LinkOut is a service that allows you to link directly from PubMed and other NCBI databases to a wide range of information and services extending beyond the NCBI systems. LinkOut aims to facilitate access to relevant online resources to extend, clarify, and supplement information found in the NCBI databases.

LinkOut Help contains information on using LinkOut, providing links to external resources and, for libraries, information on creating and managing an institutional LinkOut account that will allow users to link directly from PubMed to local library resources. LinkOut Help also contains information on two related services, Outside Tool and Document Delivery Service.

Please send comments and suggestions about LinkOut and report broken links to linkout@ncbi.nlm.nih.gov.
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Welcome to LinkOut

Created: June 13, 2005; Updated: July 22, 2016.

LinkOut is a service that allows you to link directly from PubMed and other NCBI databases to a wide range of information and services extending beyond the NCBI systems. LinkOut aims to facilitate access to relevant online resources to extend, clarify, and supplement information found in the NCBI databases.

LinkOut provides access to a variety of relevant online resources, including full-text publications, biological databases, consumer health information, and research tools, directly from PubMed and other NCBI databases.

All links are specially assigned to specific citations and database records. When accessing a link through LinkOut, no additional searching will be necessary to access the relevant resource that has been linked to the citation or database record.

Links are supplied by LinkOut resource providers. LinkOut resource providers are responsible for supplying and maintaining their links. We work with the providers to minimize errors. Please report broken links to linkout@ncbi.nlm.nih.gov for repair.

Information about LinkOut is also available on the LinkOut website.

For additional information about the various types of links found in NCBI databases, please see Databases in Entrez Help.

Examples of LinkOut Resources

Click the links below to see examples of LinkOut resources. See Databases Available for Linking for a complete list of database that may have LinkOut resources.

From the PubMed database:

Online full text – Links to online full text from publishers and from PubMed Central appear in PubMed’s Abstract and Citation displays.

Library holdings – Library holdings may be online full text available from the library’s provider or a record of print holdings.

Consumer health information – This example shows articles with links to the MedlinePlus consumer health resource. Expand “LinkOut – more resources” to see the links under the ‘Medical’ category.

Commentaries on articles – Links to commentaries or discussion to extend/continue the topic discussed in the article cited in a PubMed citation. Commentaries appear under “Other Literature Sources.”

Supplemental Materials – This example displays citations with links to the Dryad Digital Repository. Expand “LinkOut – more resources” to see the links under “Other Literature
Sources.” See the Dryad link in this citation: https://www.ncbi.nlm.nih.gov/pubmed/26354940.

Another example of links to supplemental materials is the following link provided by Neuroscience Information Framework, which aggregates related records from multiple databases:


**From the Nucleotide and Protein databases:**

Genome databases, for example, FlyBase

Links to suppliers of research materials – PlasmID Repository at Harvard Medical School

Research tools - UCSC Genome Browser

**From the Taxonomy database:**

Links from the Taxonomy database provide a variety of information about the entry term, for example:

Resources related to *Ginkgo biloba*, including toxicity, medicinal value, and a picture of the plant

Biological information about Amphibia species in AmphibiaWeb. To retrieve all Taxonomy records for which AmphibiaWeb has provided links, use the filter `loprovamphiweb[sb]`.

Other links in the Taxonomy records include images of plants, animals, fossils, people, and landscapes from CalPhotos.

**From the Gene database:**

The Gene database contains many links that provide supplementary information to the Gene record. For example:

The Weizmann Institute of Science GeneCards and MalaCards databases. To retrieve all Gene records for which the Weizmann Institute has provided links, use the filter `loprovweizmanninst[sb]`.

Genenetwork. To retrieve all Gene records for which the Genenetwork has provided links, use the filter `loprovgenenetwork[sb]`.

**From the BioProject database:**

Genomes Online Database (GOLD). To retrieve all BioProject records for which GOLD has provided links, use the filter `loprovgold[sb]`. 
Additional Assistance

Your local librarian will be best equipped to help you discover LinkOut resources available through your institution or library. Please talk to your librarian about using LinkOut.

Send comments and suggestions about LinkOut and report broken links to linkout@ncbi.nlm.nih.gov.
Using LinkOut

Created: July 25, 2005; Updated: July 22, 2016.

LinkOut provides access to a wide range of relevant online resources, directly from NCBI databases. This section provides information on using LinkOut to locate and access these resources.

Viewing LinkOut Resources in NCBI Database Records: The LinkOut display

You can see links that have been assigned to an NCBI database record in the LinkOut display.

Note: When you click on LinkOut icons or links in the LinkOut display, you are directed to the resource at an external site. Please review all use and copyright information on the resource provider’s site before using or distributing their material.

In PubMed the LinkOut full text and supplemental information links are available in the Abstract format only when a single citation is selected. The links are found by expanding the plus sign (+) next to "LinkOut - more resources." When displaying multiple records in the Abstract format the LinkOut information is not available. In PubMed, you can also view links as icons.
The Purkinje cell degeneration 5J mutation is a single amino acid insertion that destabilizes Nna1 protein.

Chakrabarti I, Neal JT, Miles M, Martinez RA, Smith AC, Sopher BL, La Spada AR.
Department of Laboratory Medicine, University of Washington, Seattle, Washington 98195-7110, USA.

Abstract
In the mouse, Purkinje cell degeneration (pcd) is a recessive mutation characterized by degeneration of cerebellar Purkinje cells, retinal photoreceptors, olfactory bulb mitral neurons, and certain thalamic neurons, and is accompanied by defective spermatogenesis. Previous studies of pcd have led to the identification of Nna1 as the causal gene; however, how loss of Nna1 function results in neurodegeneration remains unresolved. One useful approach for establishing which functional domains of a protein underlie a recessive phenotype has been to determine the genetic basis of the various alleles at the locus of interest. Because none of the pcd alleles analyzed at the time of the identification of Nna1 provided insight into the molecular basis of Nna1 loss-of-function, we obtained a recent pcd mutation—pcd5J—and after determining that its phenotype is comparable to existing pcd severe alleles, we sought its genetic basis by sequencing Nna1. In this article we report that pcd5J results from the insertion of a single GAC triplet encoding an aspartic acid residue at position 775 of Nna1. Although this insertion does not affect Nna1 expression at the RNA level, Nna1pcd-5J protein expression is markedly decreased. Pulse-chase experiments reveal that the aspartic acid insertion dramatically destabilizes Nna1pcd-5J protein, accounting for the observation that pcd5J is a severe allele. The presence of a readily detectable genetic mutation in pcd5J confirms that Nna1 loss-of-function alone underlies the broad pcd phenotype and will facilitate further studies of how Nna1 loss-of-function produces neurodegeneration and defective spermatogenesis in pcd mice.

PMID: 16486590 [PubMed - indexed for MEDLINE]
The "LinkOut Holdings" link is only included with the LinkOut information if users access PubMed through a URL that includes one of the following parameters: holding=, myncbishare=, or otool=. The "LinkOut Holdings" link leads to an alphabetical list of libraries that offer electronic full text access or hold the print version of the article in their collections.

LinkOut information may also appear within NCBI database records. For example, you can see the External Information Resources section in the Taxonomy database records. The appearance of links within NCBI database records varies according to the database that you are using.

Available resources will vary depending on which links have been assigned to the specific database record. See below Gene database example; links to Chemical, Medical and Molecular biology resources.
For additional information about the types of links found in NCBI databases, please see Related Data: Neighbors and Links in Entrez Help.

**Viewing Links as Icons in PubMed**

You can view links as icons in PubMed's Abstract display. The icons are supplied by LinkOut providers - external organizations that have submitted linking information for their web-accessible resources. The list of LinkOut providers includes libraries, publishers, research institutes, and a variety of commercial and non-profit organizations.

Three types of LinkOut icons appear in PubMed by default - icons that link to PubMed Central, icons that link to free full text, and icons that link to full text at the publisher's site. Full text at the publisher's site may require a subscription to view.

The image below shows a single PubMed citation with two default icons, an icon that links to full text at the publisher's site and an icon that links to free full text at PubMed Central.

You can customize the icon display by activating icons for a specific provider.

**Activating Icons for LinkOut Providers**

You can customize the icon display to show links provided by your institution or links to a particular online resource, such as a MedlinePlus. Your library may have already set up a
customized icon display for your institution. Check your library homepage for a special link to PubMed.

Note: When you click on LinkOut icons or links in the LinkOut-more resources, you leave PubMed and are directed to the resource at an external site. Please review all use and copyright information on the resource provider's site before using or distributing their material.

In the image below, six icons are displayed. The BMJ.com and PubMed Central icons appear in PubMed automatically (more about default icons). The icons for MedlinePlus, the National Library of Medicine and the NIH library, have been activated by the user. When users click an icon, they leave PubMed and are directed to the resource at the provider's site.

To activate provider icons, you can either select the provider(s) as filters in My NCBI or enter PubMed through a special URL that will activate the provider icons. To learn how to select providers as filters in My NCBI, see Setting up Filters.

**Activate Icons Using a Special URL**

To activate icons using a special URL, enter PubMed through the following URL:


Replace *NameAbbr* with a provider's LinkOut User Name.

**Example**

To display LinkOut icons for MedlinePlus, with user name *medplus*, enter PubMed through the following URL:

The `holding=` parameter can also be appended to https://www.pubmed.gov/.

**Activate Icons for Multiple Providers**

To activate icons for multiple providers using a special URL, create a URL, as described above. Add additional User Names to the URL, separating the User Names with commas. You can activate icons for as many providers as you like.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>To display LinkOut icons for the LinkOut Demonstration Library, User Name <code>nlmlib</code>, and MedlinePlus, User Name <code>medplus</code>, enter PubMed through the following URL:</td>
</tr>
</tbody>
</table>

The `holding=` parameter can also be appended to https://www.pubmed.gov/.

All providers must be LinkOut participants. You can find providers’ LinkOut User Names (NameAbbr) in the following lists of LinkOut Providers:

- All LinkOut Providers
- LinkOut Libraries
- LinkOut Resource Providers (excluding full-text providers)

When you enter PubMed through a special URL, a cookie is placed on your workstation that instructs PubMed to display the icons until 8 hours of inactivity have passed (more about cookies).

**Locating NCBI Database Records with Links to a Specific Resource**

There are two ways locate database records with links to a specific resource. My NCBI can display the records as a filter in the search result, or you can limit an individual search to records with links to a specific resource.

**Using Filters to Display NCBI Database Records with Links to Specific Resources**

My NCBI includes a filters feature that groups search results by areas of interest. For example, PubMed citations that are available at your library, or Nucleotide records with links to a particular molecular biology database can be grouped, as a filter in the results of database searches. Filters are available in a number of NCBI databases, including PubMed, Nucleotide, Protein and Taxonomy.

To display database records as a filter in the search result:

1. Sign in to My NCBI
2. Select the database where you want to create a filter and click the link Manage Filters
Browse Filters by selecting any of the four categories available: Popular, LinkOut, Properties or Links. You may also Search for Filters by selecting the LinkOut, Properties or Links radio button and entering the provider name in the search box.

3. After finding the provider that you would like to display as a filter, check the box under the Filter column. To display the provider’s icon in PubMed, check the box under Link Icon. You can select up to five filters for each database in My NCBI, except for PubMed where 15 filters are allowed.

The providers that you selected will be displayed as filters under “Filter your results” as long as you are signed in to My NCBI.

In the following example, the user has selected the National Library of Medicine (nlmlib) as a filter. Notice that the NLM icon is displayed below the abstract and citations available from the NLM library are grouped as a filter.

To learn more about using filters in My NCBI, see My NCBI Help.

Limiting a Search to Records with Links to a Specific Resource

To limit a single search to records with links to a specific resource, enter the following in the search box:

\`loprovNameAbbr [filter]\`

Replace NameAbbr with the library’s LinkOut User Name.
This filter will be effective for that search only.

Using the NLM library as an example:

Search PubMed for loprovnlmlib [filter].

This limits the search to holdings included in the NLM library holdings.

This filter can be used as part of any PubMed search.

<table>
<thead>
<tr>
<th>Example: Limit a search for &quot;AIDS&quot; to articles available from the NLM Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>aids AND loprovnlmlib [filter]</td>
</tr>
</tbody>
</table>

**NOTE:** Limiting your search in this way will not cause the provider’s icon to display. Provider icons must be activated in My NCBI or with a special URL.

### Obtaining the Full Text of an Article

PubMed does not include copies of journal articles. Here are some tips for obtaining articles:

1. **Free** copies of some articles may be obtained through links in PubMed. To locate these articles more easily, try **limiting your search** to citations with free full text available.
   
   Note: When you click on LinkOut icons or links in the LinkOut display, you leave PubMed and are directed to the full text at an external site. Please review all use and copyright information on the full-text provider’s site before using or distributing their material.

2. If you are a health professional or are affiliated with a hospital, university, or other institution, you should check your local medical library, or consider registering for Loansome Doc, an NLM-sponsored document delivery service.

3. You may also want to check with your local library, or go directly to the publisher.

### Additional Assistance

If you belong to a library, talk to a librarian at your institution about using LinkOut. Your local librarian will be best equipped to help you discover LinkOut resources available through your institution.

Please send comments and suggestions about LinkOut and report broken links to linkout@ncbi.nlm.nih.gov.
LinkOut provides direct links from PubMed and other NCBI databases to a wide range of information and services beyond the NCBI systems. LinkOut aims to facilitate access to relevant online resources to extend, clarify, and supplement information found in NCBI databases. LinkOut resources include full-text publications, biological databases, consumer health information, research tools, and more (see examples of LinkOut resources).

Through LinkOut, links specially assigned to specific citations and database records provide direct access to relevant external resources.

“Information for Libraries” contains the information you need to set up and support LinkOut for your library and users.

For answers to Frequently Asked Questions, see the FAQ for LinkOut Libraries.

For additional information about the various types of links found in NCBI databases, please see Databases in Entrez Help.

**How LinkOut Works for Libraries**

LinkOut allows participating libraries to link directly from PubMed citations to their library’s online full-text subscriptions and local print holdings records or to an OpenURL-based service (link resolver) implemented by the institution. Through LinkOut, links are specially assigned to specific PubMed citations. Resources that have been linked to PubMed citations through LinkOut can be accessed directly with no additional searching required.

There are three types of library links available:

1. link to online full text for a citation from the library’s full-text provider
2. link to a library print holdings record
3. link to the library’s link resolver or other local service

To add library links to PubMed citations available electronically or in print from the library, libraries must submit holdings information to NCBI. LinkOut looks at the library’s holdings information and applies the appropriate link to PubMed citations included in the library’s holdings.

When a user clicks a link for online full text or a local service, the user leaves PubMed and is redirected to the full-text provider’s site or the local service. When a user clicks a link for a print holdings record, they are shown a print holdings record generated by LinkOut.

Links to online full text are created using linking information submitted by full-text providers, including publishers, aggregators, and agents working on behalf of publishers. For libraries to link to full text from a particular provider, that provider must submit 13
linking information to NCBI. To see a list of full-text providers that participate in LinkOut and the journals for which they submit links, see the list of LinkOut journals.

LinkOut does not perform any user verification. Once a user clicks on a link for online full text or a local link resolver, access depends on pre-existing licensing agreements between the library and the full-text provider(s).

Setting Up Links to Library Holdings

For your library patrons to link directly from PubMed citations to your library’s online full-text holdings, local print holdings records, or your local link resolver, your library must participate in the Library LinkOut program, either through LinkOut or by implementing an Outside Tool.

Note: Some full-text providers will manage LinkOut holdings on behalf of subscribers. For additional information, contact your full-text provider.

Managing Library Holdings in the Submission Utility: The Library Submission Utility, a web-based, password-protected tool, allows you to select your library’s online holdings from a list of journals and providers who participate in LinkOut. You can also submit print holdings information through the Utility. Holdings entered in the Submission Utility will create your library links in PubMed. The links will point to online full text from a provider directly, or to the print holdings display provided by NCBI.

LinkOut Local: Managing Library Holdings using a Link Resolver: You may choose to manage your library holdings using a local link resolver that provides links to online full text and/or local print holdings information. Your library’s links in PubMed will lead to the link resolver. Information about using a link resolver to manage your LinkOut account is available in the LinkOut Local section of this manual.

Outside Tool: Outside Tool allows an institution to place a link on every PubMed record. This link points back to an OpenURL-based service (link resolver) offered by the institution for their users. For complete information about implementing an Outside Tool, please see the Outside Tool section of this manual.

Before Registering

You should:

- Discuss with your library staff the NCBI Library LinkOut program
- Review the section How LinkOut works for Libraries section of this manual and the LinkOut FAQs.
- See the comparison table for LinkOut via the Submission Utility, LinkOut Local and Outside Tool which may help decide which service to implement for your library

If you have questions regarding LinkOut for libraries:
• Contact National Network of Libraries of Medicine (NN/LM). U.S. libraries only: (410) 706-4173

Contact NLM Library LinkOut customer service, write to NLM Support Center

**Table 1:** Comparing the features of LinkOut, LinkOut Local and Outside Tool.

<table>
<thead>
<tr>
<th></th>
<th>LinkOut via Submission Utility</th>
<th>LinkOut Local</th>
<th>Outside Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit holdings</td>
<td>Submission Utility</td>
<td>Upload LinkOut XML files</td>
<td>No holdings submitted</td>
</tr>
<tr>
<td>Limit search to library holdings</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Display holdings as filter in My NCBI</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Icons identify library holdings</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Link on every citation</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Different print &amp; online icons</td>
<td>Yes</td>
<td>Possible</td>
<td>No</td>
</tr>
<tr>
<td>Article level-linking for online full text</td>
<td>Yes</td>
<td>Depends on service</td>
<td>Depends on service</td>
</tr>
<tr>
<td>Based on 3rd party link resolver</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Journal coverage*</td>
<td>LinkOut providers</td>
<td>Service knowledge base</td>
<td>Service knowledge base</td>
</tr>
<tr>
<td>Activate with special URL</td>
<td>holding=</td>
<td>holding=</td>
<td>otool=</td>
</tr>
<tr>
<td>PubMed use statistics</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PubMed performs IP verification</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

* The journal coverage provided by LinkOut providers and the knowledge bases of OpenURL-based services differs. A list of journals included in LinkOut is available here. For information regarding the knowledge base of a particular OpenURL-based service, please contact the vendor or developer.

**Managing Library Holdings in the Submission Utility**

Write to NLM Support Center to register for an account. Enter “LinkOut Registration Request” in the subject line of the email.

Please use the format:

**Subject:** LinkOut Registration Request  
**Library Name:**  
**Organization Name:**  
**Contact Person:**  
**Email Address:**
Phone Number:
Address:
LIBID: Optional. (Please include if your library is a member of NLM’s DOCLINE.)

Within a week, you will receive a User Name and Password that will allow you access to the Library Submission Utility.

In the Library Submission Utility, libraries can edit:

• Library Information
• Contact Information
• View or Update Online Holdings
• View or Update Print Holdings
• Provide Full Text and Print Icons
• View Usage Statistics
• Export Holdings

Managing Library Holdings using a Local Link Resolver (LinkOut Local)

Section Contents

• Introduction
• Evaluating Your Link Resolver
• Preparing LinkOut Files
  o Identity File
  o Resource File
• Registering for LinkOut Local

Introduction

Libraries that do not implement their local link resolver as an Outside Tool may manage their LinkOut holdings using a local link resolver (LinkOut Local). LinkOut Local allows one library icon to appear on all PubMed citations for which a library can provide online full text or print holdings records. Clicking on the icon directs users to your local link resolver.

Libraries that implement LinkOut Local do not manage their holdings information through the Library Submission Utility; they upload holdings information directly to LinkOut in the form of XML files.

To implement LinkOut Local, you will need to upload two LinkOut files to NCBI, a resource file and an identity file. The resource file contains a list of your library’s holdings and is usually generated by your link resolver. The identity file contains information about
your library. The resource file should be updated at least once a year to keep the holdings data current in the LinkOut database.

**NOTE:** Libraries should be able to produce files compliant to the LinkOut format. Libraries should contact their link resolver vendors for assistance. The LinkOut team does not provide technical assistance in this area.

**Evaluating Your Link Resolver**

Before submitting a registration request, your library should test your link resolver. The link resolver should provide one of the following items in your library’s holdings:

- **Online full text:** The link should lead directly to the article-level for the online full text, not the table of contents or the journal homepage.
- **Library holdings via the local OPAC:** The link should lead directly to the OPAC Holdings display or to the corresponding bibliographic record with holdings/location information displayed. The link should not lead to a general catalog or search form.

**Preparing LinkOut Files**

To implement LinkOut Local send two files, a resource file and an identity file, to NCBI, either directly or through a third-party service that you authorize. You will need to prepare an identity file and a resource file (journal holdings) before submitting your registration information.

- The identity file contains the information about your library that NCBI needs to list your library in LinkOut.
- The resource file contains the list of your library holdings that LinkOut will use to apply your icons to PubMed citations.

**Identity File**

The identity file contains the information about your library that NCBI needs to list your library in LinkOut. This file must be named “providerinfo.xml”.

**NOTE:** This file should be composed in a text editor, such as Notepad, not in a word processing program, such as MS Word. Word processing programs add unnecessary formatting information to the file.

The following is an example providerinfo.xml file for University Library, with ProviderId “9999” and NameAbbr “unilib”:

```xml
<?xml version="1.0"?>
<Provider>
<!-- ProviderId is assigned by NCBI-->
<ProviderId>9999</ProviderId>
```
See LinkOut Technical Information: Identity File or the LinkOut DTD for complete file specifications and description of elements.

Resource File

The resource file contains the list of your library holdings that LinkOut will use to apply your icons to PubMed citations. The resource file is usually generated by your link resolver. See LinkOut Technical Information: Resource File or the LinkOut DTD for complete file specifications and description of elements.

NOTE: This file should contain only journals included in PubMed. A list of PubMed journals is available. Only one <Query> line should appear per journal (ISSN).

The resource file should have the following format:

```xml
<?xml version="1.0" ?>
<LinkSet>
  <Link>
    <LinkId>openurl_local</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>http://www.mylibrary.org/icon.gif</IconUrl>
    <ObjectSelector>
      <Database>PubMed</Database>
      <ObjectList>
        <!-- Additional queries -->
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>http://baseURL/OpenURL_local</Base>
      <Rule>?sid=Entrez:PubMed&amp;id=pmid:&lo.id;</Rule>
      <UrlName>Link to Resolver/Service Name</UrlName>
    </ObjectUrl>
  </Link>
</LinkSet>
```


Once your files are validated proceed to register for a LinkOut Local account.
Registering for LinkOut Local

Libraries that implement LinkOut Local upload holdings information directly to LinkOut in the form of XML files. Libraries that seek to implement LinkOut Local should have technical expertise in XML, and should be able to produce files compliant to the LinkOut format independently. See the LinkOut Local section of this manual for file preparation.

After the files have been validated, write to NLM Support Center

Attach your identity and resource files to the email. If your library participates in LinkOut or Outside Tool, please also include your LinkOut/Outside Tool User Name.

In the body of the message, include the following information. Please use this format:

**Subject: Request to Implement LinkOut Local**
Library Name:
Contact Person:
Email Address:
Phone Number:
Address:
LinkOut/Outside Tool User Name:
Link resolver vendor:
LIBID: Optional. Please include if your library participates in NLM SERHOLD.

NCBI staff will email the contact person regarding the request in a month.

**Note:** Since only a limited number of LinkOut Local requests are handled each week, the implementation process can be a lengthy one.

PubMed and OpenURL-based Services

**Section Contents**

- About PubMed & OpenURL-based Services
- Implementing OpenURL-based Services in PubMed
- Evaluating Your OpenURL-based Service

**About PubMed & OpenURL-based Services**

OpenURL is a syntax for packaging metadata and identifiers describing information objects and for pointing to a user-specific appropriate copy of the object. The syntax has been accepted as a NISO standard.

PubMed supports OpenURL-based services through LinkOut and through Outside Tool. With LinkOut, links to an OpenURL-based service are attached to the set of PubMed records for which a library can provide links to online full text or print holdings. Outside
Tool allows libraries to place a link to their OpenURL-based service on all PubMed records.

For more information about PubMed and OpenURL, see the LinkOut, Outside Tool, and OpenURL FAQ.

Implementing OpenURL-based Services in PubMed

OpenURL-based services can be registered with NCBI to provide a link from the Abstract display of PubMed records. This link points back to a service offered by the institution for their local users.

Your library's OpenURL-based service can be implemented through LinkOut Local or may be registered as an Outside Tool.

When an OpenURL-based service is implemented through LinkOut Local, the account has all the advantages of a LinkOut account, including the ability to limit a search to library holdings, display library holdings as a filter in the search result, and apply different icons to print and online holdings.

Outside Tool does not allow users to limit a search to library holdings or to display library holdings as a filter in the search result; these functions are only available to libraries that submit LinkOut holdings. Outside Tool does not differentiate between online holdings, print holdings, or items that will have to be ordered from another institution.

The differences between LinkOut and Outside Tool are summarized in Table 1.

Evaluating Your OpenURL-based Service

To implement an OpenURL-based service through Outside Tool, we require the service to provide functional links to the following qualified resources from each PubMed record. This requirement allows us to best serve our user community, by avoiding "blind" links that do not provide useful and specific information for the individual PubMed record.

Qualified resources are:

- Full-text: The link should lead directly to the article level for the online full text, not the table of contents or the journal homepage.
- Library holdings via the local OPAC: The link should lead directly to the OPAC Holdings display or to the corresponding bibliographic record with holdings/location information displayed. The link should not lead to a general catalog or search page.
- Local document delivery service: The link should produce a form with citation information already entered for the user. Due to the scope of PubMed, it is unlikely that any single library will be able to provide print or electronic holdings for every citation in PubMed. A link to a local ILL service must be available to provide users a means to obtain the full text for citations the library does not hold in print or electronically.
In order to best serve all users and expedite processing, libraries requesting Outside Tool must provide a unique base URL that identifies their link resolver. Outside Tool requests that list a base URL already registered with NCBI will not be assigned a new Outside Tool account. Instead, the existing Tool registered with NCBI with the same base URL should be used.

To determine whether your OpenURL-based service meets the qualifications for implementation as an Outside Tool, construct a URL to your service and retrieve the PubMed records listed below.

To construct the URL to your OpenURL-based service, combine the base URL of your service with a PMID:

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base URL:</strong> <a href="https://baseURL/OpenURL_local">https://baseURL/OpenURL_local</a></td>
</tr>
<tr>
<td><strong>Tail:</strong> ?sid=Entrez:PubMed&amp;id=pmid:</td>
</tr>
<tr>
<td><strong>PMID:</strong> 12345678</td>
</tr>
</tbody>
</table>

Please test all of the following PMIDs to verify that your service is working correctly. Your service MUST provide one qualified resource for each PMID tested.

PMIDs for testing

- 18984876
- 20042755
- 14316043
- 15390390
- 12337850
- 12076440
- 12259237

All resources must be in place before the registration request is submitted. If your local service cannot provide one qualified resource for each PMID tested, it cannot be implemented as an Outside Tool. In this case, please see LinkOut Local for instructions on registering your service through LinkOut.

