	M	Provision of tools for system customization, system configuration, system monitoring, troubleshooting, and reporting
6.2.3	M	Provision of a secure web-accessible administrator interface
6.2.4	M	Support for secure administrative user logins
6.2.5	M	Support for functionally-based access management to system administration. This includes the ability to restrict the addition, modification, and deletion of knowledge database metadata to authorized users only.
6.2.6	M	Ability for multiple administrative users to be logged on to the application simultaneously
6.2.7	D	Support for "guest" logins with limited system access (e.g., read-only access)
6.2.8	D	Ability to log unauthorized attempts to perform transactions against the application
6.2.9	D	Mechanisms for logging invalid incoming OpenURLs (e.g., OpenURLs which lack metadata elements specified as "required" by the OpenURL standard and/or knowledge database rules; structurally malformed OpenURLs; OpenURLs with invalid character encodings, etc.)
6.2.10	D	Mechanisms for logging outgoing service requests which fail to complete successfully (e.g., invalid service requests, target content provider server timeouts, etc.)
6.2.11	D	Ability for the resolver to handle unrecognized metadata elements, namespaces, or metadata formats without causing errors or exceptions (e.g., by ignoring the data, mapping the data, etc.)
6.2.12	D	Ability to determine which transaction-specific data will be maintained to assure user privacy

6.2.13   Support for the OpenURL resolver security considerations as outlined in the proposed
                 OpenURL standard version 1.0 (Part 2, Appendix C, Sections C.4-C.5, dated 9/2/03):
6.2.13.1 D   - Ability to prevent licensed metadata to which the resolver has privileged access
                        from being exposed to unprivileged users through by-reference OpenURLs
6.2.13.2 D   - Ability to generate services menus that protect against cross-site scripting
                        attacks, in which code inserted into the menus may be used to insert foreign
                        content or steal user authentication information from users' "cookie" files
6.2.13.3 D   - Ability, where possible, to recognize protocols and service requests that might
                        generate endless looping requests through by-reference OpenURLs, and the
                        ability to prevent the propagation of such requests
6.2.13.4 D   - Ability to stop resolver requests to fetch metadata through OpenURLs
6.2.13.5 D   - Ability to stop the resolver from following a redirect from a network location
                        URL to an OpenURL
6.2.13.6 D   - Ability to stop resolver requests to fetch metadata from network locations
                        specified in an OpenURL with an invalid version string

6.3 Statistics and Reports

6.3.1   M   Provision of DBMS summary reports on transaction processing
6.3.2   M   Provision of reports on additions, deletions, and changes made to knowledge database
                metadata during a specified batch processing session
6.3.3   M   Provision of exception reports for knowledge database metadata which failed to load
                during a specified batch processing session
6.3.4   M   Ability to generate A-Z name/title lists for sources/referrers, target content providers, and
                target journal titles, in either XML or HTML formats. These lists must, at a minimum,
                contain names/titles, appropriate identifiers, and appropriate holdings/coverage
                information.
6.3.5   Provision of readily accessible usage statistics (e.g., how many times, when, and from
                what address a functionality has been used). Statistics should be calculated daily for:
6.3.5.1   M   - overall use of resolver functionalities
6.3.5.2   D   - individual sources/referrers
6.3.5.3   D   - individual target content providers
6.3.5.4   D   - individual services
6.3.5.5   D   - individual target journal titles
6.3.6   D   Provision of DBMS transaction logs and audit trails, including error and exception
                reporting

6.4 Performance and Scalability

6.4.1   M   No effective limitations in the application on the volume of transactions. The system
                must be able to support a substantial portion of Library users.
6.4.2   M   No effective limitations in the application on the number of sources/referrers, target
                content providers, target journal titles, and services
6.4.3   M   No effective limitations in the application on the length of OpenURLs that can be parsed
6.4.4   D   Less than 1% system unavailability (e.g., for backup, maintenance, etc.)

6.5 Vendor Support

6.5.1   M   Provision of appropriate communication mechanisms for problem resolution (e.g., email,
                telephone, site visits, etc.)

6.5.2   M   Availability of reliable vendor-maintained updates of knowledge database metadata. Updates must available for loading to the Library's knowledge database at least monthly.

6.5.3   M   Procedures that enable the Library to easily report potential updates to vendor knowledge database metadata (e.g., changes in linking information for target content providers, parser errors, target services configuration file errors, global holdings/coverage information, etc.)

6.5.4   M   Demonstration that the vendor is working with major sources/referrers (e.g., ProQuest, OCLC First Search, Gale, Ebsco, etc.) to streamline processes for making the Library's source/referrer accounts OpenURL-enabled

6.5.5   M   Demonstration that the vendor's OpenURL resolver software is in general release and installed for production in at least ten library sites for at least 90 days

6.5.6   M   Availability of maintenance contracts

6.5.7   M   Problem resolution through effective three-way communication between the OpenURL resolver vendor, sources/referrers or target content providers, and the Library, including the ability of the Library to use support from sources/referrers or target content providers when appropriate

6.5.8   M   Commitment to support current OpenURL standards and to incorporate approved revisions or additions to the OpenURL standard into the application in a timely fashion. The Library considers additions or changes to OpenURL community profiles, namespaces, and metadata formats as part of a vendor's support of the OpenURL standard.