If your service can provide one qualified resource for each sample PMID, it may be implemented in PubMed as an Outside Tool. Proceed with the registration process described in Outside Tool: Register Your Service.

**Viewing Library Links and Icons in PubMed**

- Viewing and Using Library Links
• Activating Library Icons
  ◦ Through a special URL to access PubMed
  ◦ Using a shared My NCBI account
  ◦ Displaying Library Icons through a special URL to access Clinical Queries, Single Citation Matcher, Advanced Search, the NCBI Cross-Database Search (Gquery), or the Health Services Research Queries
  ◦ By signing in to My NCBI

Viewing and Using Library Links

Library links submitted through LinkOut can be viewed in PubMed in two ways, as icons in the PubMed Abstract display, or as links in the LinkOut expandable menu (to learn more about the LinkOut expandable menu, see Viewing LinkOut Resources in NCBI database Records: The LinkOut Display in this manual.) Outside Tool links can be viewed as an icon in the PubMed Abstract display.

To view links as icons, they must be activated by entering PubMed through a special URL or by selecting a library as a Filter in My NCBI. To learn how to activate icons, see Activating Library Icons in PubMed.

When links are displayed as icons in the Abstract display, users click your library icon to access the online full text or print holdings information (see Access to LinkOut Resources for LinkOut’s access policy). If the library has implemented an OpenURL-based service in PubMed, the link will lead to that service.

If your library has links to both print holdings and online full text, users will see two icons, one for full-text and one for print holdings.

For example, in the image below, online and print icons for the University of South Carolina School of Medicine (USC-SOM) library are shown in the Abstract display when a single citation is selected. USC-SOM has both online and print holdings for J Fam Pract. Each icon will link to the respective collection.
When multiple citations are displayed in the Abstract display, the icons appear below the abstracts.

The maximum icon size for icons is 120 pixels wide by 30 pixels high. Icons larger than 120x30 will be automatically reduced to fit the size limit. Icons smaller than 120x30 remain the same size.

**Activating Library Icons in PubMed**

Library icons may be activated in PubMed in the following ways:

1. Through a special URL to access PubMed
2. Using a shared My NCBI account
3. Through a special URL to access Clinical Queries, Single Citation Matcher, Advanced Search, the NCBI Cross-Database Search (Gquery) or the Health Services Research Queries
4. By signing in to My NCBI

Unless a user chooses to sign in to My NCBI, icons are activated using a special URL. If you are using a special URL to localize PubMed for your users, you should create a button or link to this URL from your library website. Replace your current PubMed links (in your catalog, on subject pages, etc) with this URL. You should also send out a general announcement so that other departments, faculty, etc. can update their websites and
personal computers. More information about using special URLs is available in the About Cookies and Special URLs section of this manual.

**Displaying Library Icons through a special URL to access PubMed**

To display LinkOut icons through a simple link to PubMed, use the following URL:


Replace NameAbbr with your library’s LinkOut User Name.

To display Outside Tool icons through a simple link to PubMed, use the following URL:


Replace Outside Tool with the Outside Tool user name assigned by NCBI.

The holding= and otool= parameters can also be appended to https://www.pubmed.gov/.

**Displaying Library Icons using a shared My NCBI account**

My NCBI accounts can be configured so that Filter selections, Document Delivery and Outside Tool selections, and highlighting selections can be shared by multiple users. LinkOut and Outside Tool icons can be selected in My NCBI and activated using a special URL. To do this, please follow the instructions in the Sharing My NCBI Account Settings section of this manual.

**Displaying Library Icons through a special URL to access Clinical Queries, Single Citation Matcher, Advanced Search, the NCBI Cross-Database Search (Gquery), or the Health Services Research Queries**

To display LinkOut icons, use one of the following URLs:

- **Single Citation Matcher**: https://www.ncbi.nlm.nih.gov/pubmed/citmatch?
  holding=NameAbbr
- **Clinical Queries**: https://www.ncbi.nlm.nih.gov/pubmed/clinical?
  holding=NameAbbr
- **Advanced Search**: https://www.ncbi.nlm.nih.gov/pubmed/advanced?
  holding=NameAbbr
- **HSR Queries**: https://www.nlm.nih.gov/nichsr/hedges/search.html?
  holding=NameAbbr

Replace NameAbbr with the provider’s LinkOut User Name.

To display Outside Tool icons, use one of the following URLs:
**Single Citation Matcher:** https://www.ncbi.nlm.nih.gov/pubmed/citmatch?otool=OutsideTool

**Clinical Queries:** https://www.ncbi.nlm.nih.gov/pubmed/clinical?otool=OutsideTool

**Advanced Search:** https://www.ncbi.nlm.nih.gov/pubmed/advanced?otool=OutsideTool


**HSR Queries** https://www.nlm.nih.gov/nichsr/hedges/search.html?otool=NameAbbr

Replace *Outside Tool* with the Outside Tool user name assigned by NCBI.

**Displaying Library Icons in My NCBI**

Library icons can be selected in My NCBI and displayed while the user is signed in to their My NCBI account. To display icons without signing into My NCBI, set up a Sharing My NCBI Account Settings for your patrons.

**Localizing PubMed for Your Users**

In addition to displaying library icons in PubMed, there are a variety of ways to “localize” the PubMed display, allowing users to link directly from PubMed to library services and other resources. This section provides information on:

- How Will Localizing PubMed Help My Users?
- About Cookies and Special URLs
- Sharing My NCBI Account Settings
- Locating Library Holdings in PubMed
- Applying Your Library Icon to Citations with Free Full-Text Links: _fft
- Omitting Default Icons from PubMed Citations: _fft_ndi
- Setting Document Delivery Service Preferences in PubMed
- Clearing Settings Using a Special URL

**How Will Localizing PubMed Help My Users?**

*A medical resident comes into the library to find information for his Grand Rounds presentation in 4 hours. He performs a quick PubMed search, and retrieves 428 citations. In the search result, the library’s icon marks articles which are immediately available, online or in print. Next to the complete set of results, a tab tells him that 53 articles are available from the library. He clicks the tab to focus on what can be accessed quickly. After selecting several articles under the library tab, the resident returns to the complete set of results and finds several more articles that are not available at the library for further study. He requests them from the library’s document delivery service directly through PubMed.*
Too good to be true? Not at all. LinkOut, Outside Tool and Document Delivery Service (DDS) allow libraries to connect users to local resources (“localize”) in PubMed by providing easier, more focused, means of linking to a wide variety of related web-accessible resources and additional services, such as OpenURL-based link resolvers and local document delivery services.

The ability to localize online resources for a user population is a feature increasingly valued by both researchers and librarians. For users, localization features provide seamless access to available resources. For libraries, localization features allow spotlighting of and direction to resources that are readily available or of high interest to their users.

A variety of special URLs and My NCBI Filters are available for use in localizing PubMed. Special URLs allow users to activate a library’s local profile in PubMed. The MyNCBI feature allows easy branding and identification of a library’s holdings in a PubMed search result by grouping library holdings as a result tab in PubMed searches. Citations with links to other materials of interest can be grouped as result filters as well.

A few examples of how localization might be used:

- A small hospital library uses a special URL to display library holdings and automatically apply their library icon to all PubMed citations with links to free full-text, clearly marking all articles available to their users.
- A departmental library at a large institution uses a filter to group departmental holdings and a special URL to display a link to the institution-wide link resolver on PubMed citations. Users recognize which articles are immediately available and can locate or order others.
- A hospital library selects two additional filters besides their library holdings: one filter highlights citations with links to National Guideline Clearinghouse material, of particular interest to their clinicians, and another filter displays the holdings of their affiliated medical school.

**About Cookies and Special URLs**

Many of the features used to create a localized PubMed environment use “special URLs.” When a user enters PubMed through a special URL, a cookie is placed in the workstation that instructs PubMed to set the preferences indicated by the URL. To use special URLs, the workstation must be able to accept cookies.

Cookies will expire after 8 hours of inactivity. At this time, the PubMed options will be reset to the default settings. To reactivate your preferences, the user must enter PubMed through the special URL again. You can set LinkOut preferences that will not time out on a workstation by signing the workstation into My NCBI and selecting Keep me signed in unless I sign off.

If you are using a special URL to localize PubMed for your users, you should create a button or link to this URL from your library website. Replace your current PubMed links...
(in your catalog, on subject pages, etc) with this URL. You should also send out a general announcement so that other departments, faculty, etc. can update their websites and personal computers.

**Sharing My NCBI Account Settings**

My NCBI accounts can be configured so that Filter selections (including icons), Document Delivery, Outside Tool, and highlighting selections can be shared by multiple users. To view a brief animated tutorial, see [My NCBI Share Settings](#).

To share account settings:

1. **Register** for a My NCBI account that will be used to share settings with patrons. Libraries should use their LinkOut User Name as the My NCBI account User Name.
2. **Sign in** to the account and click **NCBI Site Preferences** to select the services you want for your library’s My NCBI account. Under **PubMed Preferences**:
   a. To select Filters and LinkOut icons, click **PubMed Filters and Icons**. On the resulting page search for your library and click the check boxes under the columns “Filter” and “Link icon.” If you wish to change the library Display Name on the filter link, you can do so by updating your Library Information in the Submission Utility.
   b. To select an Outside Tool, click **Outside Tool**. On the next page, select the radio button next to the desired library and click “Save”
   c. To set a Document Delivery preference, click **Document Delivery**. On the next page, select the radio button next to the desired library and click “Save”
   d. To select highlighting preferences, click the link **Highlighting** under **Common Preferences**. Select the radio button next to the desired color and click “Save”
3. **To select which services to share** click the links **NCBI Site Preferences** and click the **Shared Settings** link under Common Preferences. On the resulting page, click the check boxes for the settings you would like to share. Only the settings for a service where the **Share Selection** box is checked will be shared. For example as shown in the image below, if you check to share the Filter selections only, the Outside Tool, Document Delivery and Highlighting settings will not be shared.

After selecting the features you want to share, use the following special URL to activate the settings:

- **Single Citation Matcher**: https://www.ncbi.nlm.nih.gov/pubmed/citmatch?myncbishare=MyNCBIusername
**Advanced Search:** https://www.ncbi.nlm.nih.gov/pubmed/advanced?myncbishare=MyNCBIUsername


Replace *username* with the shared My NCBI account User Name.

The `myncbishare=` parameter can also be appended to https://www.pubmed.gov/.

Create a link to this URL on your library's website and provide it to your patrons to bookmark in their browsers.

The settings activated by the URL parameter `myncbishare=username` will work in conjunction with the URL parameter `holding=`, which activates LinkOut icons. To share your My NCBI settings and apply your library icon to citations with free full-text links, use both `myncbishare=` and `holding=NameAbbr_fft`. These parameters can be combined using “&”, as shown below:

```
myncbishare=MyNCBIUserName&holding=NameAbbr_fft
```

Replace *MyNCBIUserName* with the shared My NCBI account name and *NameAbbr* with the library's LinkOut User Name.

Outside Tool and Document Delivery Service settings in a shared My NCBI account, if any, will override those set by using the parameters `otool=` or `tool=`.

Settings activated using a shared My NCBI account URL will time out after 8 hours of inactivity.

**NOTE:** A user accessing PubMed through this URL is not signed into My NCBI - the My NCBI box in the upper right will not display, "Welcome *username*". If the user decides to sign into My NCBI with a personal account, the settings for the personal account will override the library's settings.

It is important that library staff store the username and password and the answer to the security question for their shared account in a safe but accessible place; NCBI is not able to provide this information. Keep in mind also that libraries can establish multiple My NCBI accounts, so shared settings may be created for different user groups.

**Locating Library Holdings in PubMed**

Filters, available through My NCBI, allow users to group library holdings in the search result. You may want to use a filter to highlight new library resources or to spotlight other resources that are of interest to your patrons. Libraries can activate filters for their users by sharing My NCBI account settings.
To learn how to display your library holdings as a filter, see Using Filters to Display NCBI Database Records with Links to Specific Resources. To display filters without signing into My NCBI, set up a shared My NCBI account for your patrons.

Alternatively, you can limit a single search to your library holdings by including loprovNameAbbr[sb] in the search. (Replace NameAbbr with the library’s LinkOut User Name). This can be used in any search.

<table>
<thead>
<tr>
<th>Example: Search PubMed for citations with MESH term “AIDS” included in the LinkOut Demo Library collection (User Name: psrmlib)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS[mh] AND loprovpsrmlib[sb]</td>
</tr>
</tbody>
</table>

**Applying Your LinkOut Icon to Citations with Free Full-Text Links: _fft**

To have your library’s LinkOut icon appear on all citations with free full-text links, append holding=NameAbbr_fft to the PubMed URL and enter PubMed through the resulting URL:


Replace NameAbbr with your library’s LinkOut User Name.

The holding= parameter can also be appended to https://www.pubmed.gov/.

When _fft is appended to the library’s LinkOut User Name in this special URL, library icons will be automatically applied to all citations with links to free full text. _fft can only be used with holding=.

<table>
<thead>
<tr>
<th>Example: Automatically apply LinkOut icons for the PSRML Demonstration Library, User Name psrmlib, to all citations with free full-text links</th>
</tr>
</thead>
</table>

To see the icons, try the following:

1. Enter PubMed through the URL above.

2. Search for free full text [sb].

3. Select Abstract from the Display pull-down menu.

4. The PSRML Library icons will display on all citations.

Many LinkOut libraries have added free full-text journals to which they do not subscribe to their library holdings in the Submission Utility, so that their library icon will display on citations with free full-text links. We recommend that libraries include only journals to
which they subscribe in their holdings and use _fft to apply library icons to free full-text citations.

Using this special URL will not override library holdings defined in the Submission Utility. If you have designated a fee-based provider for a publication that is freely available elsewhere, your settings will be maintained. For example, if you selected OVID as a provider for a journal that is available elsewhere for free, your library icon will continue to link to OVID, rather than the free site.

This special URL does not add free full-text journals to your library holdings. Your library icon will appear on citations with free full-text links, but the related journals will not appear in your holdings in the Submission Utility, the Libraries list, or the LinkOut Display.

Omitting Default Icons from PubMed Citations: _fft_ndi

Some users have found it confusing to see both the default icon and the library icon, especially when they cannot access the full-text article through the default icon because their library does not have a subscription to the journal. To alleviate this confusion, default icons can be omitted when library icons are applied to citations with free full-text links.

Omitting default icons will remove all default icons from PubMed abstracts, including those that link to free full text. Library icons will appear on citations that are in your library holdings and citations with free full-text links. If your library chooses to omit default icons, library holdings must be kept up to date or users will lose access to online publications.

**Caution!** The decision to omit default icons from PubMed search results should be made with special care! Please discuss this decision with library staff before omitting default icons. Omitting default icons may deprive users of access to materials. Additionally, users may inadvertently deprive others of access by sharing the URL you provide to them.

To omit default icons from the PubMed display and have your library’s LinkOut icon appear on all citations with free full-text links, append holding=NameAbbr_fft_ndi to the PubMed URL:


Replace NameAbbr with your library’s LinkOut User Name.

The holding= parameter can also be appended to https://www.pubmed.gov/.
Example: Display icons for the PSRML Demonstration Library, User Name psrmlib, apply PSRML icons to all citations with free full-text links, and omit default icons


To see the icons, try the following:

1. Enter PubMed through the URL above.

2. Search for free full text [sb].

3. Select Abstract from the display settings menu.

4. The PSRML Library icons will display on all citations.

The ability to omit default icons exists as an enhancement to the ability to automatically apply library icons to citations with free full-text links and cannot be used separately.

**Setting Document Delivery Service Preferences in PubMed**

To set your Document Delivery Service preference through a direct link to PubMed, use the following special URL:


Replace DDS with the Document Delivery Service user name assigned by NCBI.

To set your Document Delivery Service preference through a through a direct link to Clinical Queries, Single Citation Matcher, NCBI Cross-Database Search (Gquery) or the Health Services Research use one of the following URLs:

**Single Citation Matcher:** https://www.ncbi.nlm.nih.gov/pubmed/citmatch?tool=DDS

**Advanced Search:** https://www.ncbi.nlm.nih.gov/pubmed/advanced?tool=DDS

**Clinical Queries:** https://www.ncbi.nlm.nih.gov/pubmed/clinical?tool=DDS


Replace DDS with the Document Delivery Service user name assigned by NCBI.

Document Delivery Service preferences can also be set using a shared My NCBI account or by signing in to My NCBI. Instructions for selecting a DDS in My NCBI are available in the Document Delivery section of My NCBI Help.
Clearing Settings Using a Special URL

To clear LinkOut settings activated using a special URL and return to the default PubMed display, access PubMed using the following URLs:

To clear the LinkOut icon:

To clear the Outside Tool icon:

To clear the myncbishare setting:

To clear the document delivery setting:

In the above URLs, there are two underscores ( _ ) preceding reset.

Note: The above URLs will only clear icons that have been activated using the specific parameter (holding=, otool=, myncbishare=) in a special URL.
LinkOut is a service of NCBI that allows third parties to link specific NCBI database records to relevant web-accessible resources. Typically, publishers and other full-text providers use LinkOut to provide links from PubMed records to their online full-text journals.

An FAQ for Link Providers is available.

How It Works

LinkOut provides links from PubMed and other NCBI database records to online resources external to the NCBI system. All linking information is submitted by LinkOut providers - the owner or agent for the owner of the online resource. LinkOut providers are responsible for maintaining their links.

To submit links to your resource, you will need to upload two files: an XML identity file and a resource file, which can be provided in either XML or CSV formats. The identity file contains the information about your organization, which is needed to list your resource in the LinkOut database. The resource file describes the PubMed records you will link from and contains the information that LinkOut needs to generate the links.

All links can be viewed in the LinkOut more resources display. In PubMed, links can also be viewed as icons.

If your organization has a subscriber base for online full text, the links that you submit may also be used as the basis for library links. LinkOut allows libraries to display their own icon on PubMed records available through their online subscriptions. The icon links to the online full text from the provider selected by the institution. For your subscribers to link to full text at your site via PubMed, you must submit links to LinkOut (more about the use of links submitted to LinkOut).

Prerequisites for Participation

1. Journals must be included in PubMed for links to be made. To be included in PubMed, a journal must go through the MEDLINE selection process. Please see the details at:
2. Publishers of journals included in PubMed should submit their citation data electronically before submitting links to online full text. See PubMed's Information for Publishers for details on submitting electronic data to PubMed.

When a publisher submits links without sending electronic citation data, links will be shown only under the LinkOut more resources drop-down menu. The
publisher's icon will *not* appear by default in PubMed's Abstract and Records displays, unless full text is freely available (more about default icons).

3. Full-text providers that restrict access to full text may provide links to summary pages, provided that a link to the full text is prominently displayed on the summary page. In this case, providers should use one of the full-text attributes to inform users that full text is available.

For more information, see the Guidelines for Evaluation of Resources.

**Apply for Inclusion in LinkOut**

To apply for inclusion in LinkOut, send an email to linkout@ncbi.nlm.nih.gov with the following information included:

- Name, email address, and phone number of a contact person in your organization.
- Your account name, if your organization currently provides electronic citation data to NCBI.
- The scope of your resource. Publishers should provide journal titles and ISSNs; journal aggregators may provide a description of their collection.
- Describe any restrictions on access to full text.

A LinkOut team member will email the contact person within 1 week regarding your request.

**File Preparation: Identity File**

The identity file contains the information needed to list a provider in LinkOut. This file must be named *providerinfo.xml*; the file name is case sensitive. This file should be composed in a text editor, such as NotePad, not in a word processing program.

For complete file specifications and description of elements, see LinkOut Technical Information: Identity File or the LinkOut DTD.

The following is an example providerinfo.xml file for the LinkOut participant, Good Publisher, Inc. with Provider Id 8888 and NameAbbr *GoodPublisher*.

```xml
<?xml version="1.0"?>
<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
<Provider>
  <!-- ProviderId is assigned by NCBI -->
  <ProviderId>8888</ProviderId>
  <Name>Good Publisher, Inc.</Name>
  <NameAbbr>GoodPublisher</NameAbbr>
  <SubjectType>publishers/providers</SubjectType>
  <Attribute>subscription/membership/fee required</Attribute>
  <!-- Url is used in My NCBI and the LinkOut Journals and Providers lists -->
  <Url>http://www.goodpublisher.com</Url>
  <!-- Brief is used in My NCBI -->
</Provider>
```

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An international publisher of biomedical journals and books

<SubjectType> and <Attribute> elements included in the providerinfo.xml file will apply to all links submitted by the provider. In the example above, a subscription is required to access all full text at the provider’s site, therefore <Attribute>subscription/membership/fee required</Attribute> has been included in the providerinfo.xml file.

**File Preparation: Resource XML File**

To create links to your resource, NCBI needs two XML files, an identity file and a resource file.

The resource file describes the PubMed records to which your links will be applied and contains the information that LinkOut needs to generate the links. Links described in the resource file must link directly to the full text, requiring no additional searching after a user clicks on the provider’s link.

Resource files must have a file extension .xml; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Typically, files are named journals.xml, or journaltitle.xml. To help with file management, a provider may submit more than one resource file.

This file should be composed in a text editor, such as NotePad, not in a word processing program.

**Section Contents**

- Resource File XML Format
- <ObjectList>: Selecting Records in a Resource File
  - Selecting Records Using <ObjId>
  - Selecting Records Using <Query>
    - <ObjectUrl>: Specifying the Link to Access Online Full Text
  - Creating the URL for the Link
  - Describing the Resource
    - Resource File Examples
    - Linking with PII/DOI

**Resource File XML Format**

For complete file specifications and description of elements, see LinkOut Technical Information: Resource File or the LinkOut DTD.

The resource file below describes links to web-accessible full text for the journal J Cell Biol. Full text is provided by Good Publisher, Inc., ProviderId 8888.
The `<ObjectList>` element is used to select the NCBI database records to which links will be applied. `<ObjectList>` contains one or more `<Query>` elements OR one or more `<ObjId>` elements. `<Query>` elements contain a valid PubMed search that will retrieve the records to which the link described in `<ObjectUrl>` will be applied. `<ObjId>` elements contain the Unique Identifier (PMID) for records to which the link described in `<ObjectUrl>` will be applied.

Selecting Records Using `<ObjId>`

`<ObjId>` contains the PubMed ID (PMID) for a single PubMed record.

**Example: Select record with PMID 9679140**

```xml
<ObjectList>
  <ObjId>9679140</ObjId>
</ObjectList>
```

More than one `<ObjId>` can be used in an `<ObjectList>`.

**Example: Select records with PMIDs 9679140 and 12589072**

```xml
<ObjectList>
  <ObjId>9679140</ObjId>
  <ObjId>12589072</ObjId>
</ObjectList>
```
Because `<ObjId>` requires more maintenance than `<Query>`, NCBI recommends using `<Query>` whenever possible. When `<ObjId>` is used, the provider is responsible for updating the resource file as new records are submitted to PubMed.

**Selecting Records Using `<Query>`**

The `<Query>` element must contain a valid PubMed search. Please see [Searching PubMed](#) for information on constructing PubMed searches. Note that all components of a query would need to be valid for links to be created.

**Tips for using `<Query>`**

1. Use either NLM's Title Abbreviations [ta] or ISSN numbers in journal searches. Title Abbreviations must be entered in double quotes, e.g., “J Mol Dis” [ta].
2. Include the date range for full text. Use this format: `startyear:endyear[dp]`. Dates should be notated as YYYY/MM/DD. Month and Day are optional.
3. Ranging is not allowed in Volume, Issue, Page, or PMID searches.
4. Truncation (wildcards such as *) is not allowed in search statements.
5. Search field tags must be enclosed in square brackets.
6. To apply a rolling embargo to records included in or excluded from a query, use “last x (day|weeks|months|years)”[dp] to select records based on the time period indicated. Dates are calculated as follows: 1 week = 7 days, 1 month = 30 days, 1 year = 365 days.
7. Do not use the search field tags [sb] of [filter]. The only exception is future [sb]. Future [sb] will include or exclude all citations with a publication date after today.
8. Boolean operators AND, OR, NOT must be in uppercase.

Example: Select records for the journal “J Mol Dis” starting from the publication date, June 15, 1997. As new records are submitted to PubMed, links will be applied automatically.

```xml
<ObjectList>
</ObjectList>
```

Example: Select records for the journal “J Mol Dis” written by J Smith. As new records are submitted to PubMed, links will be applied automatically.

```xml
<ObjectList>
</ObjectList>
```

More than one `<Query>` can be listed within the `<ObjectList>`, as shown in the Example below.
Example: Select records for the journal "J Mol Dis" with a publication date from June 15, 1997 and records for the journal "J Feet" starting from January 1, 2000. As new records are submitted to PubMed, links will be applied automatically.

```xml
<ObjectList>
</ObjectList>
```

To apply a rolling embargo to records included in or excluded from a query, use “last x (weeks|months|year)”[dp] to select records based on the time period indicated.

Example: Select records for the journal "J Mol Dis" with publication date June 15, 1997 to the date 6 months earlier than today. Links will not be applied to records published in the last 6 months.

```xml
<ObjectList>
</ObjectList>
```

Citation providers sometimes submit records for articles that have not yet been published. “last x (weeks|months|year)”[dp] is very literal and will only select or exclude records from the past. To exclude records with a publication date in the future, use future[sb].

Example: Select records for the journal "J Mol Dis" with publication date 1997 to the present. Links will not be applied to records published in the last six months or with a future publication date.

```xml
<ObjectList>
</ObjectList>
```

Records may also be submitted to PubMed for “ahead of print” articles (articles that are available online before they are available in print). To select these records, use `pubstatusaheadofprint`.

Example: Select ahead of print records for the journal "J Mol Dis".

```xml
<ObjectList>
  <Query> "J Mol Dis" [ta] AND pubstatusaheadofprint</Query>
</ObjectList>
```

**<ObjectUrl>: Specifying the Link to Access Online Full Text**

The `<ObjectUrl>` element is used to describe the link to the online resource. `<ObjectUrl>` contains the sub-elements, `<Base>`, `<Rule>`, `<SubjectType>`, and `<Attribute>`. `<Base>` and `<Rule>` are concatenated to form the URL for the link. `<SubjectType>` and `<Attribute>` describe the resource to which the record is being linked.

For definitions of `SubjectType` and `Attribute` elements, see Special Elements: `SubjectType` and Special Elements: `Attribute`. 
Creating the URL for the Link

<Base> is the stable portion of the URL for the full text of the selected records. This is usually the URL of the provider’s web site or CGI program.

<Rule> is the remainder of the URL needed to access the online full text.


If the URL for the full text follows a pattern using variable values that are found in the PubMed record, the pattern can be described in the <Rule> element and LinkOut can insert the appropriate values for each citation. This allows many links to be generated from the information in a single <ObjectUrl>.

URL patterns are described using LinkOut's XML entities. An XML entity is a short text string that represents a type of value. During LinkOut processing, the text string is replaced in the URL by the appropriate value for each citation. Supported entities can be found in the list of LinkOut Entities and in the LinkOut DTD.

Example: Create URLs following the pattern: http://www.goodmedical.org/cgi/full/id=[PMID]
<Base>https://www.goodmedical.org/cgi/full/</Base><Rule>&lo.id;</Rule>

Example: Create URLs following the pattern: http://www.goodmedical.org/cgi/full/[ISSN]/[volume number]/[start page]
<Base>https://www.goodmedical.org/cgi/full/</Base><Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>

Entities can be combined with other information in the <Rule>.

Example: Create URLs following the pattern: http://www.goodmedical.org/links/record/pmidlookup?view=reprint&pmid=[PMID of the record]
<Base>https://www.goodmedical.org/links/record/</Base><Rule>pmidlookup?view=reprint&pmid=&lo.id;</Rule>

LinkOut does not support Unicode (UTF-8) and requires that certain special characters be encoded in files. See Special Characters for a list of these characters and their encodings.

Describing the Resource

The elements <SubjectType> and <Attribute> are used in the <ObjectUrl> to describe the resource to which records are being linked. Available SubjectTypes can be found in Special Elements: SubjectType. Available Attributes can be found in Special Elements: Attribute.
If the available SubjectTypes and Attributes do not suffice to describe the resource, UrlName can be used as well. If no SubjectType is given, the SubjectType “miscellaneous” will be assigned automatically.

As the availability and format of resources linked from NCBI database records should be readily apparent to users, links to online full text must be described using one of the following Resource Form Attributes:

ATTRIBUTE full-text online
ATTRIBUTE full-text PDF
ATTRIBUTE full-text PostScript

In addition, if there are any barriers to accessing the full text, one of the following Barrier Attributes must be used:

ATTRIBUTE registration required
ATTRIBUTE subscription/membership/fee required

Continuing with the example above, if Good Medical, Inc. requires a subscription to access HTML full text, the <ObjectUrl> element might look like this:

<ObjectUrl>
<Base>https://www.goodmedical.org/cgi/full/</Base>
<Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
<Attribute>subscription/membership/fee required</Attribute>
<Attribute>full-text online</Attribute>
</ObjectUrl>

**Resource File Examples**

**Example 1**: Dental Publications, Inc., Provider Id 1234, provides links from the PubMed records with PMIDs 98765432 and 87654321. URLs for the full text in PDF format are created using an internal identification number that is not included in PubMed, so links are created individually for each record. To minimize the repetition of textual data, the Icon URL and the Base URL have been defined as Entities in the Prolog of the file.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
[!ENTITY icon.url "https://www.dentalpub.com/images/fulltext.gif">
<!ENTITY base.url "https://www.dentalpub.com/Articles.asp?"]>
<LinkSet>
<Link>
  <LinkId>1</LinkId>
  <ProviderId>1234</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
  </ObjectSelector>
</Link>
```
Example 2: Good Medical, Inc., Provider Id 4321, provides free online access to the publications Journal of Feet [ISSN 1234-5678] and Skin Graft International [ISSN 8765-4321] in HTML format. The URL to access online full text at their site follows this pattern for each article: http://www.goodmedical.org/cgi/full/[ISSN]/[volume number]/[start page]
Example 3: A record may be retrieved by more than one <Query>. When this happens, link assignment will be handled as described in Duplicate Links and Multiple Links. If these queries are in different Link elements, <Attribute>preference</Attribute> can be used to indicate which <Link> element should be applied to the record. This is generally used in situations where the links for a subset of a range have a different URL pattern or different access restrictions. See Duplicate Links and Multiple Links for more information.

In the example below, an article by J Smith in “J Mol Dis” published in 1998 will be retrieved by the <Query> statements in both LinkId 2 and LinkId 3.

The LinkOut provider Good Publisher, Inc. provides links to the full text of two of their journals, J Mol Dis and J Biol Chem.

LinkId 1 selects articles for PMID 9679140 and 9679141, a special case. The records are selected using <ObjId> and have a special <Rule>. They are available online in PostScript format; a subscription is required to access the full text. Because these records are also included in LinkId 3, <Attribute>preference</Attribute> is used to indicate that only this link should be applied to these citations.

LinkId 2 is for all articles authored by J Smith published in the journal J Mol Dis. These are freely available in PFD format. A special icon is used for these articles. Because these records are also included in LinkId 3, <Attribute>preference</Attribute> is used to indicate that only this link should be applied to these citations.

LinkId 3 applies to the remainder of the J Mol Dis articles and all J Biol Chem articles supplied by Good Publisher, Inc., where a subscription is required to access the full text. They are available in HTML format. This link will not be applied to the citations included in LinkId 1 and LinkId 2.

As both LinkId 1 and LinkId 2 describe specific requirements, they are listed before the general LinkId 3.
<Database>PubMed</Database>
<ObjectList>
  <ObjId>9679140</ObjId>
  <ObjId>9679141</ObjId>
</ObjectList>
</ObjectSelector>
<ObjectUrl>
  <Base>&base.url;</Base>
  <Rule>pmidlookup?view=reprint&amp;pmid=&lo.id;</Rule>
  <Attribute>full-text PostScript</Attribute>
  <Attribute>subscription/membership/fee required</Attribute>
  <Attribute>preference</Attribute>
</ObjectUrl>
</Link>
<Link>
  <LinkId>2</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
    <Attribute>full-text PDF</Attribute>
    <Attribute>preference</Attribute>
  </ObjectUrl>
</Link>
<Link>
  <LinkId>3</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
    <Attribute>full-text online</Attribute>
    <Attribute>subscription/membership/fee required</Attribute>
  </ObjectUrl>
</Link>
</LinkSet>
**Linking with PII/DOI**

PII and DOI are identifiers supplied by the publisher. PII is a Publisher Item Identification, assigned by the publisher for internal use. DOI is a Digital Object Identifier (more about DOI).

Links can be created using DOI or PII. Links will appear on all records in the <ObjectList> for which PII or DOI has been submitted by the publisher. NCBI does not input DOI or PII in PubMed records; to create links using PII or DOI, these values must be included when the record is submitted electronically. Publishers should submit PII/DOI for records ONLY if they will be used for linking.

To link using DOI/PII, identify a resolver that can locate the full text in the <Base> element and use the appropriate entity in the <Rule> element.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
</table>
| **Retrieved record:**  
Journal [ISSN 1234-5678]. 2004 Sep; 27(1):3-10  
PMID: 98765432  
DOI: 10.1096/ajs59-5497  
PII: 12345678/2713 |
| **Link using DOI:**  
<Base>https://dx.doi.org/</Base>  
<Rule>&lo.doi;</Rule>  
**Resulting URL:** https://dx.doi.org/10.1096/ajs59-5497 |
| **Link using PII:**  
<Base>https://www.goodmedical.org/links/record/</Base>  
<Rule>&lo pii;.php</Rule>  
**Resulting URL:** https://www.goodmedical.org/links/record/12345678/2713.php |

**File Preparation: Resource CSV File**

Links data can also be provided in CSV (comma separated values) files. The CSV resource file contains LinkOut data provider identifiers, PubMed citation Ids or queries, and links data from your journal site, all of which is used to create links in PubMed.

A LinkOut program converts CSV files in to XML files that validate against the LinkOut DTD. Links provided in CSV files must link directly from a PubMed citation to the corresponding article full text.

CSV files need to have the file extension .csv; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Examples of file name and extension: journaltitle_2vol.csv, or freearticles_Feb2015.csv, or fulltext_2_15.csv. To help with file management, a provider may submit more than one resource file. CSV files may not exceed 10 MB each.

**Section Contents**
Resource CSV File Data Fields

The CSV files used by LinkOut to create links in PubMed have required and optional data fields:

Field 1: PrId (required). Provider Id assigned by NCBI to links data providers. A four digit number.

Field 2: DB (required). NCBI database name. Enter PubMed in this field.

Field 3: UID or Query (required). Each record in an NCBI database has a numerical unique identifier (UID). The unique identifier for PubMed citations is the citation PMID. For example, in this citation: https://www.ncbi.nlm.nih.gov/pubmed/24255994 the summary display lists the PubMed citation Id (PMID) below the article citation:

Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds.

Downs LM, Hitti R, Preganolato S, Mellersh CS.


PMID:24255994

Each PubMed record can also be retrieved using a query. For example, the above citation would be retrieved in PubMed using this query: “Vet Ophthalmol”[ta] AND 17[vol] AND 126[pg]

Field 4: URL (required). The URL to the article full text for a PubMed citation.

Filed 5: IconUrl (optional). URL of an icon file that you would like to represent your journal. The icon should meet the specifications described in Icons. The icon URL should point directly to the icon file in your server. If an icon is not provided, LinkOut will use the LinkOut generic icon.

Field 6: UrlName(optional). Additional description about the article link.

Field 7: SubjectType (required*). SubjectType is used to determine where links will be placed in the “LinkOut – more resources” display. In this field enter the subject type ‘publishers/providers.’ (*) If the ‘publishers/providers’ subject type is present in the identity file, this field should be left empty.

Field 8: Attribute (required). Enter “subscription/membership/fee required.” If the article full text is either free or open access enter either ‘Full-text online’ for the full text in HTML, or ‘Full-text PDF’ for the full text in PDF. Note that for article full text that
requires a subscription, the attribute “Full-text online” or “Full-text PDF” must be listed in the identity file.

**Resource File CSV Format**

Your CSV file can be formatted as a table. Each field must be separated by commas. The CSV file format to create links in PubMed that lead to the article full text is the following:

Field 1: PrId. Provider Id, a four digit number. For example: 1234.

Field 2: DB. Enter ‘PubMed’ in this field.

Field 3: Two options UID or Query:

UID. PubMed citation Id (PMID). For example: 11532607

Query. A query that leads to the PubMed record for an article: “Front Biosci”[ta] AND 6[vol] AND D1128[pg]


Filed 5: IconUrl. https://www.bioscience.org/images/medlink.jpg

Field 6: UrlName. Review article

Field 7: SubjectType. Publishers/providers (*) If the ‘publishers/providers’ subject type is present in the identity file, this field should be left empty.

Field 8: Attribute. Subscription/membership/fee required. Note that because the article full text is only available through subscription, the attribute “Full-text online” or “Full-text PDF” must be listed in the identity file. If this article were to be available free or open access, Field 8 would need to have either the attribute ”Full-text online” or ”Full-text PDF”.

When access to journal articles is available at the journal site in a combination of free, subscription only, or selected open access, provide separate CSV files for each. For example, links data to free articles would be provided separately from links data that is available through subscription only. Note that different icons can be provided for each type of link to display clearly in PubMed whether the article full text is available through subscription only, free, or open access.

**Resource CSV File Examples**

**Example 1.** Access to full text is through subscription, membership, or a fee is required: Provider Id 1234, provides links for the PubMed records PMIDs 11282572 and 11532607. URLs provided lead to the article full text in HTML. The icon URL leads to the icon file in jpeg format. The UrlName field is populated for the second article only (Review article).The subject type was provided in the identity file, and consequently this field is left blank. The articles are available through subscription only. In this case the Attribute field specifies that access to the article requires a subscription, since only one attribute can be
used for each article entry, use the identity file to provide the article format: Full-text Online (HTML) or Full-text PDF.

Note that each field must be comma separated.

Field 1: PrId. 1234
Field 2: DB. PubMed
Field 3: UID. 11282572 and 11532607
Field 6: UrlName None and Review
Field 7: SubjectType. None (already present in the identity file)
Field 8: Attribute. Subscription/membership/fee required

A sample file using a spreadsheet program such as MS Excel.

<table>
<thead>
<tr>
<th>PrId</th>
<th>DB</th>
<th>UID</th>
<th>URL</th>
<th>IconUrl</th>
<th>UrlName</th>
<th>SubjectType</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>fulltext.htm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fulltext.htm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The same entries in a sample CSV file can be downloaded here. Save files with the extension .csv, and upload them to the “holdings” directory of the FTP assigned to you.

Example 2. Access to full text is free: Provider Id 1234, provides links for the PubMed records PMIDs 25588643 and 25588642, however, queries are used instead of PMID numbers. URLs provided lead to the article full text in HTML. The icon URL leads to the icon file in jpeg format. The UrlName field is not populated for either article. The subject type was not provided in the identity file, and consequently it must be listed here. The articles are available free. The Attribute field provides information about the article format: Full-text Online (HTML).

Note that each field must be comma separated.

Field 1: PrId. 1234
Field 2: DB. PubMed


Filed 5: IconUrl. https://www.koreanjpathol.org/image/kjpathol_linkout.gif

Field 6: URLName None

Field 7: SubjectType. Publishers/providers

Field 8: Attribute. Full-text Online

A sample file using a spreadsheet program such as MS Excel.

<table>
<thead>
<tr>
<th>Prid</th>
<th>DB</th>
<th>Query</th>
<th>URL</th>
<th>IconUrl</th>
<th>URLName</th>
<th>SubjectType</th>
<th>Attribute</th>
</tr>
</thead>
</table>

The same entries in a sample CSV file can be downloaded here. Save files with the extension .csv, and upload them to the “holdings” directory of the FTP assigned to you.

**File Evaluation**

After your application for inclusion in LinkOut has been accepted, prepare an identity file and a sample resource file. Resource files should contain links to at least five PubMed records.


Your files will be evaluated by the LinkOut team, and you will be contacted regarding any corrections. The evaluation process will continue until your files are substantially error free.
Account Assignment

When the submitted files are substantially error free, you will be assigned a ProviderId (PrId) and an approved name abbreviation (NameAbbr), and you will be given a password for an NCBI FTP account.

Please note that each provider will be given only one FTP account at NCBI. A single provider may submit links on behalf of multiple publishers; different icons may be used in PubMed to establish the identity for each journal.

File Transfer

When you receive your account information, validate the files using the LinkOut https://www.ncbi.nlm.nih.gov/projects/linkout/doc/validate.shtml and transfer all files via FTP to the host FTP-private.ncbi.nlm.nih.gov. Place the files in the “holdings” directory of your account. No subdirectories may be created in the holdings directory.

When files have been submitted, inform the LinkOut team at linkout@ncbi.nlm.nih.gov. Your files will be given a final evaluation before being placed in the production queue. From this point on, files will be processed automatically every day.

Links should appear in PubMed within 2 days of file submission. For instructions on viewing your links, see Using LinkOut. If 2 days have passed and you do not see your links in PubMed, please write to linkout@ncbi.nlm.nih.gov.

File Maintenance

Provider Responsibilities

Link providers are responsible for:

- maintaining their LinkOut files
- transferring any additions, changes, or deletions of their links to NCBI
- updating files and informing NCBI when access rights are changed
- correcting broken or incorrect links in a timely manner

Providers may transfer new versions of current files or add new resource files at any time. It is the responsibility of the provider to keep files current and valid. Links in PubMed are regenerated every day based on the resource files in each provider’s directory; therefore, providers must delete obsolete files from their holdings directory.

Additional provider responsibilities are described in LinkOut Policies: Provider Responsibilities.
Confirmation and Error Messages

Upon processing an updated file, NCBI will send an acknowledgement to the designated LinkOut contact. If you prefer not to receive this acknowledgement, please notify the LinkOut Team at linkout@ncbi.nlm.nih.gov.

If files cannot be processed because of errors, a message with the subject line “LinkOut files uploaded to NCBI - Critical ERRORS!” will be sent to the LinkOut contact. The files should be corrected and resubmitted. If you have any questions about the errors, contact LinkOut at linkout@ncbi.nlm.nih.gov.

Provider Statistics

LinkOut collects statistics on the number of clicks on each publisher’s icons in PubMed’s Abstract display, and clicks on the publisher’s links in the LinkOut list of resources.

Statistics can be emailed to the LinkOut contact monthly. If you would like to receive statistics, please notify the LinkOut Team at linkout@ncbi.nlm.nih.gov.

Statistics send via email include the yearly and monthly totals for clicks on a provider’s links, which are sorted by journal (a CSV file with the same information is provided as an attachment as well).

Statistics may change for the first 2 weeks that they are available. After 2 weeks, statistics will be stable.

A sample statistics report is shown below:
The following is the usage statistics for your LinkOut links:
(Hits = number of times users clicked your links)

Please note that statistics for the most recent month may change in the next report.

Database: PubMed

Total: 75136

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/2005</td>
<td>7057</td>
</tr>
<tr>
<td>7/2005</td>
<td>6144</td>
</tr>
<tr>
<td>6/2005</td>
<td>6150</td>
</tr>
<tr>
<td>5/2005</td>
<td>7015</td>
</tr>
<tr>
<td>4/2005</td>
<td>8867</td>
</tr>
<tr>
<td>3/2005</td>
<td>6547</td>
</tr>
<tr>
<td>2/2005</td>
<td>5250</td>
</tr>
<tr>
<td>1/2005</td>
<td>5209</td>
</tr>
<tr>
<td>12/2004</td>
<td>4460</td>
</tr>
<tr>
<td>11/2004</td>
<td>6144</td>
</tr>
<tr>
<td>10/2004</td>
<td>3608</td>
</tr>
<tr>
<td>9/2004</td>
<td>3605</td>
</tr>
<tr>
<td>8/2004</td>
<td>2791</td>
</tr>
<tr>
<td>7/2004</td>
<td>2249</td>
</tr>
</tbody>
</table>

By Journal (for the most recent two months):

Month: August 2005  Total number of hits: 4303

<table>
<thead>
<tr>
<th>Journal Medline Abbreviation(ISSN)</th>
<th>Number of Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal 1 (1234-5678)</td>
<td>3293</td>
</tr>
<tr>
<td>Journal 2 (8765-4321)</td>
<td>1010</td>
</tr>
</tbody>
</table>

Month: July 2005  Total number of hits: 3714

<table>
<thead>
<tr>
<th>Journal Medline Abbreviation(ISSN)</th>
<th>Number of Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal 1 (1234-5678)</td>
<td>2803</td>
</tr>
<tr>
<td>Journal 2 (8765-4321)</td>
<td>911</td>
</tr>
</tbody>
</table>

Submit Links on Behalf of Libraries

Section Contents

- Introduction
- Before Submitting Links
- Submitting Links
- File Preparation
  - Resource File Format
Library Resource File Examples

- File Transfer

**Introduction**

Full-text providers and other library vendors may submit resource file(s) (library holdings information) on behalf of libraries. This is generally done by aggregators who submit links to LinkOut.

Vendors that supply OpenURL-based services to libraries can help libraries generate holdings information so libraries can link from PubMed citations to the service. This is usually done by including an export function that allows libraries to generate the necessary LinkOut files, although vendors may create files on behalf of the library.

For more information about supplying holdings information to create links to an OpenURL-based service, see Managing Library Holdings Using a Link Resolver.

**Before Submitting Links**

Before a provider can submit links on behalf of libraries, the provider must send a message to linkout@ncbi.nlm.nih.gov expressing their interest in submitting library holdings information. This message should include the following information:

- the provider's LinkOut account name (if applicable)
- the name, email address, and telephone number of a contact person at your organization

A member of the LinkOut team will respond to contact person within 1 week.

**Submitting Links**

After receiving approval to submit library holdings information, please take the following steps for each library:

1. The library must participate in LinkOut. If a library does not participate in LinkOut, they should register for an account. A library cannot ask a third party to register for LinkOut.

Libraries would need to write to NLM Support Center to give permission for the provider to submit holdings on their behalf. If a library is registering for the first time, they may include this permission in the registration email. Please use the following format for the authorization message:

Subject: [provider name] will send LinkOut files for GoodLibrary

I authorize [provider] to send LinkOut files on behalf of GoodLibrary. We understand that the holdings information in this file will not appear in the submission utility and that we are responsible for keeping the holdings information current. I have informed all library staff about this change.
My contact information is: janesmith@goodlib.edu
Phone: 123-456-7890

2. The library will receive account information from LinkOut within one week. The library then sends their LinkOut User Name and PrId to the provider.

3. The provider generates a resource file(s), described below, for the library, and submits the file(s) to the “users” directory of the provider’s FTP account.

4. The library signs in to the Library Submission Utility and supplies a library icon. If the library does not provide an icon in the Submission Utility, LinkOut's default library icon will display. Icons supplied in the resource file submitted by a provider will not be displayed. For more information about library icons, see Provide Full Text and Print Icons in the Library Submission Utility chapter.

Resource files are either submitted as a one-time load or updated regularly. When resource files are submitted as a one-time load, the provider submits the resource file(s) for the library once. The library then maintains the holdings information using the Library Submission Utility.

When resource files are updated regularly, the provider maintains the library's resource file, providing updated files on a regular basis. The holdings maintained by the provider do not appear in the Library Submission Utility. Users may choose to maintain other holdings information using the Library Submission Utility.

**File Preparation**

To submit links on behalf of a library, the provider must send a resource file(s) describing the resources (library holdings) to which the library has access. A resource file may contain resources from a single provider (i.e., the publisher or aggregator's own resources) or resources available from multiple providers (i.e., services that manage librarys' online holdings information may want to submit links to resources available to the library from a variety of publishers or aggregators).

For a journal to be included in the resource file, the full-text provider must submit links to NCBI for that journal AND the library must have a pre-existing access agreement with the full-text provider. See https://www.ncbi.nlm.nih.gov/projects/linkout/journals/jourlists.cgi?typeid=1&type=providers&operation=Show for a list of journals and associated full-text providers available for linking. In constructing the resource file, you may find the text versions of the https://www.ncbi.nlm.nih.gov/projects/linkout/journals/jourlists.cgi?typeid=1&type=journals&format=text&operation=Show (sorted by title) and the https://www.ncbi.nlm.nih.gov/projects/linkout/journals/jourlists.cgi?typeid=1&type=providers&format=text&operation=Show (journals sorted by provider) helpful.

The resource file must be named [library NameAbbr]-[provider abbreviation supplied by NCBI]-holdings.xml. For example, the resource file for the library with NameAbbr testlib
supplied by provider Good Publisher (provider abbreviation gp) would be named testlib-gp-holdings.xml.

A list of all LinkOut Libraries NameAbbr and Provider Id can be found here.

Resource File Format

For complete file specifications, see LinkOut Technical Information: Resource File or the LinkOut DTD.

The following is an example resource file for University Library, ProviderId 9999. The library has access to three online journals from the provider Good Publisher.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN" "LinkOut.dtd"
[
<!ENTITY icon "https://www.universitylibrary.edu/images/linkout.gif">
]
<LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>&icon;</IconUrl>
    <SubObjectSelector>
      <Database>PubMed</Database>
      <SubProvider>
        <NameAbbr>GoodPublisher</NameAbbr>
      </SubProvider>
    </SubObjectSelector>
    <ObjectUrl>
      <Rule>/linkout/pmliblink.cgi?id=&lo.id;&amp;lib=unilib</Rule>
      <Attribute>Electronic Full-text</Attribute>
    </ObjectUrl>
  </Link>
</LinkSet>
```

The Resource file submitted for libraries follows the same format as the Resource file described above. The only difference is that library holdings are described in the <SubProvider> element, rather than in <ObjectList>, and that the <ObjectUrl> contains a link to the LinkOut program, rather than to the provider’s site.

**<IconUrl>: The Library’s Icon**

In holdings files submitted on behalf of a library, the ENTITY icon must be used. The URL for the icon cannot be entered directly into the <IconUrl> element.

Icons submitted on behalf of a library will be overwritten by icons submitted via the Library Submission Utility.
**<SubProvider>: Describing the Library’s Online Holdings**

<SubProvider> contains one required sub-element, <NameAbbr>, and one optional sub-element, <InclQuery>.

<NameAbbr> contains the LinkOut User Name of the full-text provider. LinkOut User Names are available in the list of [https://www.ncbi.nlm.nih.gov/projects/journals/active_providers.html](https://www.ncbi.nlm.nih.gov/projects/journals/active_providers.html).

<InclQuery> lists the journals to which the library subscribes from the provider in <NameAbbr>. Typically, <InclQuery> follows this format:

```
<InclQuery>"{Journal ISSN}" AND {start year}:{end year}[dp]</InclQuery>
```

There are two ways to describe a library’s online journal holdings:

1. The library subscribes to all of a full-text provider’s LinkOut journals:

Include only the valid NameAbbr for the provider in the <NameAbbr> element within <SubProvider>. In the example below, all of provider XYZ’s journals are included in the library’s holdings.

```
<SubProvider>
  <NameAbbr>XYZ</NameAbbr>
</SubProvider>
```

2) The library does not subscribe to all of a full-text provider’s LinkOut journals:

Use <InclQuery> within <SubProvider> to list the journals to which the library subscribes. In the example below, the journals "J Teeth" beginning in 1996 and the journal "J Feet" beginning in 2000 from provider XYZ are included in the library’s holdings. <InclQuery> can be repeated to include multiple journals.

```
<SubProvider>
  <NameAbbr>XYZ</NameAbbr>
</SubProvider>
```

**<ObjectUrl>: Specifying the Link to Access Online Full Text**

The <ObjectUrl> must contain the URL of LinkOut’s library linking program. The <ObjectUrl> element must always be:

```
<ObjectUrl>
  <Rule>/linkout/pmliblink.cgi?id=&lo.id;&amp;lib=unilib</Rule>
</ObjectUrl>
```

Replace **unilib** with the library’s LinkOut NameAbbr. A list of all LinkOut Libraries NameAbbr and Provider Id can be found [here](https://www.ncbi.nlm.nih.gov/projects/journals/active_providers.html).
Library Resource File Examples

Example 1: This example shows a resource file containing library holdings from one provider. Most files submitted by providers will follow this format.