6.5.9   M   Provision of references and customer satisfaction surveys

6.5.10 M   Availability of user support groups

6.5.11 M   Availability of vendor-maintained FAQs for system support

6.5.12 D   Availability of 24x7 support for problem resolution

6.5.13 D   Availability of contact information for sources/referrers to facilitate making the Library's source/referrer accounts OpenURL-enabled

6.6 Testing and Implementation of New Releases

6.6.1   M   Assurance that background activities (e.g., software maintenance, knowledge database updates, etc.) do not degrade system performance of the production application

6.6.2   M   Ability to set up the application in local test environments. The Library anticipates needing two types of test environments: one to test monthly knowledge database updates and one to test software changes (e.g., new releases, changes in parsers and configuration files, etc.)

6.6.3   M   Clearly-defined procedures and response mechanisms for handling bug reports and enhancement requests

6.6.4   D   Willingness to work with the Library as an alpha or beta test site for enhancements in a production mode and/or in a test environment

Glossary

OpenURL – an enabling technology that uses a web-based request to link metadata for a resource to services for that resource. An OpenURL transports metadata and/or unique identifiers for a resource, along with specified contextual information, from a source to a link server that can act on the information to deliver requested services. Currently OpenURLs use the HTTP(S) GET and HTTP(S) POST communication protocols. In the proposed OpenURL standard version 1.0 (as developed by the NISO Standards Committee AX and in a trial use period through October 2003), OpenURL entities are:

Referent *(required)*	the resource for which an OpenURL is created (e.g., a journal article, book, or technical report cited in a database, in an electronic document, or in other citation sources) [v 1.0; called "object-description" in v 0.1] Example: a journal article located in Library Hi Tech which a user locates when searching ArticleFirst
Resolver	the link server to which an OpenURL is submitted for resolution of the referent's metadata into links to appropriate services [v 1.0; called "base-URL" in v 0.1] Example: the Library's proposed OpenURL resolver (*resolver.loc.gov*)
Referrer	the resource that creates an OpenURL (e.g., a subscription or non-subscription citation database, an OPAC, or a portal) [v 1.0; called "origin-description" in v 0.1] Example: the ArticleFirst subscription service (to which the Library subscribes)
Requester	the user or user-agent requesting services [v 1.0] Example: the Library researcher
ServiceType	the type of service requested from the resolver [v 1.0] Example: get full text of article OR do a Google search on the name of the article's author
ReferringEntity	a resource citing the referent [v 1.0] Example: if the article (referent) appeared in the bibliography of another article, this entity identifies the original article

In OpenURL version 1.0, these six entities are bundled together into a "Context Object," which may also carry administrative metadata (e.g., date-time stamp and character encoding). OpenURL entities must contain one of the following four types of data: an unambiguous identifier; a metadata tag or key paired with a value (e.g., "by value"); a pointer to a network location of metadata tags or keys paired with values (e.g., "by reference"); or "private data" (methods not defined in the standard, called "private identifier" in v. 0.1). For example, the journal article above can be described by metadata for its author, title, Library Hi Tech volume/issue/page number or by a DOI.

OpenURL resolver – an Internet-based application that processes OpenURLs as input from heterogeneous sources, resolves the metadata contained in these OpenURLs into various services, and returns to the referrer application those services to which the user has access. The resolver then configures service requests to target content providers, applying institutionally-controlled rules logic to

determine the services to which the user has access. Service requests may link users to accessible full digital content or provide them with a menu containing links to appropriate services..

Context-sensitive linking – web-based linking which uses rules logic to enable institutions to control users' access to and interactions with linked electronic resources

Knowledge Database – a OpenURL resolver database that contains metadata for local and global content providers accessible to the institution (as either sources/referrers or target content providers), along with the rules logic for generating context-sensitive linking services. Knowledge database components include:

Source/referrer	the information resource producing the OpenURL from referent metadata (i.e., where the user begins) [known in OpenURL v 1.0 as "referrer"]
Target content provider	the information resource that the OpenURL resolver identifies as a target for supplying requested services for the referent (i.e., where the user ends up after selecting a service). Target content providers include resources such as licensed full content services, web search engines, and document delivery services.
Target journal title	individual electronic journals contained in target content providers
Services	a set of context-sensitive linking services for the referent created by the OpenURL resolver based on institutionally-determined rules logic. Services are usually presented to users through a menu (i.e., what the user can do) [known in OpenURL v 1.0 as "serviceType"]

Knowledge Database Metadata - metadata for sources/referrers, target content providers, target journal titles, and services stored in the knowledge database. This metadata includes, as appropriate: descriptive information, identifiers, contact information, type information, linking information, parser information, holdings/coverage information, service request configuration information, etc. Knowledge database metadata records should be controlled by administrative metadata, including: date created, date last updated, character encoding information, etc.

Configuration File (in an OpenURL resolver application) - a file that contains parameters or program code used by the application to select appropriate options and syntax when generating service requests

Parser (in an OpenURL resolver application) - an algorithm or program used by the application to analyze the syntactic structure of input (such as an incoming OpenURL) and separate this data into component parts for subsequent processing

Rules Logic - institutionally-set parameters and routines which control the availability and appearance of services based on information in the incoming OpenURL as well as the user's location and privileges. Rules logic may be implemented through parsers or configuration files for sources/referrers, target content providers, or services.

Services Menu - a web page which presents user with a menu of appropriate services options for the resolution of an OpenURL request