The following resource file describes the LinkOut holdings for University Library, ProviderId 9999. University Library subscribes to four journals from the provider Good Publisher.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN" "LinkOut.dtd"
[
<!ENTITY icon "https://www.universitylibrary.edu/images/linkout.gif">
]>
<LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>&icon;</IconUrl>
    <SubObjectSelector>
      <Database>PubMed</Database>
      <SubProvider>
        <NameAbbr>GoodPublisher</NameAbbr>
      </SubProvider>
    </SubObjectSelector>
    <ObjectUrl>
      <Rule>/linkout/pmliblink.cgi?id=&lo.id;&amp;lib=unilib</Rule>
      <Attribute>Electronic Full-text</Attribute>
    </ObjectUrl>
  </Link>
</LinkSet>
```

Example 2: This example shows a resource file containing library holdings information from multiple providers. This type of file would be submitted by a service that had access to all of a library's holdings information, including full-text providers, or by a library that has chosen to submit library holdings as a file, rather than managing holdings through the Library Submission Utility or by using a local service.

The following resource file describes the LinkOut holdings for University Library, ProviderId 9999. University Library subscribes to:

- all LinkOut journals offered by the provider "Springer"
- two LinkOut journals, "J Cell Biol" and "J Biol Chem" (ISSN:0021-9258) offered by the provider "HighWire"
- all LinkOut journals except the journal "Cancer" offered by the provider "Wiley"
• one LinkOut journal "J Mol Biol" offered by the provider "AcadPres". "AcadPres" offers links to this journal from 1990 to the present, but University Library's online access starts in 1996.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN" "LinkOut.dtd"
[<!ENTITY icon "https://www.universitylibrary.edu/images/linkout.gif">
<LinkSet>

  <Link><LinkId>1</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>&icon;</IconUrl>
    <SubObjectSelector>
      <Database>PubMed</Database>
      <SubProvider>
        <NameAbbr>Springer</NameAbbr>
      </SubProvider>
    </SubObjectSelector>
    <ObjectUrl>
      <Rule>/linkout/pmliblink.cgi?id=&lo.id;&lib=unilib</Rule>
      <Attribute>Electronic Full-text</Attribute>
    </ObjectUrl>
  </Link>

  <Link><LinkId>2</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>&icon;</IconUrl>
    <SubObjectSelector>
      <Database>PubMed</Database>
      <SubProvider>
        <NameAbbr>HighWire</NameAbbr>
        <InclQuery>"J Cell Biol"[ta]</InclQuery>
        <InclQuery>"0021-9258"[ta]</InclQuery>
      </SubProvider>
    </SubObjectSelector>
    <ObjectUrl>
      <Rule>/linkout/pmliblink.cgi?id=&lo.id;&lib=unilib</Rule>
      <Attribute>Electronic Full-text</Attribute>
    </ObjectUrl>
  </Link>

  <Link><LinkId>3</LinkId>
    <ProviderId>9999</ProviderId>
    <IconUrl>&icon;</IconUrl>
  </Link>

</LinkSet>
```
File Transfer

Use the https://www.ncbi.nlm.nih.gov/projects/linkout/doc/validate.shtml utility to validate LinkOut files against the LinkOut DTD before submitting them to NCBI.

Transfer the resource file(s) via FTP to the host FTP-private.ncbi.nlm.nih.gov. Place the files in the “users” directory of your FTP account. No subdirectories should be created in the “users” directory.

Additional Information about Linking

Section Contents

- Deleted PMIDs
- Transferring Journals Between Publishers
Deleted PMIDs

From time to time, records are deleted from the PubMed database. Please see the publisher journal submission FAQ for details.

If you provide links using PMIDs in LinkOut files and the PMIDs are deleted, your links will disappear from PubMed. If you use these PMIDs to link to PubMed from your system, these links will be broken.

A list of all PMIDs that have been deleted since October 2004 is available at:

This plain text file is updated every night at 10:00 p.m. Eastern Time. Please consult this list frequently to synchronize your linking system with PubMed to ensure proper functioning of your links.

Adding/Changing DOI/PII in PubMed Records (for Linking Purposes Only)

NLM and NCBI do not input DOI or PII in PubMed records; this information must be submitted by providers that are submitting journal citation data. For citations that are already in PubMed, DOI/PII information can be added or updated in the ArticleID IdType element of the citation XML by providing the new or updated information to NCBI. Only the current citation data provider of a journal title would be able to submit DOI/PII information.

To submit updated DOI/PII for PubMed records, upload a simple text file containing PMID and DOI/PII pairs in two columns:

- Locate the PubMed citation IDs (PMID) of the citations for which DOI/PII will be added or updated.
- Create a text file of PMID</tab>DOI or PMID</tab>PII pairs </tab> refers to the tab key). For example:

12345678 10.1234/2013/999990.

- Each pair should appear on one line.
- DOI files must have the extension .doi.
- PII files must have the extension .pii.
- Each file may contain up to 10,000 pairs. You may submit multiple files.

Place DOI or PII files in the pid directory of the FTP assigned to you. If you don’t have a pid directory in your assigned FTP, write to linkout@ncbi.nlm.nih.gov to request a pid directory. Text files will be processed in about 48 hours.

Transferring Journals Between Publishers

When a journal is transferred to a new publisher, LinkOut needs to be informed so that the default icon can be changed (more about the default icon), and to ensure that links
continue to function properly. To do this, please send the following information to linkout@ncbi.nlm.nih.gov.

- Is the journal being added or deleted?
- Journal title and ISSN.
- Publisher name and LinkOut account name.

If the journal is being added to your collection, please also include the following:

- Name of previous publisher
- When will change take place?
- When will you start submitting citation data?
- When will you submit links for the journal? (This should be done after citation files are submitted for the first time.)
- Will back content of the journal be hosted on your site?
- Will libraries that subscribe to the journal have access to all content available for the journal at your site?
- Should your icons appear on back content in PubMed? (This can be done only if the previous publisher’s links are not working, or if the copyright holder approves the change.)

If the journal is being removed from your collection, please also include the following:

- Is the journal being transferred to a new publisher? Which?
- When will the change take place?
- When will you stop submitting links for the journal or update your LinkOut files to stop links from being generated for new content?
- Will back content continue to be hosted at your site?
- Should your icons appear on back content in PubMed? (If links are not working, they will be removed. Icon can continue to appear on back content if copyright holder approves it.)
- Will the libraries that subscribed to the journal continue to have access to back content at your site?

Both old and new provider links should be working during the transition.
Information for Other Resource Providers

Created: September 14, 2005; Updated: August 2, 2016.

LinkOut is a feature of NCBI databases where third parties provide information to link specific NCBI database records to relevant web-accessible online resources, such as full-text publications, molecular biology databases (i.e., organism-specific, taxonomy, structure, etc.), catalogs of research materials (clones, cell cultures, primers, etc.), funding sources, medical resources, research groups, and others. This document explains how providers of resources other than online full text can participate in LinkOut by supplying NCBI with the necessary information for creating links from NCBI database records to the providers' resources.

An FAQ for LinkOut Providers is also available.

How It Works

LinkOut provides links from PubMed records and other NCBI database records to online resources external to the NCBI systems. All linking information is submitted by LinkOut providers - the owner or agent for the owner of the online resource. LinkOut providers are responsible for maintaining their links.

To submit links to your resource, you will need to upload two XML files, an identity file and a resource file. The identity file contains the information about your organization needed to list your resource(s) in LinkOut. The resource file describes the database records you will link from and contains the information that LinkOut needs to generate the links.

All links can be viewed in the LinkOut Display. In PubMed, links can also be viewed as icons.

Links submitted to LinkOut are available through the NCBI Programming Utility ELink. Thus, systems outside NCBI may retrieve links through this utility and display them at their sites.

Prerequisites for Participation

Resources submitted for inclusion in LinkOut will be evaluated individually to determine whether they meet certain inclusion criteria.

Resources eligible for linking from NCBI databases must be directly relevant to the specific subjects of the NCBI database records and useful to users' study and research. Resources from professional societies, government agencies, educational institutions, or individuals and organizations that have received grants from major funding organizations are preferred.
Please review the Guidelines for Evaluation of Resources before applying for inclusion in LinkOut. Resources with a commercial interest should pay particular attention to the Additional Information for Commercial Interests section of the Guidelines.

**Apply for Inclusion in LinkOut**

To apply for inclusion in LinkOut, send an email to linkout@ncbi.nlm.nih.gov. Include the following information:

- Name, email address, and phone number of a contact person in your organization.
- The scope of your resource, including the URL of the resource. If a username and password are required to access the resource, please include a temporary username and password that the LinkOut team can use to evaluate the resource. Also, please describe the type of NCBI database records to which you would like to apply links.
- Describe any restrictions on access to the resource.

A LinkOut team member will email the contact person within 1 week regarding your request.

**File Preparation: Identity File**

To create links to your resource, NCBI needs two files, an identity file and a resource file.

The identity file contains the information needed to list a provider in LinkOut. This file must be named `providerinfo.xml`; the file name is case sensitive. This file should be composed in a text editor, such as NotePad, not in a word processing program.

For complete file specifications and description of elements, see Technical Information: Identity File or the LinkOut DTD.

The following is an example `providerinfo.xml` file for the LinkOut participant, WebDatabase Co., with Provider Id 7777 and NameAbbr WebDB.

```xml
<?xml version="1.0"?>
<Provider>
  <!-- ProviderId is assigned by NCBI -->
  <ProviderId>7777</ProviderId>
  <Name>WebDatabase Co.</Name>
  <NameAbbr>WebDB</NameAbbr>
  <SubjectType> gene/protein/disease-specific </SubjectType>
  <Attribute>registration required</Attribute>
  <!-- Url is used in My NCBI and in the lists of LinkOut Providers -->
  <Url>http://www.webdatabase.com</Url>
  <!-- Brief is used in My NCBI -->
  <Brief> On-line publisher of biomedical databases </Brief>
</Provider>
```
<SubjectType> and <Attribute> elements included in the providerinfo.xml file will apply to all links submitted by the provider. In the example above, access to all databases published by WebDatabase Co. requires a free registration, therefore <Attribute>registration required</Attribute> has been included in the providerinfo.xml file.

File Preparation: Resource File (XML)

Section Contents:

• Resource File Format
• <ObjectList>: Selecting Records in a Resource File
  ◦ Selecting Records Using <ObjId>
  ◦ Selecting Records Using <Query>
    ▪ Tips for Using <Query>
    ▪ Additional Information on Using <Query> When Linking to PubMed Citations
• <ObjectUrl>: Specifying the Link to Access the Resource
  ◦ Creating the URL for the Link
  ◦ Describing the Resource
• Resource File Examples

To create links to your resource, NCBI needs two XML files, an identity file and a resource file.

The resource file describes the database records to which your links will be applied and contains the information that LinkOut needs to generate the links. Links described in the resource file must link directly to the relevant resource, requiring no additional searching to access the resource after a user clicks on the provider's link.

Resource files are typically submitted in XML format, or you may choose to submit links as a simple text file instead. Providers of online full text must submit resource files in XML format.

XML: Resource File Format

XML resource files must have a file extension .xml; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Typically, files are named resources.xml. To help with file management, a provider may supply more than one resource file. File size may not exceed 20 MB. This file should be composed in a text editor, such as NotePad, not in a word processing program.

For complete file specifications and description of elements, see LinkOut Technical Information: Resource File or the LinkOut DTD.
The resource file below describes links from NCBI’s Nucleotide database to a *C. elegans* sequence database provided by WebDatabase Co., ProviderId 7777.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
[ <!ENTITY icon.url "https://www.webdatabase.com/images/webdb.gif">
<!ENTITY base.url "https://www.webdatabase.com/cgi-bin/elegans?">
]> <LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>7777</ProviderId>
    <ObjectSelector>
      <Database>Nucleotide</Database>
      <ObjectList>
        <Query>Caenorhabditis elegans [orgn]</Query>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>&base.url;</Base>
      <Rule>an_lookup=&lo.pacc;</Rule>
      <UrlName>Caenorhabditis elegans</UrlName>
      <SubjectType>organism-specific</SubjectType>
    </ObjectUrl>
  </Link>
</LinkSet>
```

**<ObjectList>: Selecting Records in a Resource File**

The `<ObjectList>` element is used to select the database records to which links will be applied. `<ObjectList>` contains one or more `<Query>` elements OR one or more `<ObjId>` elements. `<Query>` elements contain a valid search query with a valid field descriptor that will retrieve the records to which the link described in `<ObjectUrl>` will be applied. `<ObjId>` elements contain the Unique Identifier of the database records to which the link described in `<ObjectUrl>` will be applied.

**Selecting Records Using `<ObjId>`**

`<ObjId>` contains the unique identifier for a record in an NCBI database. For example, Taxonomy ID for the Taxonomy database.

```
Example: Select record with Taxonomy ID 37572 in the Taxonomy database
<ObjectList>
  <ObjId>37572</ObjId>
</ObjectList>
```

More than one `<ObjId>` can be used in an `<ObjectList>`.
Example: Select records with Taxonomy IDs 37572 and 33392

<ObjectList>
  <ObjId>37572</ObjId>
  <ObjId>33392</ObjId>
</ObjectList>

Because <ObjId> requires more maintenance than <Query>, NCBI recommends using <Query> whenever possible. When <ObjId> is used, the provider is responsible for updating the holdings file as new records are submitted to PubMed.

Selecting Records Using <Query>

The <Query> element contains a valid NCBI database search. A valid search term or terms should include the corresponding field descriptors. For example, a search query for Arabidopsis Thaliana would be: Arabidopsis Thaliana[orgn]. A search query for the Genbank accession number HM047434 would be HM047434 [pacc].

See Entrez Help for information on constructing search queries and field descriptors. Links will be applied to the citations retrieved by the search.

Tips for Using <Query>

1. Ranging is not allowed in Unique Identifier searches. For journal searches, ranging is additionally not allowed in Volume, Issue, or Page searches.
2. Truncation is not allowed in search statements.
3. Search field descriptors (for example, [orgn] for organism or [pacc] for primary accession number) must be used with <Query>
4. To include a date range in searches, use this format: startyear:endyear[pdat]. Dates should be notated as YYYY/MM/DD. Month and Day are optional.
5. Do not use the search field descriptors [sb] or [filter].
6. Boolean operators AND, OR, NOT must be in uppercase.
7. Use either NLM’s Title Abbreviations [ta] or ISSN numbers in journal searches. Title Abbreviations must be entered in double quotes, e.g., “J Mol Dis” [ta].

Example: Select records with the organism “Caenorhabditis elegans” published from 1996 to 1999 in the Nucleotide database

<Database>Nucleotide</Database>
<ObjectList>
</ObjectList>

See the results of this <Query> in the Nucleotide database.
Example: Select records with the organism “Caenorhabditis elegans” published by J. Smith in Nucleotide. As new records are submitted to the database, links will be applied automatically.

```xml
<Database>Nucleotide</Database>
<ObjectList>
<Query>Caenorhabditis elegans [orgn] AND smith j [auth]</Query>
</ObjectList>
```

See the results of this `<Query>` in the Nucleotide database.

More than one `<Query>` can be listed within the `<ObjectList>`, as shown in the example below.

Example: Select records for chimpanzees starting from the publication date January 1, 2000 and records for humans starting from January 1, 2002 in the Genome database. As new records are submitted, links will be applied automatically.

```xml
<Database>Genome</Database>
<ObjectList>
</ObjectList>
```

See the results for this `<ObjectList>` in the Genome database.

**Additional Information on Using `<Query>` for Linking**

When using Genbank accession numbers with `<Query>` include the field descriptor for primary accession number `[pacc]` to ensure that search results are directly related to the Genbank number included in the search query.

Example: Use a Genbank accession number as a search query to create links in Nucleotide.

```xml
<Database>Nucleotide</Database>
<ObjectList>
<Query>HM047434 [pacc]</Query>
</ObjectList>
```

See the results for this `<Query>` in Nucleotide.

MeSH headings can be used to create links in PubMed. In this case, the `<Query>` should be very precise. Only Major headings should be used in the `<Query>` and noexp should be used so the terms will not be exploded. See the MeSH database for information about using MeSH and tutorials.

Example: Use MeSH headings to select citations on acupuncture therapy in the treatment of tension headaches in PubMed.

```xml
<Database>PubMed</Database>
<ObjectList>
</ObjectList>
```
See the results for this <Query> in PubMed.

<ObjectUrl>: Specifying the Link to Access the Resource

The <ObjectUrl> element is used to describe the link to the online resource. <ObjectUrl> contains the sub-elements <Base>, <Rule>, <SubjectType>, <Attribute>, and <UrlName>. <Base> and <Rule> are concatenated to form the URL for the link. <SubjectType>, <Attribute>, and <UrlName> describe the resource to which the record is being linked.

For definitions of SubjectType and Attribute elements, see Special Elements: SubjectType and Special Elements: Attribute.

Creating the URL for the Link

<Base> is the stable portion of the URL for the provider's resource. This is usually the URL of the provider's website or CGI program.

<Rule> is the remainder of the URL needed to access the appropriate record within the resource.

Example: Create the URL https://www.webdatabase.com/cgi-bin/elegans?OID=1988

<table>
<thead>
<tr>
<th>&lt;Base&gt;</th>
<th><a href="https://www.webdatabase.com/cgi-bin/elegans?OID=1988">https://www.webdatabase.com/cgi-bin/elegans?OID=1988</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Rule&gt;</td>
<td>OID=1988</td>
</tr>
</tbody>
</table>

If the URL for the resource follows a pattern using variable values that are found in a database record, the pattern can be described in the <Rule> element, and LinkOut can insert the appropriate values for each citation. This allows many links to be generated from the information in a single <ObjectUrl>.

URL patterns are described using LinkOut's XML entities. An XML entity is a short text string that represents a type of value. During LinkOut processing, the text string is replaced in the URL by the appropriate value for each record. Supported entities can be found in the list of Allowable Rule Keywords and in the LinkOut DTD.

Example: Create URLs following the pattern: https://www.webdatabase.com/cgi-bin/an_lookup=[PACC]

| <Base> | https://www.webdatabase.com/cgi-bin/an_lookup=
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Rule&gt;</td>
<td>&amp;lo.pacc;</td>
</tr>
</tbody>
</table>

Using this <Base> and <Rule>, the URL constructed for the record with accession number AL032671 would be https://www.webdatabase.com/cgi-bin/elegans?an_lookup=AL032671

Entities can be combined with other information in the <Rule>.
Example: Create URLs following the pattern:
https://www.webdatabase.com/cgi-bin/db=elegans&id_lookup=[NCBI database Unique Identifier]&view=text

<Base>https://www.webdatabase.com/cgi-bin</Base>
<Rule>/db=elegans&amp;id_lookup=&lo.id;&amp;view=text</Rule>

In this case, the URL generated for the record with the unique ID "6016240" would be:
https://www.webdatabase.com/cgi-bin/db=elegans&id_lookup=6016240&view=text

LinkOut does not support Unicode (UTF-8) and requires that certain special characters be encoded in files. See Special Characters for a list of these characters and their encodings.

**Describing the Resource**

The relevance of resources linked from NCBI database records should be readily apparent to users. The name and/or description of the resource should convey something about the information that is being offered and its relevance.

The elements `<SubjectType>` and `<Attribute>` are used in the `<ObjectUrl>` to describe resources. Available SubjectTypes can be found in Special Elements: SubjectType. Available Attributes can be found in Special Elements: Attribute.

If the available SubjectTypes and Attributes do not suffice to describe the resource, `UrlName` can be used as well. If no SubjectType is given, the SubjectType “miscellaneous” will be assigned automatically.

The application of SubjectTypes and Attributes is at the discretion of the resource provider. However, if there are any barriers to accessing the resource, one of the following Barrier Attributes must be used:

```
<Attribute>registration required</Attribute>
<Attribute>subscription/membership/fee required</Attribute>
```

Continuing the example above, if WebDatabase Co. requires a subscription to access the *C. elegans* database, the `<ObjectUrl>` element might look like this:

```
<ObjectUrl>
<Base>https://www.webdatabase.com/cgi-bin/</Base>
<Rule>/db=elegans&amp;id_lookup=&lo.id;&amp;view=text</Rule>
<Attribute>subscription/membership/fee required</Attribute>
</ObjectUrl>
```

**Resource File Examples**

**Example 1:** Molecular Biology Database, Inc., Provider Id 1234, provides links to freely available information for the Taxonomy records with IDs 9606 and 111063. URLs for the database entries are created using a text string that is not included in Taxonomy, so links
are created individually for each record. To minimize the repetition of textual data, the
Base for the URL has been defined as an Entity in the Prolog of the file.

```xml
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
[<!ENTITY base.url "http://molbioco.com/animals/">]>
<LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>1234</ProviderId>
    <ObjectSelector>
      <Database>taxonomy</Database>
      <ObjectList>
        <ObjId>9606</ObjId>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>&base.url;</Base>
      <Rule>homo/h._sapiens</Rule>
      <UrlName>Homo sapiens</UrlName>
      <SubjectType>taxonomy/phylogenetic</SubjectType>
    </ObjectUrl>
  </Link>
  <Link>
    <LinkId>2</LinkId>
    <ProviderId>1234</ProviderId>
    <ObjectSelector>
      <Database>taxonomy</Database>
      <ObjectList>
        <ObjId>9733</ObjId>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>&base.url;</Base>
      <Rule>orcinus/o._orca</Rule>
      <UrlName>Orcinus orca</UrlName>
      <SubjectType>taxonomy/phylogenetic</SubjectType>
    </ObjectUrl>
  </Link>
</LinkSet>
```

**Example 2:** Genotypes, Inc., Provider Id 4321, provides free online access to genotyping assays from records in the SNP database. SNP records are selected using the SNP unique identifier. The URL to access the assays at their site follows this pattern for each record:

https://gti.com/Gateway?source=SNP&res=Assays&ap1=rs[SNP ID]
Example 3: A record may be retrieved by more than one <Query>. When this happens, link assignment will be handled as described in Duplicate Links and Multiple Links.

If these queries are in different Link elements, <Attribute>preference</Attribute> can be used to indicate which <Link> element should be applied to the record. This is generally used in situations where the links for a subset of a range have a different URL pattern or different access restrictions. See Duplicate Links and Multiple Links for more information.

In the example below, the records included in LinkId 1 will also be selected by LinkId 2.

The LinkOut provider WebDatabase Co. provides links from the Nucleotide database to the C. elegans sequence database.

LinkId 1 describes links from particular Nucleotide records. The records are selected using <Query> and have a special <Rule>. Because these records are also included in LinkId 2, <Attribute>preference</Attribute> is used to indicate that only these links should be applied to these citations.

LinkId 2 provides links from all Nucleotide records on C. elegans to WebDatabase Co.’s C. elegans records, except for the records selected in LinkId 1.

As LinkId 1 describes specific requirements, it is listed before the general LinkId 2.
File Preparation: Resource CSV File

Links data can also be provided in CSV (comma separated values) files. The CSV resource file contains LinkOut data provider identifiers, database record IDs or queries, and links data to your resource pages, all of which is used to create links in NCBI databases.

A LinkOut program converts CSV files into XML files that validate against the LinkOut DTD. Links provided in CSV files must link directly from a NCBI database record to a resource page that provides information directly related to the database record.

CSV files need to have the file extension .csv; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Examples of file name and extension: linksgene2015.csv, or linksnucleotide2015.csv. To help with file management, a provider may submit more than one resource file. CSV files may not exceed 10 MB each.

Section Contents
• Resource CSV File Data Fields
• Resource File CSV Format
• Resource CSV File Examples

**Resource CSV File Data Fields**

The CSV files used by LinkOut to create links have required and optional data fields:

Field 1: PrId (required). Provider Id assigned by NCBI to links data providers. A four digit number.

Field 2: DB (required). NCBI database name. Enter the name of the NCBI database for which you want to provide links data.

Field 3: UID or Query (required). Each record in an NCBI database has a numerical unique identifier (UID). For example, in this Taxonomy record: http://www.ncbi.nlm.nih.gov/taxonomy/?term=37572 the Taxonomy Id 37572.

NCBI database records can also be retrieved using queries. For example, Nucleotide query: Caenorhabditis elegans [orgn] AND 2011:2015[pdat] AND smith j [auth]

Field 4: URL (required). URL to the supplemental information page in your resource, which is directly related to the selected NCBI database record.

Field 5: IconUrl (optional). URL of an icon file that you would like to represent your resource. The icon should meet the specifications described in Icons. The icon URL should point directly to the icon file in your server. If an icon is not provided, LinkOut will use the LinkOut generic icon. Icons are only displayed in PubMed.

Field 6: UrlName(optional). Additional description about the link.

Field 7: SubjectType (required*). In this field enter a subject type selected from this page that best describes your resource. (*) If the subject type is present in the identity file, this field should be left empty.

Field 8: Attribute (required). If access to the resource requires a license or membership, enter the following in this field: Subscription/membership/fee required. If access is free, but registration is required enter: registration required. Otherwise, if access to the resource is free and registration is not required, this field can be left empty.

**Resource File CSV Format**

Your CSV file can be formatted as a table. Each field must be separated by commas.

Field 1: PrId. Provider Id, a four digit number. For example: 1234.

Field 2: DB. Enter the selected NCBI database name in this field. For example: Nucleotide

Field 3: Two options UID or Query:

UID. Taxonomy ID. For example: 37572

Field 4: URL. https://treebase.org/treebase-web/search/taxonSearch.html

Filed 5: IconUrl. Only needed for PubMed. Leave blank for other databases.

Field 6: UrlName. Caenorhabditis elegans

Field 7: SubjectType. organism-specific (*) If the ‘organism-specific’ subject type is present in the identity file, this field should be left blank.

Field 8: Attribute. If access to the resource requires a license or membership, enter the following in this field: Subscription/membership/fee required. If access is free, but registration is required enter: registration required. Otherwise, if access to the resource is free and registration is not required, this field can be left empty.

Resource CSV File Examples

Example 1. Access to a resource is through license or membership: Provider Id 1234, provides links for the Nucleotide record 3810674. The URL provided leads to a page that has information that supplements the Nucleotide record. The UrlName indicates the resource page topic. The subject type was provided in the identity file, and consequently this field is left blank. Access to the resource is through license or membership only, therefore enter the attribute “subscription/membership/fee required” in this field.

Note that each field must be comma separated.

Field 1: PrId. 1234

Field 2: DB. Nucleotide

Field 3: Query. BX284601.5[pacc]

Field 4: URL. http://www.origene.com/cdna/search-all.mspx?product=HCLONES&term=1B%20%28VP2%29

Filed 5: IconUrl. None needed for Nucleotide.

Field 6: UrlName Caenorhabditis elegans chromosome I

Field 7: SubjectType.

Field 8: Attribute. Subscription/membership/fee required

A sample file using a spreadsheet program such as MS Excel.
The same entries in a **sample CSV file** can be downloaded [here](http://www.origene.com/cdna/search-all.mspx?product=HCLONES&term=1B(VP2)). Save files with the extension `.csv`, and upload them to the “holdings” directory of the FTP assigned to you.

**Example 2.** Access to a resource is free, but requires registration: Provider Id 1234, provides links for Gene database records, however, queries are used instead of UID numbers. The URL provided leads to a page that has information that supplements the Gene record. The UrlName field is left blank. The subject type was not provided in the identity file, and consequently it must be listed here. Access to the resource is free, but registration is required, therefore, enter the attribute “registration required” in this field. Note that each field must be comma separated.

Field 1: PrId. 1234

Field 2: DB. Gene

Field 3: Query. APOE[sym] AND chromosome 7

Field 4: URL. [https://biogps.org/#goto=genereport&id=11816](https://biogps.org/#goto=genereport&id=11816)

Field 5: IconUrl. None needed for Gene

Field 6: UrlName

Field 7: SubjectType. gene/protein/disease-specific

Field 8: Attribute. Registration required

A sample file using a spreadsheet program such as MS Excel.

<table>
<thead>
<tr>
<th>PrId</th>
<th>DB</th>
<th>Query</th>
<th>URL</th>
<th>IconUrl</th>
<th>UrlName</th>
<th>SubjectType</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1234</td>
<td>Gene</td>
<td>APOE[sym] AND chromosome 7</td>
<td><a href="https://biogps.org/#goto=genereport&amp;id=11816">https://biogps.org/#goto=genereport&amp;id=11816</a></td>
<td>gene/protein/disease-specific</td>
<td>Registration required</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The same entries in a **sample CSV file** can be downloaded [here](http://www.origene.com/cdna/search-all.mspx?product=HCLONES&term=1B(VP2)). Save files with the extension `.csv`, and upload them to the “holdings” directory of the FTP assigned to you.

**Example 3.** Access to a resource is free and registration is not required: Provider Id 1234, provides links for the Taxonomy record 314297. The URL provided leads to a page that has information that supplements the Taxonomy record. The UrlName indicates the resource page topic. The subject type was provided in the identity file, and consequently
this field is left blank. Access to the resource is free and registration is not required, consequently, the field is left blank. Note that each field must be comma separated.

Field 1: PrId. 1234
Field 2: DB. Taxonomy
Field 3: UID. 314297
Filed 5: IconUrl. None needed for Taxonomy
Field 6: UrlName Compsopogon hookeri Montagne
Field 7: SubjectType.
Field 8: Attribute.

A sample file using a spreadsheet program such as MS Excel.

<table>
<thead>
<tr>
<th>PrId</th>
<th>DB</th>
<th>UID</th>
<th>URL</th>
<th>IconUrl</th>
<th>UrlName</th>
<th>SubjectType</th>
<th>Attribute</th>
</tr>
</thead>
</table>

The same entries in a **sample CSV file** can be downloaded [here](https://example.com). Save files with the extension .csv, and upload them to the “holdings” directory of the FTP assigned to you.

**File Preparation: Resource File (Simple Text)**

**Section Contents:**
- Resource File Format
- Global Information
- Creating Links
  - Selecting Records
  - Specifying the Link
  - Describing the Resource
- Resource File Examples

**Simple Text: Resource File Format**

Providers may choose to submit the resource file in a simple text file instead of XML.

Text resource files must have a file extension .ft; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Typically, files are named “resources.ft”. To help with file
management, a provider may supply more than one resource file. File size may not exceed 10 MB.

Text files will be translated into valid XML files that conform to the LinkOut DTD and then are processed into LinkOut. This file should be composed in a text editor, such as NotePad, not in a word processing program.

For complete file specifications and description of elements, see Resource File: Simple Text or the LinkOut DTD.

The resource file below describes links from NCBI’s Nucleotide database to a *C. elegans* sequence database provided by WebDatabase Co., ProviderId 7777.

--- lines starting with "-" are comments ---
--- information in the first block is global ---
prid:   7777
dbase:  nucleotide
stype:  organism-specific
!base:  http://www.webdatabase.com/cgi-bin/elegans?

------
linkid: 1
query:  Caenorhabditis elegans [orgn]
base:   &base;
rule:   an_lookup=&lo.pacc;
name:   Caenorhabditis elegans

------

**Simple Text: Global Information**

The first block holds global information that will be used throughout the file.

- **prid**: LinkOut Provider ID
- **dbase**: NCBI database that will be hosting the links, e.g., pubmed, nucleotide, taxonomy
- **stype**: SubjectType. See Special Elements: SubjectType for all available SubjectTypes.
- **attr**: Attribute. See Special Elements: Attribute for all available Attributes.

**Simple Text: Creating Links**

Each subsequent block specifies a LinkOut link. This has two basic parts, a valid search query with a valid field descriptor and a URL pointing back to the provider’s site. Each search query will be evaluated, and a link to the specified URL will be applied to records that are retrieved by the query. See Entrez Help for information on constructing search queries and on field descriptors. Links will be applied to the citations retrieved by the search.
In the simplest case, each block could be:

```
query: [a valid NCBI database query with a valid database field descriptor]
rule: [the URL that will be applied to the records retrieved by the query]
```

**Simple Text: Selecting Records**

Any valid search query may be used to select records. Each query should appear on a single `query` line and must include a database field descriptor. Multiple query lines in one block will be OR-ed together: See Entrez Help for information on constructing search queries and on field descriptors.

| Example: This search will be translated as: human[name] OR chimpanzee[name] |
| query: human [name] |
| query: chimpanzee [name] |

Genbank accession numbers can be used as queries to create links. For example: a Genbank sequence accession number for *Arabidopsis Thaliana* is HM047434. A query for this sequence would be HM047434 [pacc] – pacc is the field descriptor for primary accession numbers.

| Example: enter the query with the field descriptor [pacc] |
| HM047434 [pacc] |

Each record in an NCBI database has a numerical unique identifier (UID). You can select the NCBI database records that you would like to link from by UID in the `uids:` line.

| Example: Place links on records with UIDs 123456, 123469, and 3847559 |
|---- separate unique identifiers (UIDs) with a blank space. Each new line should start with the “uids:” label |
| uids: 123456 123469 3847559 |

**Simple Text: Specifying the Link**

The link is specified using the `base:` and `rule:` lines. `base:` is the stable portion of the URL for the resource. This is usually the URL of the provider’s website or CGI program. `rule:` is the remainder of the URL needed to access the online resource.

`base:` and `rule:` are concatenated to form the URL for the link.

If desired, the entire URL for the resource can be included on the `rule:` line, and the `base:` line can be omitted.
If the URL for the resource follows a pattern using variable values that are found in the database record, the pattern can be described on the rule: line, and LinkOut can insert the appropriate values for each citation. This allows many links to be generated from the information in a single block.

URL patterns are described using LinkOut’s XML entities. An XML entity is a short text string that represents a type of value. During LinkOut processing, the text string is replaced in the URL by the appropriate value for each record. Supported entities can be found in the list of LinkOut Entities and in the LinkOut DTD.

Example: Create URLs following the pattern: http://www.webdatabase.com/cgi-bin/an_lookup=[PACC]

**base:** https://www.webdatabase.com/cgi-bin/

**rule:** an_lookup=&lo.pacc;

Using this base: and rule:, the URL constructed for the record with accession number AL032671 would be https://www.webdatabase.com/cgi-bin/elegans?an_lookup=AL032671

Entities can be combined with other information in the rule:

Example: Create URLs following the pattern:

https://www.webdatabase.com/cgi-bin/db=elegans&id_lookup=[NCBI database Unique Identifier]&view=text

**base:** https://www.webdatabase.com/cgi-bin

**rule:** db=elegans&amp;id_lookup=&lo.id;&view=text

In this case, the URL generated for the record with the unique ID 6016240 would be: https://www.webdatabase.com/cgi-bin/db=elegans&id_lookup=6016240&view=text

To minimize the repetition of textual data, the base: portion of the URL can be defined as an entity in the global information block, as shown below.

```
prid: 4592
dbase: PubMed
!base.url: https://a257.g.akamaitech.net/7/257/2422/
-----------------------------------------------
linkid: 704411419
uids: 15754467
base: &base.url;
rule: 01jan20051800/edocket.access.gpo.gov/2005/pdf/05-4062.pdf
```
Simple Text: Describing the Resource

The relevance of resources linked from NCBI database records should be readily apparent to users. The name and/or description of the resource should convey something about the information that is being offered and its relevance.

The following optional fields allow you to describe your links and resources.

- **icon**: URL of an icon file that you would like to represent your link and resources. Only applicable to links in PubMed. The icon should meet the specifications described in Icons.

- **name**: Additional description of the link. **name**: should only be used when the values in the LinkOut SubjectType and Attribute lists are not sufficient.

- **stype**: SubjectType. See Special Elements: SubjectType for all available SubjectTypes. SubjectType is used to determine where links will be placed in the LinkOut Display. If no SubjectType is given, the SubjectType “miscellaneous” will be assigned automatically.

- **attr**: Attribute. See Special Elements: Attribute for all available Attributes.

The application of SubjectTypes and Attributes is at the discretion of the resource provider. However, if there are any barriers to accessing the resource, one of the following Barrier Attributes must be used:

- registration required
- subscription/membership/fee required

Simple Text: Resource File Examples

**Example 1**: The following file shows five links to taxonomic resource on the Web. Because each link has an individual URL, the links are made separately.
Example 2: The hypothetical provider Genotypes, Inc., Provider Id 4321, provides free online access to genotyping assays from records in the SNP database. SNP records are selected using the SNP unique identifier. The URL to access assays at their site follows this pattern for each record: https://genotypinc.com/servlet/web.Gateway?source=NCBI.SNP&res=genotypAssay&ap1=rs[SNP ID]

Example 3:
A record may be retrieved by more than one <Query>. When this happens, link assignment will be handled as described in Duplicate Links and Multiple Links.

If these queries are in different linkids, you can use attr: preference to indicate which link should be applied to the record. This is generally used in situations where the links for a subset of a range have a different URL pattern or different access restrictions. See Duplicate Links and Multiple Links for more information.

In the example below, the records included in LinkId 1 below will also be selected by LinkId 2.

The hypothetical LinkOut provider WebDatabase Co. provides links from the Nucleotide database to the *C. elegans* sequence database.

**LinkId 1** describes links from all Nucleotide records on *C. elegans* published by J. Smith from 1997 to 1999 to a set of *C. elegans* records in PDF format. Because these records are also included in LinkId 2, attr: preference is used to indicate that only this link should be applied to these citations.

**LinkId 2** provides links from all Nucleotide records on *C. elegans* to WebDatabase Co.’s *C. elegans* records, except for the records selected in LinkId 1.

Because **LinkId 1** describes specific requirements, it is listed before the general **LinkId 2**.

```
----- Nucleotide links -----
prid: 7777
dbase: nucleotide
!base: "https://www.webdatabase.com/cgi-bin/elegans?"
------

linkid: 1
base: &base;
rule: auth_lookup=j-smith&view=pdf
attr: full-text PDF
attr: preference
------

linkid: 2
query: Caenorhabditis elegans [orgn]
base: &base;
rule: an_lookup=&lo.pacc;&view=full
------
```

**Example 4:** The following file shows three links to The Restriction Enzyme Database. Each query uses a specific sequence accession number. Because each link has an individual URL, the links are made separately.

```
prid: 1234
dbase: Nucleotide
!base: https://rebase.neb.com/rebase/enz/
-------
```
File Evaluation

After your application for inclusion in LinkOut has been accepted, prepare an identity file and sample resource files according to the instructions above. Resource files should contain links to at least five records from the selected database.

Validate the files using the LinkOut File Validation Utility. Email the files to linkout@ncbi.nlm.nih.gov.

Your files will be evaluated by the LinkOut team, and you will be contacted regarding any corrections. The evaluation process will continue until your files are substantially error free.

Account Assignment

When the submitted files are substantially error free, you will be assigned a ProviderId (PrId) and an approved name abbreviation (NameAbbr), and you will be given a password for an NCBI FTP account.

Please note that each provider will be given only one account at NCBI.

File Transfer

When you receive your account information, validate the files using the LinkOut File Validation Utility and transfer all files via FTP to the host FTP-private.ncbi.nlm.nih.gov. Place the files in the “holdings” directory of your FTP account. No subdirectories may be created in the holdings directory.
When files have been submitted, inform the LinkOut team at linkout@ncbi.nlm.nih.gov. Your files will be given a final evaluation before being placed in the production queue. From this point on, files will be processed automatically every day.

Links should appear in the selected NCBI database within 2 days of file submission. For instructions on viewing your links, see Using LinkOut. If 2 days have passed and you do not see your links, please write to linkout@ncbi.nlm.nih.gov.

File Maintenance

Provider Responsibilities

Link providers are responsible for:

- maintaining their LinkOut files
- transferring any additions, changes or deletions of their links to NCBI
- updating files and informing NCBI when access rights are changed
- correcting broken or incorrect links in a timely manner

Providers may transfer new versions of current files or add new resource files at any time. It is the responsibility of the provider to keep files current and valid. Links are regenerated every day based on the resource files in each provider’s directory. Therefore, providers must delete obsolete files from their holdings directory.

Additional provider responsibilities are described in LinkOut Policies: Provider Responsibilities.

Confirmation and Error Messages

Upon processing an updated file, NCBI will send an acknowledgment to the designated LinkOut contact. If you prefer not to receive this acknowledgment, please notify the LinkOut Team.

If files cannot be processed because of errors, a message with the subject line “LinkOut files uploaded to NCBI - Critical ERRORS!” will be sent to the LinkOut contact. In this case, please correct the files and resubmit them. If you have any questions about the errors, contact LinkOut at linkout@ncbi.nlm.nih.gov.

Provider Statistics

LinkOut collects statistics on the number of clicks on each provider’s links in the LinkOut display.

Statistics can be emailed to the LinkOut contact monthly. If you would like to receive statistics, please notify the LinkOut Team at linkout@ncbi.nlm.nih.gov

Statistics send via email include the yearly and monthly totals for clicks on a provider’s links (a CSV file with the same information is provided as an attachment as well).
Statistics may change for the first 2 weeks that they are available. After 2 weeks, statistics will be stable.

A sample statistics report is shown below.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/2005</td>
<td>126</td>
</tr>
<tr>
<td>7/2005</td>
<td>195</td>
</tr>
<tr>
<td>6/2005</td>
<td>142</td>
</tr>
<tr>
<td>5/2005</td>
<td>155</td>
</tr>
<tr>
<td>4/2005</td>
<td>11</td>
</tr>
</tbody>
</table>

The following is the usage statistics for your LinkOut links:
(Hits = number of times users clicked your links)

Please note that statistics for the most recent month may change in the next report.

Database: Gene

Total: 629
Related Services: Outside Tool and Document Delivery Service

Created: July 18, 2005; Updated: February 21, 2017.

Outside Tool and Document Delivery Service (DDS) are available in PubMed. DDS allows users to order articles from a service or institution that has registered with LinkOut. Outside Tool places a link to a local service on every PubMed citation.

Outside Tool

Section contents

- Introduction
- How It Works
- Register Your Service
- Manage Your Outside Tool
- Display Your Outside Tool Icons in PubMed

Introduction

Outside Tool allows an institution to place a link on every PubMed record. This link points back to a resource offered by the institution for their users. Outside Tool can be used to implement OpenURL-based and other types of services in PubMed. In order to best serve our users and expedite processing, only one Outside Tool will be set up for each unique base URL that identifies the tool. For more information about PubMed and OpenURL, see the LinkOut, Outside Tool, and OpenURL FAQ.

Libraries that would like to implement an OpenURL-based service should see Implementing OpenURL-based Services in PubMed.

To best serve the user community, NCBI tries to avoid “blind” links that do not provide useful and directly relevant information for the specific PubMed record. Therefore, to register an Outside Tool in PubMed, an institution must demonstrate that their service can provide relevant web-accessible resources for all PubMed records.

Examples of relevant resources include:

- online full text
- library holdings via the local OPAC
- local document delivery service
- other resources approved by NCBI

Search forms, tables of contents, journal home pages, bibliography building software, and other such resources that are not directly relevant to the PubMed record do not qualify as relevant resources.

All resources must be in place before a request to set up an Outside Tool can be processed.
How It Works

PubMed links to your service by attaching the PubMed ID (PMID) of the current PubMed citation to the end of the URL of your service. For example:

**Your tool URL:** http://goodmedical.edu/mytool.cgi?

**PMID:** 12345678

**Resulting URL:** http://goodmedical.edu/mytool.cgi?12345678

Please note that PubMed will only pass back the PMID. Your institution can then use the E-Utilities to obtain citation information.

You can test your service by constructing URLs to your service as described above.

Register Your Outside Tool Service

All library resources should be in place before a registration request is submitted. For your OutsideTool registration you must provide:

1. The base URL of your local service in the following format https://yourbaseURL? sid=Entrez:PubMed&id=pmid: For example:
2. Four test URLs (i.e., 2 for full-text and 2 for ordering) including PMIDs to demonstrate the links resolve to the actual resource/full-text or to a pre-filled order form. Provide requested test URLs in the following format:


   We will conduct further testing based on your 4 samples.

3. If access to full-text or the ILL/order form is password-protected, provide a temporary username and password that NLM staff can use to conduct testing. No requests will be sent.

4. The name, postal address, and phone number of the library/institution.

5. The name and email address of the contact persons. Optional: A second email address for a group, e.g., librarystaff@university.edu.

6. A file (.png, .gif, or .jpeg) of an icon that will identify your institution in PubMed. For icon specifications and examples of icons, see LinkOut Technical Information - Icons. If you are unable to provide a file, please provide a URL for the icon. The icon URL must lead to a publicly available site.
7. The URL of a web page from your library/institution that explains your institution’s full-text service (not your vendor’s), to be included in the My NCBI directory of Outside Tool services.

8. A short label (under 50 characters) that will identify your institution and local service in My NCBI. Outside Tool services are listed alphabetically, therefore, begin your label the with your institution name. NCBI reserves the right to edit this label.

9. If your institution is already using LinkOut, please provide that Name Abbr (username)

Fill out the NLM Support Center form with the subject line: “Request to set up an Outside Tool.” In the text of the message, use the following numbered format based on the explanations above:

**Subject: Request to set up an Outside Tool**

1. Base URL of your local service
2. Test URLs
3. Temporary Username and Password for password-protected access
4. Institution name, postal address and phone number
5. Contact person name and e-mail address. Optional group e-mail address
6. URL of the Outside Tool icon to be displayed in PubMed
7. URL of your institution Help page
8. Short label that identifies your
9. If your institution has a LinkOut account, please provide the NameAbbr (username)

**Manage Your Outside Tool**

After initial implementation of Outside Tool, libraries can manage their Outside Tool accounts through the Library Submission Utility. See the Library Submission Utility chapter of this manual. Please note that any changes to the Outside Tool settings or icon would take 48 hours to be implemented.

In the Library Submission Utility libraries can edit:

- Outside Tool contact(s) information
- Tool Settings (Outside Tool label, base URL, help page URL and allow listing in MyNCBI)
- Outside Tool icon (upload an icon)

In addition, Outside Tool users can access statistics recorded by clicking “View Usage Statistics.” Statistics are kept for the current and the previous year. An explanation of the different types of statistics available for libraries can be found here.
Display Your Outside Tool Icons in PubMed

Once your Outside Tool has been implemented, users can activate your Tool in two ways, by accessing PubMed through a special URL or by using My NCBI.

Display Your Outside Tool Icons Using a Special URL

To display your Outside Tool icon, append `otool=NameAbbr` to the PubMed URL and enter PubMed through the resulting URL:


Replace `NameAbbr` with the Outside Tool User Name assigned by NCBI.

Appending `otool=NameAbbr` to the PubMed URL displays your Outside Tool icons in PubMed's Abstract display. Users click on your library's icon to access your link resolver landing page.

The `otool=` parameter can also be appended to [https://www.pubmed.gov/](https://www.pubmed.gov/).

You should create a button or link to this URL from your library website. Replace your current PubMed links (in your catalog, on subject pages, etc.) with this URL. You should also send out a general announcement so that other departments, faculty, etc. can update their websites and personal computers.

When a user enters PubMed through a special URL, a “cookie” is placed in the workstation (more about [cookies](#)). This cookie instructs PubMed to display your Outside Tool icons. To use Outside Tool, the workstation must be able to accept cookies.

The cookie will expire after 8 hours of inactivity. To reactivate your icons, the user must enter PubMed through the special URL again.

For additional information on using special URLs to localize PubMed for your users, see [Localizing PubMed for your Users](#).

Display Your Outside Tool Icons Using My NCBI

To activate your Outside Tool using My NCBI, users should:

- Sign in to My NCBI (more about [My NCBI](#)).
- Click the link [NCBI Site Preferences](#), and then click [Outside Tool](#) under PubMed Preferences.
- Select a library from the list of Outside Tool (Open URL) services available

When a user selects an Outside Tool in My NCBI, the Outside Tool preference remains in effect on a workstation until the user changes the Outside Tool option or signs out of My NCBI.
To display your Outside Tool icon and other My NCBI settings without signing in to My NCBI, set up a shared My NCBI account. LinkOut and Outside Tool icons, Document Delivery preferences, filters, and highlighting selections can be shared.

**Document Delivery Service (DDS)**

**Section Contents**

- Introduction
- Evaluate Your DDS
- Register Your DDS
- Manage Your DDS
- Set Your DDS Preference in PubMed

**Introduction**

Document Delivery Service (DDS) allows PubMed users to order articles described in PubMed citations from a service of their choice. In order to best serve our users and expedite processing, only one Document Deliver Service will be set up for unique base URL that identifies the service. To register a local document delivery service with NCBI use the procedures outlined below.

Documents are ordered by clicking on the check box to the left of each citation and selecting **Order** from the **Send To** menu. By default, PubMed will send the order to Loansome Doc (more about Loansome Doc.) A different provider can be designated as described in Set Your DDS Preference in PubMed.

Document delivery service providers or vendors should contact linkout@ncbi.nlm.nih.gov

**Evaluate Your DDS**

To register a local document delivery service, an institution must have a program developed at their site that:

- accepts PubMed ID numbers (PMID) sent through the **Order** option of the **Send To** menu
- retrieves complete citation information for the articles using the PMIDs
- creates a document order form with the citation information pre-filled for the user

To be registered as a Document Delivery Service, the program must combine a Base URL with PubMed’s DDS “tail” (?CALLING_SYSTEM=PubMed&BACK_URL=http://www.ncbi.nlm.nih.gov/pubmed?Db=pubmed&PMID_1=). Using the resulting URL, your program should retrieve the citation information for the document. One method is to use the E-Utilities: E-Summary or E-Fetch. After retrieving the citation information, your server should present a document order form that has the citation information already filled in.
To test your document delivery service with PubMed, you can construct a URL to your service and retrieve PubMed records by their PMIDs. To do this, combine the base URL of your service with PubMed’s DDS “tail” and add a PMID.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base URL</strong>: <a href="http://DocDelBaseUrl">http://DocDelBaseUrl</a></td>
</tr>
<tr>
<td><strong>PMID</strong>: 11149990</td>
</tr>
</tbody>
</table>

DDS allows users to request up to 100 articles at a time. All PMIDs will append to the URL:


When your program is able to provide an order form with the citation information pre-filled, your Document Delivery Service can be implemented in PubMed.

**Register Your DDS**

Before submitting a request to register your DDS in PubMed, complete the evaluation process described in Evaluate Your DDS.

Send an email with the subject “Request to Set Up a Document Delivery Service” to: linkout@ncbi.nlm.nih.gov. In the message body, include the following:

1. Name, email address, and phone number of a contact person.
2. Name and postal address of your institution.
3. The URL for your service that you developed in Step 1.
4. The URL of an HTML help page that explains your service, to be used in My NCBI.
5. A short label (less than 50 characters) that identifies your service, to be used in My NCBI. NCBI reserves the right to adjust this label.
6. Indicate whether would like a testing period where your service is not listed in My NCBI but is available using the tool parameter.
7. LinkOut NameAbbr, if already using LinkOut

Use the following format in your email:

**Subject: Request to set up a Document Delivery Service**
1. **Contact name, email address and phone number**
2. **Institution name and postal address**
3. **Base URL of your local service**
4. **URL of the DDS help page**
5. **Short label that identifies your institution**
6. **Whether a testing period is desired**
7. **LinkOut NameAbbr, if already using LinkOut**

NCBI staff will email the contact person within three weeks about your request.

**Manage Your DDS**

After initial implementation of DDS in PubMed by the LinkOut Team, libraries manage their DDS accounts through the Library Submission Utility. Please note that any changes to the DDS settings take 48 hours to be implemented.

In the Library Submission Utility libraries can edit:

- DDS contact(s) information
- DDS Settings (DDS label, base URL, help page URL and allow listing in MyNCBI)

In addition, DDS users can access statistics recorded by clicking “View Usage Statistics.” Statistics are kept for the current and the previous year. An explanation of the different types of statistics available for libraries can be found here.

**Set Your DDS Preference in PubMed**

A user can set a DDS preference in PubMed in two ways, by entering PubMed through a special URL or by using My NCBI.

**Set Your DDS Preference Using a Special URL**

To set your DDS preference, append `tool=NameAbbr` to the PubMed URL and enter PubMed through the resulting URL:


Replace `NameAbbr` with the DDS User Name assigned by NCBI.

Appending `tool=NameAbbr` to the PubMed URL changes the Order option. Orders will be sent to the specified service instead of to Loansome Doc. The DDS preference will be in effect on a workstation until the user changes it or is inactive for 8 hours.

The `tool=` parameter can also be appended to https://www.pubmed.gov/

You should create a button or link to this URL from your library website. Replace your current PubMed links (in your catalog, on subject pages, etc) with this URL. You should
also send out a general announcement so that other departments, faculty, etc. can update their websites and personal computers.

When a user enters PubMed through a special URL, a “cookie” is placed in the workstation (more about cookies). This cookie instructs PubMed to set your DDS preference. To set your DDS preference, the workstation must be able to accept cookies.

The cookie will expire after 8 hours of inactivity. When the cookie expires, the Order option will be reset to send orders to Loansome Doc. To change the DDS preference, the user must enter PubMed through the special URL again.

For additional information on using special URLs to localize PubMed for your users, see Localizing PubMed for your Users.

**Set Your DDS Preference Using My NCBI**

To set your DDS preference using My NCBI:

1. Sign in to My NCBI (more about My NCBI).
2. Click the link NCBI Site Preferences, and then click Document Delivery under PubMed Preferences.
3. Select your preferred service from the list of Document Delivery Services.

When a user selects a DDS in My NCBI, the DDS preference is set on the workstation until the user changes the DDS option or signs out of My NCBI.

To set your DDS preference and display other My NCBI settings without signing in to My NCBI, set up a shared My NCBI account. LinkOut and Outside Tool icons, Document Delivery preferences, filters, and highlighting selections can be shared.
Library Submission Utility

Created: February 27, 2008; Updated: February 21, 2017.

The Library Submission Utility is a web-based, password-protected tool used to manage your LinkOut, Outside Tool and Document Delivery accounts. You must have registered for at least one type of account to access the Library Submission Utility.

In the Submission Utility users can manage:

*LinkOut*
- Library Information
- Contact Information
- View or Update Online Holdings
- View or Update Print Holdings
- Provide Full Text and Print Icons
- View Usage Statistics
- Export Holdings

*Outside Tool*
- Contact Information
- Tool Settings
- Outside Tool Icon/Icon URL
- Outside Tool Statistics

*Document Delivery*
- Contact Information
- DDS Settings
- DDS Statistics

To log into the Library Submission Utility:

1. Go to the LinkOut Libraries webpage
2. Click “Library Submission” from the quick link bar under the LinkOut banner.
3. On the Library Submission Utility page, select the task that you would like to perform.
4. Log in with your library’s User Name and Password. Both User Name and Password are case sensitive. If you have forgotten your password click on “I forgot my password,” your library’s password will be sent to the email address(es) registered with LinkOut.
If you do not remember your user name, go to either the LinkOut Libraries or Outside Tool provider lists. To view a brief animated tutorial, see Submission Utility: retrieving your password. (Macromedia Flash™ Player required).

Library Information

NCBI lists your library “Name” and “Public URL” in the LinkOut Libraries list. It is important to keep this information up to date to ensure that your library will be listed correctly.

To update Library Information:

1. Under the LinkOut tab, click Library Info
2. On the next screen click Edit
3. Edit the information as shown in the image below:
   A. Name: Verify that your Library Name is correct
   B. Description: Enter a brief description for your library (optional)
   C. Display Name: Choose a name for your library’s filter in My NCBI.
   D. Public URL: Enter the URL of your library Web site. If you do not have a library Web site, enter the homepage for your organization. The URL must be publicly accessible. Intranet URLs or URLs behind a firewall are not acceptable
   E. DOCLINE LIBID: Enter the DOCLINE LIBID assigned to your library if you wish to use the embargo function in DOCLINE for your holdings information stored in LinkOut.
4. Click Save. Updates take effect in 48 hours
Contact Information

The contact information is used only by the LinkOut Team and is not publicly available. It is important to keep this information current because the library contact is the recipient of the “I forgot my password” automated email and to allow the LinkOut team to contact you in the event of a problem with your account.

To update Contact Information:

1. Under the LinkOut tab, click Contact Info. On the next screen click Add/Edit.
2. Edit the fields Contact Name and Email. To list additional contact names and email, click Add Contact.
3. Enter the additional contact name and email in the additional fields.

4. Click Save: Changes take effect immediately.

To view a brief animated tutorial on adding Contact Information see; Submission Utility: Contact Info (Macromedia Flash™ Player required).
View or Update Online Holdings

Links to your library’s online full-text holdings are applied to PubMed citations that are included in your LinkOut online holdings. Using your library links, your patrons can link directly from a PubMed citation to online full text from your library’s full-text provider. To view a brief animated tutorial on finding journals, see Submission Utility: Finding Journals. (Macromedia Flash™ Player required).

Note: Some full-text providers will manage LinkOut holdings on behalf of subscribers. For additional information, contact your full-text provider.

Section Contents

- Organizing Your Online Full-Text Holdings
- Editing your Holdings by Journals
- Editing your Holdings by Providers
- Editing your Holdings by Searching
- Entering your Subscription Information
- Using Preferred Provider

Organizing Your Online Full-Text Holdings

To help manage your online holdings, you should develop a list of journals that your library will be linking to through LinkOut.

For a library to link to online full text from a particular full-text provider (publisher, aggregator, etc.), the full-text provider must submit links for the journal AND the library must have a pre-existing access agreement with the full-text provider. See LinkOut Journals for a list of journals and associated full-text providers available for linking.

Some full-text providers do not provide links to NCBI, i.e., they are not LinkOut participants. Moreover, some LinkOut participants do not submit links to all of their online journals. If a journal is not available for linking from your full-text provider, please contact the provider and encourage them to submit links to NCBI.

NOTE: LinkOut does not perform any user verification. When users click on your link, they leave PubMed and are redirected to the provider site. Therefore, you should only include journals that validate IP addresses or are accessible through your proxy server; otherwise, you will need to distribute your passwords.

When organizing your holdings, you may encounter the following situations:

1. Sometimes the full-text provider is not obvious:

Provider of full-text links may not be the publisher of the journal. If you subscribe directly to the New England Journal of Medicine online, the provider is HighWire. Usually the provider information can be found at the journal website, or you can contact the publisher of a journal and ask.
If you’re not sure who your provider is, go to the Abstract view, and check the LinkOut — more resources, shown in the image below. Test provider links and see which one you can access. The one accessible to you is your provider.

2) Sometimes one journal has multiple full-text providers:

You may choose multiple full-text providers for the same journal. For example, if you receive the Journal of Advanced Nursing from both EBSCO and Ovid, you can select both full-text providers in LinkOut. If you have multiple full-text providers, it is to your advantage to select all of your full-text providers in the Library Submission Utility, because some full-text providers choose to omit links to certain articles or types of articles that may be linked to by a different full-text provider.

If you choose multiple full-text providers for the same date range, your links will be assigned according to the LinkOut priority: PubMed Central (PMC), publisher, aggregator. LinkOut will check first to see if one of the full-text providers you selected is PMC. If it is, your icon will link to the PMC version of the article. If the article is not in PMC, LinkOut will check to see if you chose one or more publishers for the article. If multiple publishers are selected, your icon will link to the first publisher in alphabetical order. If no publisher is selected, LinkOut will look at the aggregators that you selected. If multiple aggregators are selected, your icon will link to the first aggregator in alphabetical order.

You can assign a preferred provider for your library holdings or individual journals when multiple subscriptions are available for the same journal.

Regardless of how many full-text providers are selected, only one library icon will display with a link to full text from one full-text provider.

**Editing your Holdings by Journals**

1. Start by selecting **Browse by Journals** and **Show all**.
2. Locate the journal you want to add or edit by scrolling down the page and clicking on the pertinent alphabetical range for the journal title. For example, the Journal of clinical microbiology can be found on the below range:
3. Click on the range to reveal a list of titles and select the pertinent journal title.

4. Check the box next to your full-text provider(s) from the list of available providers. A set of drop-down menus will appear.

5. Select the date range for your library’s subscription(s) using the drop-down menus. See Entering your Subscription Information for guidelines on entering different types of subscriptions. Click Update to save your changes. Updates will take effect in 48 hours. To view a brief animated tutorial, see Submission Utility: entering online holdings. (Macromedia Flash™ Player required).

**Editing your Holdings by Providers**

1. Start by selecting Browse by Providers and Show all.
2. Locate your provider. Click on your provider’s name to reveal an alphabetical list of journals titles. Select the pertinent alphabetical range for the journal title you want to add or edit. For example, the Journal of clinical microbiology can be found on the below range:
3. Check the box next to the journal you want to edit. A set of drop-down menus will appear. Select the date range for your library’s subscription(s) from the drop-down menus. See Entering your Subscription Information for guidelines on entering different types of subscriptions. Click Update to save your changes. Updates will take effect in 48 hours. To view a brief animated tutorial, see Submission Utility: entering online holdings. (Macromedia Flash™ Player required).

**Tip:** Click “Check all” to select all journal titles within one journal title range page. “Uncheck all” deselects all journal titles. Click Update to save your changes.

**Editing your Holdings by Search**

1. On the Online Holdings page, select the Search tab.
2. Enter a journal title, title abbreviation, ISSN, provider name or publisher name in the search box. Select “Journals,” “Providers,” or “Publishers” from the drop-down menu to specify the area that you want to search. Click “Go”.
3. If you searched by Providers or Publishers, locate the journal title(s) you would like to add or edit.
4. Select the date range for your library’s subscription(s) from the drop-down menus. See Entering your Subscription Information for guidelines on entering different
types of subscriptions. Click **Update** to save your changes. Updates will take effect in 48 hours.

---

**Online Holdings**

![Online Holdings](image)

**Entering your Subscription Information**

After selecting your full-text provider(s) for a journal, a set of **drop-down menus** will appear. Select a subscription type or date range for your library’s subscription(s):

- If your subscription agreement allows access to all years use the option “All available.” If the subscription agreement has an embargo period, set the embargo period by using the delayed drop-down menu (A).
- If your subscription agreement has a specific starting year and allows access to subsequent years or if it has a specific starting and ending year, use the option “Subscription effective” (B). Here you can also enter an embargo period using the delayed drop-down menu. For subscriptions that include gap years, you can add multiple subscription date ranges by clicking the plus sign. Note that each subscription date range should not overlap.
- If you have a sliding scale (limited retention) subscription agreement, click the radio button next to “Retained for the last” and set the retention term using the drop-down menu. (C) LinkOut will automatically remove your link when the retention period is over.

Each subscription type entry can be associated with a specific publication date type (D), select:

- **pdat** (publication date) when you want links to be applied to journal citations that have either print or electronic publication dates.
- **ppdat** (print publication date) when you want links to be applied to journal citations that use only print publication dates.
- **epdat** (electronic publication date) when you want links to be applied to journal citations that use only electronic publication dates.
When you are finish updating a page, click Update (E). If you do not click Update, your changes will be lost! Updates will take effect in 48 hours.

Tip: Click “Open all” to open all the drop-down menus within one journal title range page. “Close all” closes all the drop-down menus.

NOTE: You don’t need to add all of your holdings at once. Holdings can be added over time.

Using Preferred Provider

Libraries can override the default priority for links (PMC, publishers, aggregators) by selecting a preferred provider when multiple providers are selected for the same journal.

Default Preferred Provider: When a provider is selected as the default preferred provider and it is also selected as full text provider for individual journals, library links will point automatically to the full text at the default preferred provider’s site. This setting can be changed for individual journals by selecting a different preferred provider for each journal. Click the “Preferences” tab and “Change” to select a default preferred provider from the drop-down menu. Click “Save” to save your selection.

Preferred Provider for a Journal: You can select a preferred provider for individual journals. When selecting both a default Preferred Provider and Preferred Providers for individual journals, libraries should select a default Preferred Provider first, then select Preferred Providers for individual journals.

To select a preferred provider for individual journals:

1. Under “Show” select “Just my holdings.” Locate the journal title and click “Select a preferred provider.” Note: The “Select a preferred provider” link is only available when multiple providers are selected for a journal.
3. Select a preferred provider from the drop-down menu and click **Save**. Updates will take effect within 48 hours.

**View or Update Print Holdings**

Links to a record of your library’s holdings are applied to citations included in your LinkOut print holdings. You can see an example of a LinkOut print holdings record.

Print holdings information can be provided in two ways: by Using LinkOut-SERHOLD to automatically upload holdings from Docline's Serial Holdings (**SERHOLD**) or by Using Upload Holdings with a text file. To view a brief animated tutorial, see **Submission Utility: print holdings**. (Macromedia Flash™ Player required).

**Section contents**

- Using LinkOut-SERHOLD
  - Call Number Submission for LinkOut-SERHOLD
- Using Upload Holdings
  - Creating the Text File
  - Adding Call Numbers and Custom Holdings Statements to Print Holdings
  - Uploading the Text File
- Adding a Link to the Print Holdings Location Field
- Executing a Search in your Library Catalog from the Print Holdings Record
- Discontinuing Print Holdings Submission
Using LinkOut-SERHOLD

If your library participates in NLM’s Docline Serial Holdings (SERHOLD), you can display your print holdings information from the SERHOLD database in PubMed.

SERHOLD print holdings information is transferred to LinkOut daily. Print holdings information will only be presented for PubMed titles and for the ranges of PubMed citations that a library carries. For example, if your library has all volumes of a title except volume 5, links to holdings information will not appear in the PubMed citations for volume 5 of that title.

**NOTE:** SERHOLD is currently available for libraries in the United States and for some libraries in Canada and Mexico.

Before registering, make sure you have the following:

- **SERHOLD LIBID(s) for your library:** You can enter one or more LIBIDs for your LinkOut account. Holdings information for all of your LIBIDs will be shown on one print holdings page.
- **Enter your library DOCLINE LIBID** in the Library Info section of the Submission Utility.
- **Location of the print collection(s):** A description of where the print collections are located for each LIBID. Be as specific as you can. This can be up to 255 characters.
- **URL to the Library Catalog:** This is optional. If included, a link to the library catalog will display with print holdings.

To register:

1. Click **Use LinkOut-SERHOLD.** On the resulting page click **Add LIBID.**
2. On the below page:
   a. Select your library LIBID from the drop-down menu (A)
   b. Enter the location of your print collection (B). Be as specific as possible - for example: *Current Year (Unbound): First Floor, Main Branch Reading Room. Previous Years (Bound): Fourth Floor Open Stacks, Main Branch*
   c. Enter your library Catalog URL(C) - optional
3. Click **Save.** Updates will appear in PubMed within **48 hours**
Call Number Submission for LinkOut-SERHOLD

Libraries that participate in LinkOut-SERHOLD can supply call numbers for print holdings via the Call Number Submission function in the Library Submission Utility. Call numbers are submitted as a text file.

**Creating the file**

Call numbers are submitted to LinkOut as a text file. Each line must be in the following format:

```
LIBID|ISSN|tu|Call Number|
```

Call numbers must be no longer than 50 characters.

**Example**

```
MDUNLM|0360-4039|tu|W1 NU584K|
MDUNLM|0279-3091|tu|W1 NU639M|
MDUNLM|0276-5284|tu|W1 NU5853|
```

The file must:

1. Be created in a text editor, such as Notepad, rather than in a word processing program, such as MS Word. Word processing programs add formatting information that interferes with file processing. Save the file with the extension “.txt”.
2. Be no larger than 1.5 megabytes.
3. Contain only journals that are included in your SERHOLD print holdings.
4. Use only letters from the English alphabet or numbers in the file name. Do **not** use special characters or spaces.

**Submitting the file**

1. Click “Upload call numbers.”

2. On the resulting screen click on the **Browse** button to upload a text file (extension .txt) containing the call numbers. Click **Save**. Updates take effect in 48 hours.

**Using Upload Holdings**

If your library does not participate in SERHOLD, your library’s print holdings information can be submitted to LinkOut as a text file.

To upload your print holdings, you will need:

1. A text file of your print holdings for journals in PubMed. Please see Creating the Text File for the file specifications. ONLY PubMed journals should be in this file.
To be sure that you are only including PubMed journals, check the list of PubMed journals.

2. Print collection location (description of the physical location of the print collection). Be as specific as possible. This can be up to 255 characters.

3. Library Catalog URL (optional). If included, a link to your library catalog will display in the print holdings record.

Libraries that submit print holdings as a text file can also Add Call Numbers and Custom Holdings Statements to Print Holdings.

Creating the Text File

Each line of the text file must be in the following format:

```
ISSN|ESSN|Medline abbreviation|Start year|End year|Start volume|End volume|Acquisition status|
```

At least three values must be included in each line:

1. One of the following: ISSN, ESSN (ISSN for the electronic version), Title Abbreviation
2. One of the following: Start Year, Start Volume. If both year and volume are entered, their quantity must be the same on that line.
3. Acquisition Status: 4 = ongoing subscription, 5 = no longer received. If acquisition status is 5, End Year or End Volume must be included. Both are optional if Acquisition Status is 4.

Note: If any element is omitted, insert the delimiter "|" only. Each line must have 8 delimiters.

<table>
<thead>
<tr>
<th>Example file format</th>
</tr>
</thead>
<tbody>
<tr>
<td>0891-0162</td>
</tr>
<tr>
<td>0094-6354</td>
</tr>
<tr>
<td>0001-2092</td>
</tr>
<tr>
<td>1091-5923</td>
</tr>
<tr>
<td>1040-2446</td>
</tr>
</tbody>
</table>

The text file that you upload to LinkOut must follow the given format and each line must contain the required information. If your file does not follow this format or if required information is omitted, your print holdings will not be displayed.

The file must:

1. Be created using a text editor, such as Notepad, rather than a word processing program, such as MS Word. Word processing programs add formatting information that interferes with file processing.
2. Contain only PubMed journals. To be sure that you are only including PubMed journals, check the list of PubMed journals.
3. Be no larger than 1.5 megabytes.
4. Use only letters from the English alphabet or numbers in the file name. Do not use special characters or spaces.

Example: American Journal of Cardiology. Ongoing subscription from 1997
0002-9149||Am J Cardiol|1997||4|

Example: American Journal of Cardiology. Ongoing subscription from volume 66:
0002-9149||Am J Cardiol||66||4|

Example: Physical Therapy. No longer received, with back years for 1995 to 2000:
0031-9023||Phys Ther|1995|2000||5|

To represent a gap in holdings for a title, use one line to represent each continuous run.

Example: Journal ISSN 1234-5678. Ongoing subscription from 1991 (vol. 1), 1995 (vol. 5) is missing
1234-5678|||1991|1994|1|4|4|
1234-5678|||1996||6||4|

Example: Physical Therapy. No longer received, with back issues for 1980 (vol. 60) – 1999 (vol. 79), missing 1991 (vol. 71) – 1994 (vol. 74)
0031-9023||Phys Ther|1980|1990|60|70|5|
0031-9023||Phys Ther|1995|1999|75|79|5|

Holdings statements will be constructed according to the year and volume information you provide.

Example: holdings display 262-279,281- (1990-1998,1999-)
|||AMA|1990|1998|262|279|4|
||AMA|1999|281|4|

0031-9023||Phys Ther|1980|1990|60|70|5|
0031-9023||Phys Ther|1995|1999|75|79|5|

**Adding Call Numbers and Custom Holdings Statements to Print Holdings**

Libraries that submit print holdings as a text file can add Journal Call Numbers and Custom Holdings Statements to the print resource file.

To add a call number, use the following format:
ISSN|ESSN|Medline abbreviation|Start year|End year|Start volume|End volume|
Acquisition status|Call Number|

Call Numbers must be no longer than 50 characters.

To add a custom holdings statement, use the following format:

ISSN|ESSN|Medline abbreviation|Start year|End year|Start volume|End volume|
Acquisition status|Call Number|Custom holdings statement|

If you provide a Custom Holdings Statement and omit the Call Number, you must provide the delimiter “|” for the Call Number field:

ISSN|ESSN|Medline abbreviation|Start year|End year|Start volume|End volume|
Acquisition status||Custom holdings statement|

Uploading the Text File

IMPORTANT: Uploading a Print Resource file will overwrite the current file. Be sure that the new file contains ALL of your print holdings information, not just “updates”.

1. Click on Use Upload Holdings, and on the resulting page, enter:
   a. Your library’s holdings text file (A)
   b. The location of your print collection (B). Be as specific as possible - for example: Current Year (Unbound): First Floor, Main Branch Reading Room. Previous Years (Bound): Fourth Floor Open Stacks, Main Branch
   c. The Library Catalog URL, if desired (C)
2. Click Save (D). Updates take effect in PubMed within 48 hours
**Adding a Link to the Print Holdings Location Field**

You can add a link to your library webpage or library catalog to the location field in both LinkOut-SERHOLD and Upload Holdings.

To add a link to the Location field:

1. In the Location field, use the HTML `href` tag:
   - Click `<a href="http://www.library.org">here</a>` for library information.
   - Check the `<a href="http://librarycatalog.edu">Library Catalog</a>` for details.
2. Click “Save” to save the changes.

Changes will appear in PubMed within 48 hours.

**Executing a Search in your Library Catalog from the Print Holdings Record**

Links in the Library Catalog URL or Location fields (see Adding a Link to the Print Holdings Location Field) can be enhanced to execute an ISSN search in your catalog. To do this, add one of the following terms to the URL of your library catalog:

- `&lo.issn;` - include hyphen in ISSN.
- `&lo.issnl` - omit hyphen from ISSN.

The exact format of the command will depend on your OPAC software. Please ask your library software vendor for more assistance. Here are some models:

**Endeavor Voyager:**

```plaintext
http://www.mylibrary.edu/cgibin/Pwebrecon.cgi?
DB=local&Search_Arg=&lo.issn;&SL=None&Search_Code=ISSN&CNT=25
```

**ExLibris Aleph:**

```plaintext
http://www.mylibrary.edu/F/?
func=findb&base=mydatabase&find_code=022&request=&lo.issn;
```

**Innovative Millennium:**

```plaintext
http://mylibrary.edu/search/i?SEARCH=&lo.issn;
```
Discontinuing Print Holdings Submission

To withdraw print holdings for libraries via LinkOut-SERHOLD or Upload Holdings (text file):

1. Click Discontinue on the “Current Status” line.
2. On the next screen click Discontinue again to confirm that you want to cancel providing print holdings. Updates will appear in PubMed within 48 hours.

Provide Full Text and Print Icons

Your library icons represent your library in PubMed and serve as a link to online full text or to a local print holdings record.

We recommend submitting two different icons, one for online holdings and one for the print collection. Your marketing department or IT staff may be able to help you design your icons. Your icons could be your institution’s logo or simply a statement saying “Full Text Provided by [Library Name]” or “[Library Name] Print Collection”.

For icon specifications (size, file format, etc.) and to see examples of icons currently in use, see Technical Information: Icons.

If you cannot provide an icon, LinkOut will apply these icons to your library holdings:

- ![Online Full-text](image)
- ![Local Print Collection](image)

There are two ways to provide icons to LinkOut. Icons can be stored at a publicly accessible URL or uploaded to NCBI.
If you provide the URL for an icon at a publicly accessible URL, LinkOut will retrieve the latest version of your icon daily. Icons must not be on an intranet or behind a firewall. This method allows you to change your icon at any time without having to upload a new icon to LinkOut. The URL must point directly to the icon file, not to an HTML page.

If you upload an icon file, you will need to upload a revised icon to LinkOut if any changes are made.

To provide an icon:

1. Click on the **Change** button to upload an icon or enter a URL for either your online or print holdings.

2. To use a default LinkOut icon, choose the option **Use the default icon** (See A below).

3. To provide an image located on a publicly accessible web server, enter the URL under **Use an icon on the Internet** (See B below) The URL must point directly to the icon file, not to an HTML page.

4. To upload an image file from your computer, choose the option **Upload an icon**, then click **Browse** (see C below). A popup window will allow you to browse your computer for the file. Select the gif, jpg, or png file that you would like to upload. Only these image file formats can be used for your icons.

5. Click **Save** (see D below). Updates will appear in PubMed within 48 hours.
To view a brief animated tutorial on providing icons see; Submission Utility: Uploading Icons (Macromedia Flash™ Player required).

**View Usage Statistics**

Library statistics are only available via the Library Submission Utility. Statistics are kept for the current and the previous year. Statistics can be displayed for daily, weekly, monthly or yearly numbers, and can be downloaded as a CSV file (to MS Excel for example) or as a text file.

The following statistics are available for libraries:

**Total**: The aggregation of the number of times users click on LinkOut Full text, LinkOut Print, LinkOut Local, and Outside Tool links and icons.

**LinkOut Full Text**: Number of times users click on your library’s online full-text icon or the electronic full text link under your library name in the LinkOut display.
**LinkOut Print:** Number of times users click on your library’s print icon or the Print Collection link under your library name in the LinkOut display.

**LinkOut Local:** Number of times users click on your library’s icon or link under your library name in the LinkOut display to connect to a local link resolver.

**Outside Tool:** Number of times users click on your library’s Outside Tool icon

`holding=[linkout username]:` Number of times users click on the special URL with your LinkOut username. The special URL turns on your library’s LinkOut icon.

`otool=[outside tool username]:` Number of times users click on the special URL with your Outside Tool username. The special URL turns on your library’s Outside Tool icon.

`tool=[tool username]:` Number of times users click on the special URL with your DDS Tool username.

To view a brief animated tutorial, see Submission Utility: view usage statistics. (Macromedia Flash™ Player required).

**Note:** Statistics may change during the first 2 weeks that they are available. After 2 weeks, statistics will be stable.

## Export Holdings

You can export your holdings to a CSV file or a text file using **Export Holdings:**

1. To export your holdings to a CSV file, which can be used with a spreadsheet program such as MS Excel, first sort the data either by Provider or Title/ISSN, then select the option **Export Holdings (CSV file)** (See A below)
2. To export your holdings to a text file, first sort the data either by Provider or Title/ISSN, then select the option **List Holdings (text format)** (See B below)
3. To see all your holdings in PubMed with your icon activated click on **Search PubMed for Library Holdings** (C in the image below)

To view a brief animated tutorial, see Submission Utility: Export holdings. (Macromedia Flash™ Player required).
Manage Outside Tool

Outside Tool allows an institution to place a link on every PubMed record. This link points back to a resource offered by the institution for their users. To view a brief animated tutorial, see Submission Utility: Managing Outside Tool. (Macromedia Flash™ Player required).

Contact Information

The contact information is used only by the LinkOut Team and is not publicly available. It is important to keep this information current because the library contact is the recipient of the “I forgot my password” automated email and to allow the LinkOut team to contact you in the event of a problem with your account.

1. Click Contact Info tab to see your current contact. Click Add/Edit to edit information.
2. On the next screen you can edit the current information or enter additional contacts by clicking Add Contact. When you are finished, click Save. Changes will take effect immediately.
**Tool Settings**

1. Edit the information as shown in the image below:
   
   A. **Library Name**: Verify that your Library Name is correct
   
   B. **Description**: Enter a brief description for your library (optional). This information appears in MyNCBI
   
   C. **Tool Label**: A short label (less than 50 characters) that identifies your institution and local service in My NCBI. The label must begin with your institution’s name, name abbreviation or acronym. NCBI reserves the right to adjust this label
   
   D. **Base URL**: Enter your institution's Outside Tool URL, right before where the PubMed ID (PMID) number is supposed to go. For example:

   ```
   http://myUniveristy.edu/myLibrary/OpenURL_local?
   sid=Entrez:PubMed&id=pmid:
   ```

   E. **Help Page URL**: The URL of an HTML help page that explains your service, to be used in My NCBI

   F. **Databases**: Indicate whether you would like your tool to be listed in MyNCBI

2. Click **Save** (G). Updates take effect in PubMed in 48 hours
Outside Tool Icon/Icon URL

1. At the bottom of the Outside Tool main page click **Change** to upload an icon or enter a URL for your Outside Tool.
2. To use a default Outside Tool icon, choose the option Use the default icon (See A below). This is the default Outside Tool icon:

3. To provide an image located on a publicly accessible web server, enter the URL under Use an icon on the Internet (See B below) The URL must point directly to the icon file, not to an HTML page.

4. To upload an image file from your computer, choose the option Upload an icon and then click on the Browse button (C in the image below). A popup window will allow you to browse your computer for the file. Select the gif, jpg, or png file that you would like to upload. Only these image file formats can be used for your icons.

5. Click Save (D in the image below).

Add or Edit Outside Tool Icon

Specify a Outside Tool icon to use when linking to your link resolver.

Icon Guidelines
Size: 100 x 25 pixels recommended (maximum: 150 x 35)
File type: gif, jpg, jpeg, or png
Appearance: look like a button, use borders, avoid white/transparent background.

A  Use the default icon
B  Use an icon on the Internet
C  Upload an icon

Note: These changes will take effect after 2 p.m. ET on the next business day.

Outside Tool Statistics

To see the statistics recorded for your Outside Tool, click “View Usage Statistics.” Statistics are kept for the current and the previous year. An explanation of the different types of statistics available for libraries can be found here.

Manage Document Delivery

Document Delivery Service (DDS) allows PubMed users to order articles described in PubMed citations from a service of their choice. Users select the articles that they want to
order and click the “Send to” menu. Selecting “order” there and clicking “order article” will lead users to the Document Delivery Service.

**Contact Information**

The contact information is used only by the LinkOut Team and is not publicly available. It is important to keep this information current because the library contact is the recipient of the “I forgot my password” automated email and to allow the LinkOut team to contact you in the event of a problem with your account.

1. Click **Contact Info** tab to see your current contact. Click **Add/Edit** to edit information
2. On the next screen you can edit the current information or enter additional contacts by clicking **Add Contact**. When you are finished, click **Save**. Changes will take effect immediately.

**DDS Settings**

1. Edit the information as shown in the image below:
   A. **Library Name:** Verify that your Library Name is correct
   B. **Description:** Enter a brief description for your library (optional) This information appears in MyNCBI
   C. **DDS Label:** A short label (less than 50 characters) that identifies your institution and local service in My NCBI. The label must begin with your institution’s name, name abbreviation or acronym. NCBI reserves the right to adjust this label.
   D. **Base URL:** Enter the base URL of your DDS service.
   E. **Help Page URL:** The URL of an HTML help page that explains your service, to be used in My NCBI
   F. **List DDS in MyNCBI:** Indicate whether you would like your DDS to be listed in MyNCBI
2. Click **Save** (See G below). Updates take effect in PubMed in 48 hours
DDS Statistics

To see the statistics recorded for your DDS tool, click “View Usage statistics.” Statistics are kept for the current and the previous year. An explanation of the different types of statistics available for libraries can be found here.
LinkOut is a service that allows users to link directly from PubMed and other NCBI databases to a wide range of information and services with the purpose of providing NCBI database users with on-target supplemental information to NCBI database records. LinkOut aims to facilitate access to relevant online resources to extend, clarify, and supplement information found in the NCBI databases.

Participating LinkOut providers, including publishers, aggregators, libraries, and other web resources, can display links to their sites on records from the NCBI databases. A current list of LinkOut providers is available.

Resources Description
LinkOut requires two types of files, Identity and Resource files, to describe online resources. These files are specified in the LinkOut DTD, and are provided by a participating provider. These files include the necessary elements for the NCBI retrieval system to construct an appropriate URL to access specific resources. LinkOut DTD

Publishers and Other Full-Text Providers
Publishers and other full-text providers can use LinkOut to provide links from PubMed citations to their web-accessible full-text journals. For publishers who supply their data to PubMed electronically and providers of free full text, an icon link will appear in PubMed's Abstract format by default (more about default icons). Other providers should see Activating Icons for LinkOut Providers for information about promoting their icon to these display formats.

Additional information and file examples for publishers and other full-text providers are available in Information for Full-Text Providers.

Libraries
LinkOut provides libraries the means to link patrons from a PubMed citation directly to the full-text of an article from the library's full-text provider. To do this, libraries must submit holdings information to LinkOut. Libraries should use the LinkOut Submission Utility to generate their LinkOut holdings. The holdings data should include those online journals that the library has a subscription to under a prior agreement. When a library submits their holdings data to NCBI, the providers of the holdings (publishers or aggregators) must be LinkOut participants, i.e. the providers have already submitted linking information for their online journals to NCBI.

Additional information is available in Information for Libraries.

Other Resources
LinkOut can also be used to provide links from NCBI databases to non-bibliographic Web resources, such as factual databases (i.e., organism-specific, taxonomy, structure and other databases), catalogs of research materials (clones, strains, probes, etc.), funding opportunities, clinical resources, research groups, and others.
Additional information and file examples are available in Information for Other Resource Providers.

**LinkOut DTD**


The URL for the DTD must be included in the prolog of a LinkOut file.

In the identity file, use:

```xml
```

In a resource file, use:

```xml
```

```xml
<!-- Typical usage: -->
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut//EN" "LinkOut.dtd">
<LinkSet>
  ...
</LinkSet>

or:

<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut//EN" "LinkOut.dtd">
<Provider>
  ...
</Provider>

<!--
Rule based URL generation. In general, to build the URL both base and rule are required, where base is the HTTP base address, for example:

http://www.sciencemag.org/cgi/content/full/

and rule is in the following format:
&lo.vol;/&lo.iss;/&lo.page;

LinkOut will replace the keywords in rule with the actual value for a retrieved citation. Therefore, rule will be

-->
translated into: 281/5384/1863

The program will concatenate base with rule:

http://www.sciencemag.org/cgi/content/full/281/5384/1863

The following keywords are supported for any database:

lo.id - Unique identifier (PMID, TaxID, etc.)

For PubMed only

lo.pii  - Publisher Item Identifier. Must be submitted by the publisher. For example, 6847, in the PubMed DTD this ID is an attribute of the ArticleId element.
lo.doii - Article DOI
lo.issn - Journal ISSN code
lo.essn - Journal Electronic ISSN code
lo.issnl - Journal ISSN code without the dash
lo.jtit - Journal title (MEDLINE abbreviation)
lo.vol  - Volume
lo.iss  - Issue
lo.page - First page
lo.year - Four digit year. For example, 1998
lo.yr   - Last two digit of year. For example, 98; 00
lo.yl   - Last digit of year. For example, for 1999 use 9; for 1990 use 0.
lo.eyear - Four digit year of electronic publication date. For example, 1998
lo.eyr  - Last two digits of year of electronic publication date. For example, 98; 00
lo.eyl  - Last digit of year of electronic publication date. For example, for 1999 use 9; for 1990 use 0
lo.month - The month. For example, September
lo.mon  - The 3 letter month abbreviation. For example, Sep
lo.mo   - Two digit month. For example, 01; 12
lo.emonth- The month of electronic publication date. For example, September
lo.emon  - The 3 letter month abbreviation of electronic publication date. For example, Sep
lo emo  - Two digit month of electronic publication date. For example, 01; 12
lo.day  - Two digit day. For example, 01; 31
lo.eday - Two digit day of electronic publication date. For example, 01; 31
lo.auth - First author
lo.authln- Last name of the first author
lo.nlmld - NLM unique Identifier
lo.bookacc- Book accession number of a record
lo.bookname- Internal id for a book record
lo.elocationid - Electronic location Identifier of a record
For Sequence databases (Nucleotide, Protein, Structure, Genome):

lo.pacc  - Primary accession for sequences

For Taxonomy only:

lo.scientificname - Full scientific name. For example: "Homo sapiens neanderthalensis"
lo.genus - genus name
lo.species - species name
lo.subsp - subspecies name
For Gene only:

lo.genename - Gene name
lo.orgname - binomial, and strain when appropriate, from NCBI Taxonomy database
lo.taxid - unique identifier from NCBI Taxonomy database
lo.mimid - identifier(s) from Online Mendelian Inheritance in Man (OMIM)
<!DOCTYPE subjecttype PUBLIC "-//NCBI//DTD LinkOut file Special Elements SubjectType 1.0//EN" "files.SpecialElements.SubjectType">

<!ENTITY lo.species              "lo.species">
<!ENTITY lo.subsp                "lo.subsp">
<!ENTITY lo.genename             "lo.genename">
<!ENTITY lo.orgname              "lo.orgname">
<!ENTITY lo.taxid                "lo.taxid">
<!ENTITY lo.mimid                "lo.mimid">

<!-- Entities for special characters -->

<!ENTITY reg        "&#174;" >
<!ENTITY copy       "&#169;">  
<!ENTITY trade      "&#8482;">  

<!-- internal DTD entities -->

<!ENTITY % url.data          "#PCDATA">
<!ENTITY % rule.data         "%url.data; | pad | apad | subs |
| toupper | tolower | strip | normalize">
<!ENTITY % iso.lang.codes    "(DA|DE|EN|EL|ES|FR|IT|IW|JA|NL|NO|RU|SV|ZH)">
<!ELEMENT SubjectType        (#PCDATA)>

<!-- can be one of the following; see LinkOut SubjectTypes and Attributes at https://www.ncbi.nlm.nih.gov/books/NBK3807/ #files.Special_Elements_SubjectType for a description of these elements:

//CHEMICAL INFORMATION
Biological Properties
Chemical Libraries
Imaging Agents
Metabolism
Molecular Interactions
Physical Properties
Reactions
Theoretical Properties
Toxicology
Vendors

//EDUCATION
conferences/meetings/workshops
glossaries/dictionaries
online tutorials/courses

//FUNDING SOURCES
funding sources

//LITERATURE
abstracts/indexes/summaries
aggregators
books
images
individual online article
institutional repository
libraries
patent databases
publishers/providers
supplemental materials
systematic reviews

//MEDICAL
clinical trials
consumer health
diagnostics
disease organizations
medical equipment and devices
pharmacology
treatment guidelines

//MOLECULAR BIOLOGY DATABASES
DNA/protein sequence
gene/protein/disease-specific
gene expression
locus-specific
mapping
organism-specific
population/variation
protein interactions/pathways
structure
taxonomy/phylogenetic

//RESEARCH MATERIALS
clones/clone libraries
culture/stock collections
laboratory equipment
oligonucleotides
other reagents

//RESEARCHERS
colleges/universities
companies/research institutes
directories
individuals
societies/associations

//TOOLS
3D structure prediction/functional modeling
primer design
protein identification/characterization
restriction mapping
sequence screening/similarity/alignment
sequence viewer
translation

-->
for a description of these elements:
//BARRIERS
 registration required
 subscription/membership/fee required

//OWNERSHIP
 author of URL
 publisher of information in URL

//Resource Form
 author manuscript
 electronic full-text
 full-text online
 full-text PDF
 full-text PostScript
 order form
 print collection

//Administrative
 preference

<!-- This is the top level element for Provider -->
<!ELEMENT Provider               (ProviderId, Name, NameAbbr,
 SubjectType?,
 Attribute*, Url*, IconUrl*, Brief?, ExclFileName*)>
<!ELEMENT ProviderId              (#PCDATA)>  
<!ELEMENT Name                    (#PCDATA)>  
<!ELEMENT NameAbbr                (#PCDATA)>  
<!ELEMENT Url                     (%url.data;)>
<!ATTLIST Url              LNG    %iso.lang.codes;  "EN"  >
<!ELEMENT IconUrl                 (%url.data;)>
<!ATTLIST IconUrl          LNG    %iso.lang.codes;  "EN"  >
<!ELEMENT Brief                   (#PCDATA)>  
<!ELEMENT ExclFileName                          (#PCDATA)>  
<!ATTLIST ExclFileName
 fieldname       (uid|query)             "uid"  
database        CDATA           #REQUIRED>

<!-- End of Provider group -->

<!ELEMENT LinkSet                 (Link+)>
<!ELEMENT Link                    (LinkId, ProviderId, IconUrl*,
(ObjectSelector|SubObjectSelector),(ObjectUrl+)>
<!ELEMENT LinkId                  (#PCDATA)>  
<!ELEMENT ObjectSelector          (Database, ObjectList)>  
<!ELEMENT Database                (#PCDATA)>  

<!-- All NCBI databases may be configured to include LinkOut. Please
write to
linkout@ncbi.nlm.nih.gov for the current list of databases available
for LinkOut -->

<!ELEMENT ObjectList              (FileName|
(QUERY,EXCLQUERY*,EXCLOBJ*,EXCLFILENAME*)|OBJID)+>
<!ELEMENT FileName                (#PCDATA)>
<!ATTLIST FileName                 fieldname   CDATA   #REQUIRED>
<!ELEMENT Query                   (#PCDATA)>
<!ELEMENT ObjId                   (#PCDATA)>
<!ELEMENT ExclObjId               (#PCDATA)>

<!!-- End of ObjectList group -->
<!!-- End of ObjectSelector group -->

<!!-- Libraries must use SubObjectSelector to refer to the sub providers
-->
<!ELEMENT SubObjectSelector       (Database, SubProvider)>
<!ELEMENT SubProvider             (NameAbbr, (InclQuery|ExclQuery)*)>  
<!ELEMENT InclQuery               (#PCDATA)>
<!ELEMENT ExclQuery               (#PCDATA)>
<!!-- End of SubObjectSelector group -->

<!ELEMENT ObjectUrl              (((Base, (RULE|RULETOMANY)?) | (RULE|
RULETOMANY)),
UrlName?, SubjectType?, Attribute*)>

<!ATTLIST ObjectUrl        LNG    %iso.lang.codes;  "EN" >

<!ELEMENT Base                    (%url.data;)>  
<!ELEMENT pad                     (%rule.data;)*>

<!ATTLIST pad
with                CDATA                  #REQUIRED
width               CDATA                  #REQUIRED
align               (left|right)            "right">

<!!-- with a character to pad with (required)
width result string size (required) (integer)
align the text should align to (left|right) (default:right) -->

<!ELEMENT apad                     (%rule.data;)*>
<!!-- used to mark up strings that require padding to create
fixed-length string attributes. It skips all preceding
alpha characters before padding -->

<!ATTLIST apad
with                CDATA                  #REQUIRED
width               CDATA                  #REQUIRED
align               (left|right)            "right"}
Databases Available for Linking

Links can be made from the following NCBI databases to outside resources. When entering the database in the <Database> element, use the Db abbreviation, rather than the database name.

<table>
<thead>
<tr>
<th>Database Name</th>
<th>Db Abbreviation</th>
</tr>
</thead>
</table>

Table continues on next page...
If you are interested in providing LinkOut links to other NCBI databases not listed in the above table, please write to info@ncbi.nlm.nih.gov to express your interest to the relevant groups at NCBI.

**Icons**

Icons should:

- Be 120 pixels wide x 30 pixels high or smaller.
- Be in one of the following image formats: GIF, JPEG, or PNG
- The icon URL for an icon file should not include XML escape characters such as &, "", <, >, '
- Identify the resource being linked. For libraries, this could be the library name and the format of the resource (full-text/print collection). For resource providers, this could be the name of the resource and/or the format or language in which the resource is being delivered.
- If a journal or database resource is freely available, or free with a registration, the icon should have the text “Free.”
- Look like an actionable button. The icon should have a border and a colored background. Icons and text should be easy to read and should not blend in to the PubMed display.
- Not be animated.

The icon file name should use only letters from the English alphabet and numbers. Do **not** use special characters or spaces. Examples of file names are: libft.gif, libprint.gif, freeft.jpg, notfree.jpg.

Examples of icons are shown below.

**Library icons**

<table>
<thead>
<tr>
<th>Database Name</th>
<th>Db Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://www.ncbi.nlm.nih.gov/est">https://www.ncbi.nlm.nih.gov/est</a></td>
<td>NucEST</td>
</tr>
</tbody>
</table>
Identity File

The identity file contains the information about a provider that NCBI needs to list the provider in LinkOut. This file must be named `providerinfo.xml`; the file name is case sensitive.

Section Contents

- Format
- Prolog
- Elements

Identity File Format

Note: The following format description shows the basic structure of an Identity file and includes all possible elements. Not all elements will be used in all files. Additional examples of Identity files are available for full-text providers, other resource providers, and libraries.

```xml
<?xml version="1.0"?>
<Provider>
  <ProviderId>ProviderId assigned by NCBI (required)</ProviderId>
  <Name>Name of Resource Provider or Library (required)</Name>
  <NameAbbr>NameAbbr assigned by NCBI (required)</NameAbbr>
  <SubjectType>SubjectType (optional)</SubjectType>
  <Attribute>Attribute (optional, repeatable)</Attribute>
  <Url>URL of provider’s website (optional, repeatable)</Url>
  <Brief>Short description of resource provider (optional)</Brief>
</Provider>
```
Identity File Prolog

The Prolog occurs once at the beginning of the file.

**XML Declaration (required):** `<?xml version="1.0"?>`

**Document Type Declaration (required):** `<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut 1.0//EN" "https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">`

Identity File Elements

The following lists all elements that may be included in the Identity File. Not all elements will be used in every Identity file.

**Provider (required):** Root element of the file

**ProviderId (required):** A unique ID assigned by NCBI

**Name (required):** The full name of the resource provider or library. For libraries, this is the name of the library or institution; for other providers, this is the name of the organization.

**NameAbbr (required):** A short one word name for the resource provider or library. NameAbbr may only include alpha and numeric characters; spaces and special characters such as hyphens are not allowed. Because this element must be unique, NCBI reserves the right to adjust it as necessary. Resource providers who are submitting, or may submit, links on behalf of multiple publishers should select a neutral NameAbbr.

**SubjectType (optional):** SubjectTypes are used to display resources by Subject Category. SubjectTypes included in the identity file apply to all resources provided by a provider. See Special Elements: SubjectType for a list of SubjectTypes and descriptions. If no SubjectType is given, the SubjectType “miscellaneous” will be assigned automatically.

**Attribute (optional, repeatable):** Attributes describe resources independent of content and describe any ownership of the information that is being claimed by the individual or organization providing the link. Attributes included in the Identity file apply to all resources provided by a provider. See Special Elements: Attribute for the list of Attributes and descriptions.

**Url (optional, repeatable):** URL of the library or resource provider’s website, used in the LinkOut Providers list. Note: The URL may be different for different languages; see the LNG attribute in the LinkOut.DTD.
Brief (optional - displayed in My NCBI): Short description of the resource provider. Maximum is 255 characters.

The **providerinfo.xml** file is specified in the LinkOut DTD.

**Resource File**

The resource file describes the records the provider will link from and contains the information that LinkOut needs to generate links. Links described in the resource file should link directly to the resource; users should not have to perform any additional searching to access the resource after clicking the provider’s link.

Resource files, links to online full text and other database content, may be submitted as an XML file, CSV file, or as a simple text file.

*Note:* Resource files should be composed in a text editor, such as NotePad, rather than in a word processing program.

**Resource File: XML**

Files must have a file extension .xml; the file extension is case sensitive. The file name is assigned by the provider. File names should include alpha and numeric characters only. Spaces and special characters such as hyphens are not allowed. Examples of file names are **journals.xml, journaltitle.xml, resourcename.xml**

Note that Providers using `<FileName>` (see example below) need to supply a supplementary uid file, and the uid file name must be indicated in the element `<FileName filename="uid">filename.uid</FileName>`. This file would consist of a list of unique IDs (uid) of Entrez database records, and have the file extension .uid.

File size may not exceed 20 MB. To help with file management, a provider may supply more than one resource file.

**Section Contents**

- Format
- Prolog
- Elements

**Resource File XML Format**

Note: The following format description shows the basic structure of a Resource file and includes all possible elements. Not all elements will be used in all files. Additional examples of Resource files are available for full-text providers, providers submitting holdings on behalf of libraries, other resource providers, and libraries.
Using ObjectSelector (standard format)

<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
<LinkSet>
  <Link>
    <LinkId>Identifier assigned to link by provider(required)</LinkId>
    <ProviderId>ProviderId assigned by NCBI(required)</ProviderId>
    <IconUrl>URL of icon to be displayed on database records(required)</IconUrl>
    <ObjectSelector>
      <Database>NCBI database in which links will appear(required)</Database>
      <ObjectList>
        <Query>Search retrieving records to be linked(repeatable, required unless <ObjId> is specified)</Query>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>Stable portion of URL for provider’s resource(required)</Base>
      <Rule>Variable portion of URL for resource (required)</Rule>
      <SubjectType>SubjectType (optional)</SubjectType>
      <Attribute>Attribute (optional, repeatable)</Attribute>
      <UrlName>Short text string describing resource (optional)</UrlName>
    </ObjectUrl>
  </Link>
</LinkSet>

Using SubObjectSelector (for providers submitting links on behalf of libraries only)

<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
<LinkSet>
  <Link>
    <LinkId>Identifier assigned to link by provider(required)</LinkId>
    <ProviderId>ProviderId assigned by NCBI(required)</ProviderId>
    <IconUrl>URL of icon to be displayed on database records(required)</IconUrl>
    <SubObjectSelector>
      <Database>NCBI database in which links will appear(required)</Database>
      <SubProvider>
        <NameAbbr>LinkOut NameAbbr of the SubProvider(required)</NameAbbr>
        <InclQuery>Title Abbreviation or ISSN(required unless ExclQuery is specified, repeatable)</InclQuery>
      </SubProvider>
    </SubObjectSelector>
    <ObjectUrl>
      <Base>Stable portion of URL for provider’s resource(required)</Base>
      <Rule>Variable portion of URL for resource (required)</Rule>
      <SubjectType>SubjectType (optional)</SubjectType>
      <Attribute>Attribute (optional, repeatable)</Attribute>
      <UrlName>Link Resolver or Service Name</UrlName>
    </ObjectUrl>
  </Link>
</LinkSet>
Using FileNan (requires a supplementary uid file)

<?xml version="1.0" ?>
<LinkSet>
<Link>
  <LinkId>Identifier assigned to link by provider(required)</LinkId>
  <ProviderId>ProviderId assigned by NCBI(required)</ProviderId>
  <ObjectSelector>
    <Database>NCBI database in which links will appear(required)</Database>
    <ObjectList>
      <FileName fieldname="uid">filename.uid (file with Entrez database uids)</FileName>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>Stable portion of URL for provider’s resource(required)</Base>
    <Rule>Variable portion of URL for resource (required)</Rule>
    <SubjectType>SubjectType</SubjectType>
    <Attribute>Attribute (optional, repeatable)</Attribute>
    <UrlName>Short text string describing resource (optional)</UrlName>
  </ObjectUrl>
</Link>
</LinkSet>

Resource File XML Prolog

The Prolog occurs once at the beginning of the file.

XML Declaration (optional): <?xml version="1.0"?> (required)


dtd
[ <!ENTITY icon.url "https://www.goodpublisher.com/icon/goodpublisher.jpg">
<!ENTITY base.url "https://www.goodmedical.org/cgi/content/" > ]>

The Entity Declaration, included in the Document Type Declaration, is optional. ENTITY may be specified to be used in the body of the file. In the above example, ENTITY icon.url is defined with the value “https://www.goodmedical.org/images/icon.gif”, and ENTITY base.url is defined with the value “https://www.goodmedical.org/cgi/content/”.

Once an ENTITY is defined in the Prolog, it can be used in the holding file by placing the ENTITY name between an ampersand (&) and semicolon (;). This alleviates the need to replicate long, textual data. In the above example, '(icon.url; is used to represent the URL
of the provider icon. Using ENTITY icon.url will make it easier to change the icon URL if necessary, because it will only need to be changed in one place.

Resource File XML Elements

The following lists all elements that may be included in the Resource file. Not all elements will be used in every Resource file.

**LinkSet (required):** Root element of the holdings file

**Link (required,repeatable):** An element that describes a specific set of resources grouped together by access characteristics or for convenience. A holdings file can have multiple Link elements. Resources that can be accessed via a single URL Rule are usually grouped in one Link. To help with file management, you may choose to put holdings in different Link elements, even if the same URL Rule applies to all holdings.

**LinkId (required):** An identifier assigned by a participating provider for its own reference. The LinkId can be any alpha-numeric string. Each Link within a LinkSet or file must have a unique LinkId.

**ProviderId (required):** The identifier number assigned to the publisher by NCBI and listed in the providerinfo.xml file.

**IconUrl (optional, repeatable):** The URL of the icon that will be displayed on the database records described within the Link element. The icon should meet the specifications described in Icons. IconUrl is repeatable as defined in the LinkOut DTD. However, this functionality is not implemented. Icons appear only in PubMed.

**ObjectSelector (required unless SubObjectSelector is specified):** An element containing other sub-elements in which a provider will specify which database records are being linked from by a Link element.

**SubObjectSelector (required unless ObjectSelector is specified):** An element containing other sub-elements in which journals and full-text providers for those journals are specified. For use by libraries and providers submitting information on behalf of libraries.

**Database (required):** A sub-element of ObjectSelector or SubObjectSelector that specifies the NCBI database in which the links will appear.

**ObjectList (required if ObjectSelector is specified,repeatable):** A sub-element of ObjectSelector, containing Query or ObjId elements, that specifies which database records the URL(s) defined in ObjectUrl will link from. Note that all components of a query have to be valid for the query to be used for linking.
SubProvider (required if SubObjectSelector is specified): A sub-element of SubObjectSelector. SubProvider contains NameAbbr and InclQuery elements. This element describes the publishers or full-text providers with whom a library has a pre-arranged access agreement.

Query (required sub-element of ObjectList unless ObjId is specified, repeatable): A sub-element of ObjectList that contains a valid search used to select the records in the database specified in Database that will be linked from.

ObjId (required sub-element of ObjectList unless Query is specified, repeatable): A sub-element of ObjectList that contains the Unique Identifier for a database record.

FileName (required sub-element of ObjectList. A supplementary uid file is required): A sub-element of ObjectList that contains the file name for the supplementary uid file. For example <FileName fieldname="uid">filename.uid</FileName>.

InclQuery (required sub-element of SubProvider unless ExclQuer is specified, repeatable): A sub-element of SubProvider that includes a journal supplied by the SubProvider as a part of the online journal holdings of a library. Use the MEDLINE Journal Title Abbreviation or ISSN. Both are available in the list of LinkOut Journals.

ExclQuery (required sub-element of SubProvider unless InclQuery is specified, repeatable): A sub-element of SubProvider that excludes a journal supplied by the SubProvider from the online journal holdings of a library. Use the MEDLINE Journal Title Abbreviation or ISSN. Both are available in the list of LinkOut Journals.

ObjectUrl (required): An element that describes the information necessary for the NCBI systems to construct URLs to access the full-text for database records specified in the ObjectList. ObjectUrl contains two required sub-elements, Base and Rule.

Base (required): A sub-element of ObjectUrl that is the stable portion of the URL for the provider’s web-accessible resource. This can be defined as an ENTITY in the Entity Declaration. No LinkOut entities can be used in this element.

Rule (required): A sub-element of ObjectUrl. The Rule will be concatenated with the Base to create a valid URL when a record is retrieved from a search. Allowable Keywords in the Rule will be translated into the correct values for the specific database record. The Rule is based on the provider’s specifications for access to the resource. Links should point directly to the resource. LinkOut entities can be used in this element.
**SubjectType (optional):** SubjectTypes are used to display resources by subject category. SubjectTypes apply to all resources identified within a `<Link>`. See Special Elements: SubjectType for the list of SubjectTypes and descriptions. If no SubjectType is given, the resource will be displayed under the category “Miscellaneous”. If a SubjectType is provided in the Identity file, then it should not be included in the Resource file(s).

**Attribute (optional, repeatable):** Attributes describe resources independent of content and describe any ownership of the information that is being claimed by the individual or organization providing the link. Attributes apply to all resources identified within a `<Link>`. See Special Elements: Attribute for the list of Attributes and descriptions.

**UrlName (optional):** A short text string that describes a resource. UrlName is typically used when the allowed SubjectTypes and Attributes cannot meet the needs of a provider.

The resource file is specified in the LinkOut DTD.

**Resource File: CSV**

CSV files need to have the file extension `.csv`; the file extension is case sensitive. File names may contain alpha-numeric characters and underscores only. Special characters and spaces are not allowed. Examples of file name and extension: `linksgene2015.csv`, `jamafulltextlinks.csv`, or `linksnucleotide2015.csv`. To help with file management, a provider may submit more than one resource file. CSV files may not exceed 10 MB each.

A LinkOut program converts CSV files in to XML files that validate against the LinkOut DTD. Links provided in CSV files must link directly from a NCBI database record to the article full text, or a resource page that provides information directly related to the NCBI database record.

**Section Contents**

- Format and Elements

**Resource File CSV Format and Elements**

The following describes the required and optional elements of a Resource CSV file for full text providers and other resource providers. Examples can be found in the following pages: full-text providers CSV resource file, and other resource provider CSV file.

**Full-text provider**

Field 1: PrId (required). Provider Id assigned by NCBI to links data providers. A four digit number.

Field 2: DB (required). NCBI database name. Enter PubMed in this field.
Field 3: UID or Query (required). Each record in an NCBI database has a numerical unique identifier (UID). For example, in this Nucleotide record: https://www.ncbi.nlm.nih.gov/nuccore/3810674 the Accession Id is shown in the record.

Accession: AL032671

Technical Information

Field 3: UID or Query (required). Each record in an NCBI database has a numerical unique identifier (UID). The unique identifier for PubMed citations is the citation PMID. For example, in this citation: https://www.ncbi.nlm.nih.gov/pubmed/24255994 the summary display lists the PubMed citation Id (PMID) below the article citation:

Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds.

Downs LM, Hitti R, Pregolato S, Mellersh CS.


PMID: 24255994

Each PubMed record can also be retrieved using a query. For example, the above citation would be retrieved in PubMed using this query: “Vet Ophthalmol”[ta] AND 17[vol] AND 126[pg]

Field 4: URL (required). The URL to the article full text for a PubMed citation.

Filed 5: IconUrl (optional). URL of an icon file that you would like to represent your journal. The icon should meet the specifications described in Icons. The icon URL should point directly to the icon file in your server. If an icon is not provided, LinkOut will use the LinkOut generic icon.

Field 6: UrlName(optional). Additional description about the article link.

Field 7: SubjectType (required*). SubjectType is used to determine where links will be placed in the “LinkOut – more resources” display. In this field enter the subject type ‘publishers/providers.’ (*) If the ‘publishers/providers’ subject type is present in the identity file, this field should be left empty.

Field 8: Attribute (required). Enter “subscription/membership/fee required.” If the article full text is either free or open access enter either ‘Full-text online’ for the full text in HTML, or ‘Full-text PDF’ for the full text in PDF. Note that for article full text that requires a subscription, the attribute “Full-text online” or “Full-text PDF” must be listed in the identity file.

Other resource provider

Field 1: PrId (required). Provider Id assigned by NCBI to links data providers. A four digit number.

Field 2: DB (required). NCBI database name. Enter the name of the NCBI database for which you want to provide links data.

Field 3: UID or Query (required). Each record in an NCBI database has a numerical unique identifier (UID). For example, in this Nucleotide record: https://www.ncbi.nlm.nih.gov/nuccore/3810674 the Accession Id is shown in the record.

Accession: AL032671
NCBI database records can also be retrieved using queries. For example, Nucleotide query: Caenorhabditis elegans [orgn] AND 2011:2015[pdat] AND smith j [auth]

Field 4: URL (required). URL to the supplemental information page in your resource, which is directly related to the selected NCBI database record.

Field 5: IconUrl (optional). URL of an icon file that you would like to represent your resource. The icon should meet the specifications described in Icons. The icon URL should point directly to the icon file in your server. If an icon is not provided, LinkOut will use the LinkOut generic icon. Icons are only displayed in PubMed.

Field 6: UrlName(optional). Additional description about the link.

Field 7: SubjectType (required*). In this field enter a subject type selected from this page that best describes your resource. (*) If the subject type is present in the identity file, this field should be left empty.

Field 8: Attribute (required). If access to the resource requires a license or membership, enter the following in this field: Subscription/membership/fee required. If access is free, but registration is required enter: registration required. Otherwise, if access to the resource is free and registration is not required, this field can be left empty.

**Resource File: Simple Text**

Files linking to resources other than full text may be submitted as a simple text file, rather than an XML file.

Files must have a file extension .ft; the file extension is case sensitive. The file name is assigned by the provider. File names may only include alpha and numeric characters, spaces and special characters such as hyphens are not allowed. Example file names might be resources.ft, resourcename.ft.

File size may not exceed 10 MB. To help with file management, a provider may supply more than one resource file.

Files submitted as text files will be translated into valid XML by LinkOut. Translated files will conform to the LinkOut DTD.

**File Syntax**

The file consists of blocks separated by comment lines beginning with "-":

```
------ lines starting with "-" are comments ------
------ information in the first block is global------
prid:  [required]
dbase: [required]
stype: [optional]
attr:  [optional]
!base: [optional]
```
linkid: [required - LinkOut will add a suffix to make sure it is unique]
uids:   [required if query is not present]
query:  [required if uids is not present]
base:   [required]
rule:   [required]
icon:   [optional]
name:   [optional]
stype:  [optional]
attr:   [optional]

The first block holds global information that will be used throughout the file.

**prid:** LinkOut Provider ID

**dbase:** NCBI database that will be hosting the links, e.g., pubmed, nucleotide, taxonomy

**stype:** SubjectType. See Special Elements: SubjectType for all available SubjectTypes.

**attr:** Attribute. See Special Elements: Attribute for all available Attributes.

Each subsequent block specifies a link to the provider's resource. This has two basic parts, a search query and a URL pointing back to the provider's site. Each query will be evaluated, and any database records that are retrieved will be assigned a link to the URL specified by the provider. An example of simple blocks is shown below.

```
query: <species1> [name]
rule:  <http://...my_species1_page.html>
```

```
query: <species2> [name]
rule:  <http://...my_species2_page.html>
```

Any valid search query may be used to select records. See Entrez Help for information on constructing search queries. Each query should appear on a single query line. Multiple query lines in one block will be OR-ed together. The following two link descriptions are equivalent:

**Link Description 1:**

```
query: <species1> [name] OR <species2> [name]
rule:  <http://...my_species1or2_page.html>
```

**Link Description 2:**
Objects in each NCBI database are indexed by a numerical unique identifier. For example, taxid in taxonomy, pmid in PubMed. You can specify the database records you would like to link from by listing them directly with the uids: line.

Link description with uids:

--- separate unique identifiers (UIDs) with a blank space.---
---Each new line of UIDs should start have the “uids” label---
uids: 123456 123469 3847559
uids: 4755983 2197866
rule: <http://...my_species1or2_page.html>

The optional fields allow you to customize your links in several ways.

- **icon**: URL of an icon file that you would like to represent your link and resources. Only applicable to links in PubMed.
- **name**: Additional description about the link.
- **stype**: SubjectType. See Special Elements: SubjectType for all available SubjectTypes.
- **attr**: Attribute. See Special Elements: Attribute for all available Attributes.

**Special Elements: SubjectType**

The <SubjectType>, <Attribute>, and <UrlName> elements are used to organize and describe resources in the database displays and to facilitate access to these resources by defining them as groups.

SubjectType is used to group resources in the LinkOut Display, making it easier to browse through available LinkOut resources. In most cases, resources are grouped by Subject Category (described below).

Only one SubjectType should be applied to each Link. If no SubjectType is specified for a Link, it will be displayed under the heading "Miscellaneous".

SubjectTypes are also used in My NCBI, allowing users to display records with links to resources from a specific SubjectType or Subject Category as a filter, and to activate icons for these links.

SubjectType can be used in searches to retrieve records with links to resources from a specific SubjectType.
To do this, enter the following in the search box.

```
losubj SubjectTypeName [sb]
```
Replace `SubjectTypeName` with the SubjectType name from the list below.

This filter can be used as a part of any NCBI database search.

**SubjectType Categories**
SubjectTypes are grouped into the following categories:

- Chemical Information
- Education
- Funding Sources
- Literature
- Medical
- Molecular Biology Databases
- Research Materials
- Researchers
- Tools

Note: Category headings CANNOT be used in the `<SubjectType>` element.

**Chemical Information**

- **biological properties**: Information about chemicals with biological activity.
- **chemical libraries**: Link to libraries of chemicals provided by depositors, for example screening centers.
- **imaging agents**: Information on radionuclide-containing chemicals which bind to specific sites/molecules and help to detect motion/binding.
- **metabolism**: Information about chemicals participating in metabolism.
- **molecular interactions**: Information about chemicals which interact or bind to other molecules (for example, protein-protein or small molecule-protein interactions)
- **physical properties**: Information about chemicals with determined physical properties.
- **reactions**: Information on chemicals which used as reactants/products/intermediates/catalysts.
- **theoretical properties**: Information about chemicals with calculated properties.
- **toxicology**: Information on chemicals investigated for their toxic effect.
**vendors:** Information from commercial distributors of chemicals.

**Education**

These SubjectTypes describe links from NCBI database records to resources offering educational content, as well as those providing information about educational opportunities.

**conferences/meetings/workshops:** Resources offering announcements of, or information on upcoming scientific conferences, meetings, and workshops relevant to the subjects of specific database records.

**glossaries/dictionaries:** Resources offering glossaries or dictionaries of technical terminology or other specialized vocabularies used in research relevant to specific database records.

**online tutorials/courses:** Resources offering information about or providing Web-based primers, tutorials, or courses on specialized areas of research relevant to specific database records.

**Funding Sources**

The SubjectType in this category describes links to resources within information on funding for research.

**funding sources:** Resources providing information on locating, applying for, or obtaining funding for particular areas of research relevant to the subjects of specific database records.

**Literature**

These SubjectTypes describe links to literature databases and resources from NCBI databases records (typically PubMed records).

SubjectTypes under the "Literature" category appear in the LinkOut Display as follows:

- Resources from "aggregators", "individual online article", "publishers/providers" are grouped under the heading "Full Text Sources".
- Links with SubjectType "libraries" are displayed under the heading "Libraries".
- The SubjectTypes: "author profiles", "books", "document delivery", "images", and "supplemental materials" are displayed under the heading "Other Literature Sources".
**aggregators**: Services that provide a single point of online access to multiple full-text publications cited in NCBI database records. "aggregators" are differentiated from "publishers/providers" (see below) by their aggregation of online access to the publications of multiple publishers and/or providers. See LinkOut: Information for Full-Text Providers for details on LinkOut and full-text.

**author profiles**: Resources offering biographical information and/or research interest of authors of a PubMed citation

**books**: Links to relevant information in a book.

**commentaries/discussion**: Links to commentaries or discussion to extend/continue the topic discussed in the article cited in a PubMed citation.

**document delivery**: Links to vendors that deliver electronic or print copies of documents to users.

**images**: Links to online images from the NCBI database records that they are relevant to or referenced by.

**individual online article**: Links from NCBI database records to individual online copies of the publications that they reference (i.e., a link from a PubMed record to a copy of a research article that the author has made available on her/his personal website or on a repository).

**institutional repository**: Links to materials, such as datasets or full text documents, deposited to an online archive of an institution.

**libraries**: Links to the online full text and print holdings of a library. Links to online holdings will point directly to full-text articles; links to print holdings will point to a record of the library's print holdings.

**patent databases**: Links to patent database records from PubMed citations of publications discussing patented products (including proteins and DNA sequences) or processes, or from relevant NCBI database records.

**publishers/providers**: Links to online full-text articles offered by publishers or their agents.

**supplemental materials**: Links to the materials directly supporting the research discussed in the cited article, including data sets from experiments/studies accessory graphics, images, sound, and multimedia files related to the article.

**systematic reviews**: Links to reviews including systematic reviews of controlled trials.
Medical

These SubjectTypes describe links from NCBI database records to relevant online medical resources.

**clinical trials:** Links from NCBI database records to resources providing information about relevant ongoing and upcoming clinical trials, including information on locating, applying to, or participating in clinical trials.

**consumer health:** Links from NCBI database records to relevant resources or materials intended to educate or inform the general public about particular health topics or issues.

**diagnostics:** Resources providing information on the signs, symptoms and diagnosis of diseases, syndromes, or conditions relevant to specific NCBI database records.

**disease organizations:** Institutions, groups, or other organizations whose work is focused on the research of particular diseases or conditions, or that offer information, support, and/or other resources to people suffering from particular diseases or conditions, linked from relevant NCBI database records.

**medical equipment and devices:** Organizations or companies providing medical equipment or other medical devices relevant to specific NCBI database records.

**pharmacology:** Resources providing information on the pharmacological aspects of substances relevant to specific NCBI database records.

**treatment guidelines:** Resources offering treatment guidelines or information on treatment guidelines for particular diseases, syndromes, or conditions relevant to specific NCBI database records.

Molecular Biology Databases

These SubjectTypes describe links from NCBI database records to corresponding or related records in other online molecular biology databases.

**DNA/protein sequence:** Databases providing nucleotide or amino acid sequence data.

**gene/protein/disease-specific:** Databases providing data specific to particular genes, proteins, diseases, syndromes, or conditions.

**gene expression:** Databases providing data on gene expression (e.g., RNA transcription, knockouts).
**locus-specific**: Databases, often described as LSDB, focusing on a single gene or a small family of genes.

**mapping**: Databases providing chromosomal mapping data, such as sequence tagged site (STS) mapping.

**meta-databases**: Databases that draw and/or synthesize information from other databases and extend or add value to the original information.

**organism-specific**: Databases providing data specific to a particular organism or group of organisms.

**population/variation**: Databases providing data on sequence variation within particular populations, including mutations or other polymorphisms.

**protein interactions/pathways**: Databases that describe molecular interactions and/or biological pathways.

**structure**: Databases providing structural or pattern data, such as three-dimensional protein structures, chemical structures, or two-dimensional electrophoresis patterns.

**taxonomy/phylogenetic**: Databases providing data on organism taxonomy, phylogenetic trees and relationships, or biodiversity.

**Research Materials**

These SubjectTypes describe links to relevant research material suppliers from NCBI database records that discuss the use of these materials.

**clones/clone libraries**: Suppliers providing DNA clones and clone libraries (e.g., DNA, cDNA).

**culture/stock collections**: Suppliers providing cell cultures.

**herbarium/museum collections**: Curated plant/animal specimen collections

**laboratory equipment**: Suppliers providing laboratory equipment.

**oligonucleotides**: Suppliers providing equipment, materials, and reagents used in researching oligonucleotides.

**other reagents**: Suppliers providing other reagents not described by the SubjectTypes above.
Researchers

These SubjectTypes describe links from NCBI database records to the individuals or organizations that conducted or supported the research cited therein.

- **colleges/universities**: Colleges, universities or other academic institutions that have conducted or supported research cited in NCBI database records.
- **companies/research institutes**: Private companies or research institutions that have conducted or supported research cited in NCBI database records.
- **directories**: Links to the directory entries of individuals or organizations from NCBI database records that cite research conducted or supported by those individuals or organizations.
- **individuals**: The web pages of individuals who have conducted research cited in NCBI database records.
- **societies/associations**: Societies or organizations that have conducted or supported research cited in NCBI database records.

Tools

These SubjectTypes describe links to research tools, utilities or other software from NCBI database records citing research that discusses or requires the use of these tools.

- **3D structure prediction/functional modeling**: Tools used in predicting the three-dimensional structure of proteins or in modeling protein function.
- **primer design**: Tools used in the design of nucleotide primer sequences for use in polymerase chain reactions.
- **protein identification(characterization)**: Tools used in the identification, annotation, characterization, or other description of proteins.
- **restriction mapping**: Tools used in the mapping of restriction enzyme cutting sites.
- **sequence screening/similarity/alignment**: Tools used in screening, comparing, matching, and alignment of sequences.
- **sequence viewer**: Tools used in creating visual representations of nucleotide or amino acid sequences.
- **translation**: Tools used in the translation of sequences or of sequence file formats.
Special Elements: Attribute

The <SubjectType>, <Attribute>, and <UrlName> elements are used to organize and describe resources in the NCBI database displays and to facilitate access to these resources by defining them as groups.

The Attribute element is used to provide information about the resource itself, independent of content. It describes the format, barriers to access, and the ownership (if any) of the resources being linked. On the basis of information provided by Attribute, users can make an informed choice from a list of LinkOut resources available. For example, they will know if a resource is free before clicking the link.

Attributes can be used in database searches to retrieve records with links to resources with a specific Attribute.

To do this, enter the following the in the search box.

\texttt{loattr\{AttributeName\} [sb]}

Replace \texttt{AttributeName} with the Attribute name from the list below.

This filter can be used as a part of any NCBI database search.

Special aliases are also available for these searches:

- Full text [sb]
- Free full text [sb]

For each resource, the provider should select all Attribute values from the list below that apply and include them in the appropriate LinkOut files.

Attribute Categories

Attributes are grouped in the following categories:

- Barriers
- Ownership
- Resource Form
- Miscellaneous

Barriers

These Attributes describe barriers to accessing the information being linked to from a database record.
**registration required:** A free registration is required to access the information being linked. If any expense is involved, please use the Attribute “subscription/membership/fee required”. Citations with this Attribute will be marked as “Registration required” in the LinkOut links.

**subscription/membership/fee required:** Membership in an organization, a subscription, or some other fee or expense is required to obtain access to the information being linked.

If no Barrier Attributes are used, citations will be marked as “Free” in the LinkOut links.

**Ownership**

These Attributes describe any ownership of the information that is being linked claimed by the individual or organization providing the link.

- **author of URL:** The individual or organization providing a link is the author of the information that is being linked.
- **publisher of information in URL:** The individual or organization providing a link is the publisher of the information that is being linked.

**Resource Form**

These Attributes describe the form of the documents being linked from NCBI database records.

- **author manuscript:** Final, peer reviewed manuscripts that have been accepted for publication. These manuscripts are typically posted on a journal website or at PubMed Central.
- **electronic full-text:** Online full-text holdings of a library.
- **full-text online:** Full-text documents that are in text, HTML, word processor, or other formats (besides PDF or PostScript).
- **full-text PDF:** Full-text documents that are in Adobe Portable Document Format (PDF).
- **full-text PostScript:** Full-text documents that are in PostScript format.
- **order form:** Order form for the resources mentioned in the database record, e.g. clones.
- **print collection:** Print collection of a library.
**Miscellaneous**

Attribute not included in other categories:

**preference:** When duplicate URLs are submitted for the same database record but different IconUrl, SubjectType, and/or Attributes are assigned, use preference to indicate which link should be displayed. See Duplicate Links for details. When a provider submits multiple, unique, URLs for a PubMed record, the provider should use preference to indicate which URL should be linked through their icon in PubMed. See Multiple Links for details.

**Special Elements: UrlName**

UrlName is a short text string used to describe a resource. If possible, <SubjectType> and <Attribute> should be used, rather than UrlName. UrlName should be used only when the allowed terms in the SubjectType and Attribute lists do not suffice to describe the resource. UrlName is not searchable.

When UrlName is used, it will appear in the LinkOut Display. In the example below from the Gene database LinkOut display, the two providers Kyoto Encyclopedia of Genes and Genomes and TaqMan have used UrlName to provide additional information about the resource being linked. The link appears as the description given in UrlName. The first provider has not used UrlName, so the link appears as the resource name.

![The following LinkOut resources are supplied by external providers. These providers are responsible for maintaining the links.](image)

- Molecular Biology Databases
  - The Comparative Toxicogenomics Database
  - GenScript
- Kyoto Encyclopedia of Genes and Genomes
- [dre:100302655](#)

- Research Materials
  - TaqMan® probe and primer sets (Assays) and RNAi products from Life Technologies
  - TaqMan® Gene Expression Assays

**Allowable Rule Keywords**

As in all XML files, entities can be defined and used in LinkOut files to facilitate file construction.

There are a number of pre-defined Linkout entities (Allowable Rule Keywords) in the LinkOut DTD. When an entity is used in the <Rule> element, the NCBI system will replace the entity with the corresponding value from each NCBI database record when
constructing the URL specified in your <Rule>. Note that LinkOut entities cannot be used in the <Base> element or other elements in a LinkOut file.

The following is a list of entities and the values with which they will be substituted:

<table>
<thead>
<tr>
<th>Entity</th>
<th>Corresponding value from NCBI database record</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;lo.id;</td>
<td>Unique identifier (PMID, TaxID, etc.)</td>
</tr>
</tbody>
</table>

For PubMed only:

<table>
<thead>
<tr>
<th>Entity</th>
<th>Corresponding value from NCBI database record</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;lo.auth;</td>
<td>First Author. Example: Smith JE.</td>
</tr>
<tr>
<td>&amp;lo.authln;</td>
<td>First Author Last Name. Example: Smith.</td>
</tr>
<tr>
<td>&amp;lo.day;</td>
<td>Two-digit day of the publication date. Example: 01; 31.</td>
</tr>
<tr>
<td>&amp;lo.doi;</td>
<td>Article DOI. Must be submitted by Publisher.</td>
</tr>
<tr>
<td>&amp;lo.eday;</td>
<td>Two-digit day of electronic publication date. Example: 01; 31.</td>
</tr>
<tr>
<td>&amp;lo.emo;</td>
<td>Two-digit month of electronic publication date. Example: 01; 12.</td>
</tr>
<tr>
<td>&amp;lo.emon;</td>
<td>Three-letter month abbreviation of electronic publication date. Example: Sep.</td>
</tr>
<tr>
<td>&amp;lo.emonth;</td>
<td>Month of electronic publication date. Example: September.</td>
</tr>
<tr>
<td>&amp;lo.eyl;</td>
<td>Last digit of year of the electronic publication date. Example: 1999 =9.</td>
</tr>
<tr>
<td>&amp;lo.eyr;</td>
<td>Last two digits of year of electronic publication date. Example: 98; 00.</td>
</tr>
<tr>
<td>&amp;lo.essn;</td>
<td>Journal electronic ISSN code.</td>
</tr>
<tr>
<td>&amp;lo.iss;</td>
<td>Journal issue.</td>
</tr>
<tr>
<td>&amp;lo.issn;</td>
<td>Journal print ISSN code.</td>
</tr>
<tr>
<td>&amp;lo.issnl;</td>
<td>Journal print ISSN code with the dash stripped.</td>
</tr>
<tr>
<td>&amp;lo.jtit;</td>
<td>Journal title (NLM's Title Abbreviation).</td>
</tr>
<tr>
<td>&amp;lo.mo;</td>
<td>Two-digit month abbreviation of the publication date. Example: 01.</td>
</tr>
<tr>
<td>&amp;lo.mon;</td>
<td>Three-letter month abbreviation of the publication date. Example: Sep.</td>
</tr>
<tr>
<td>&amp;lo.month;</td>
<td>Month of the publication date. Example: September.</td>
</tr>
<tr>
<td>&amp;lo.otit;</td>
<td>Article title.</td>
</tr>
<tr>
<td>&amp;lo.page;</td>
<td>First page.</td>
</tr>
<tr>
<td>&amp;lo.pii;</td>
<td>Publisher Item Identifier. Must be submitted by Publisher.</td>
</tr>
<tr>
<td>&amp;lo.vol;</td>
<td>Journal volume.</td>
</tr>
<tr>
<td>&amp;lo.year;</td>
<td>Four-digit year of the publication date. Example: 1998.</td>
</tr>
<tr>
<td>&amp;lo.yl;</td>
<td>Last digit of year of the publication date. Example: 1999 =9.</td>
</tr>
<tr>
<td>&amp;lo.yr;</td>
<td>Last two digits of year of the publication date. Example: 98.</td>
</tr>
</tbody>
</table>
For Sequence databases (Nucleotide, Protein, Structure, Genome):

<table>
<thead>
<tr>
<th>Entity</th>
<th>Corresponding value from NCBI database record</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;lo.pacc;</td>
<td>Primary accession for sequences.</td>
</tr>
</tbody>
</table>

For Taxonomy only:

<table>
<thead>
<tr>
<th>Entity</th>
<th>Corresponding value from NCBI database record</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;lo.scientificname;</td>
<td>Scientific name. Example: &quot;Homo sapiens neanderthalensis&quot;</td>
</tr>
</tbody>
</table>

For UniGene only:

<table>
<thead>
<tr>
<th>Entity</th>
<th>Corresponding value from NCBI database record</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;lo.clusterid;</td>
<td>Cluster Id.</td>
</tr>
</tbody>
</table>

**Special Characters**

XML requires certain special characters to be encoded in the files. When using the following characters in LinkOut files, except in LinkOut entities, please encode them as shown.

<table>
<thead>
<tr>
<th>Character</th>
<th>XML Encoding</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;</td>
<td>&amp;</td>
</tr>
<tr>
<td>&lt;</td>
<td>&lt;</td>
</tr>
<tr>
<td>&gt;</td>
<td>&gt;</td>
</tr>
<tr>
<td>©</td>
<td>©</td>
</tr>
<tr>
<td>*</td>
<td>®</td>
</tr>
<tr>
<td>™</td>
<td>™</td>
</tr>
</tbody>
</table>

Do not use ASCII encoding in LinkOut files.

**Transferring Files via FTP**

Providers must write to linkout@ncbi.nlm.nih.gov to apply for inclusion in LinkOut before submitting files.

LinkOut files are submitted to NCBI via FTP to the host: ftp-private.ncbi.nlm.nih.gov. The following file name conventions apply:

- File names may include alpha and numeric characters only. Spaces and special characters such as hyphens are not allowed.
- Identity and Resource files must have the file extension “.xml”. The exception is resource files submitted as a simple text file.
- Identity files must be named "providerinfo.xml".
File Placement

- Resource provider files (both full-text and other providers) are placed in the “holdings” directory of the FTP account.
- Files submitted on behalf of libraries by full-text providers are placed in the “users” directory.
- Files submitted by libraries are placed in the “collection” directory
- “.doi” or “pii” files are placed in the “pid” directory.

Files placed in an incorrect directory will not be processed.

How to FTP

From a standard ftp client:

2. Type your login name at the login prompt and press enter. (See how to obtain ftp account from NCBI.)
3. Type your password at the password prompt and press enter.
4. You should now be logged into the ftp server. If you receive an error message, check your login information, type 'bye' followed by enter, and retry steps 1-3.
5. Type 'bin' and press enter. This changes your ftp server to BINARY mode.
6. Type 'cd [directory, i.e. holdings, users]' and press enter. This changes your current directory.
7. Type the 'put' command, followed by your pathname or drive and filename and press enter. (For example, 'put C:\filename' or 'put /home/testfiles/journalv6n3'.)
8. Type 'dir' and press enter to display the files in the current directory.
9. Type 'bye' to disconnect from the server and close the ftp session.

From a browser window:

2. From the file pull-down menu, choose "Login As".
3. Type in your username and password in the dialog box. The screen will display your directory with subdirectory folders inside.
4. Open the folder into which you will be depositing files.
5. Add files in the selected directory
Policies
Created: July 18, 2005; Updated: July 22, 2016.

This section contains LinkOut's policies on the evaluation, management, assignment, and display of links included in or considered for inclusion in LinkOut.

Questions and comments regarding these policies may be sent to linkout@ncbi.nlm.nih.gov.

Guidelines for Evaluation of Resources

Although participation in LinkOut is open to various types of online resource providers, resources from professional societies, government agencies, educational institutions, or individuals and organizations that have received grants from major funding organizations are preferred. All resources considered for inclusion in LinkOut must meet the following evaluation criteria for both Quality and Relevance outlined in this document.

Resource providers should review the guidelines below before submitting online resources for inclusion in LinkOut. Providers with a commercial interest in using LinkOut must also carefully review the section Additional Information for Commercial Interests.

NCBI LinkOut staff will determine whether potential resources satisfy these guidelines and are eligible for participation in LinkOut.

Quality

LinkOut resources and the information therein must be of sufficiently high quality that NCBI database users will not be hindered, interrupted, or unnecessarily frustrated in their research. In evaluating the resource for inclusion in LinkOut, both the quality of the resource and the quality of the information will be considered as detailed below.

a. Information quality: The information provided by LinkOut resources must not, through typographical or factual errors, omissions, fraud, duplication or other flaws or inconsistencies, mislead, hinder, or otherwise frustrate the research efforts of NCBI database users.

b. Resource quality: Both technical and usability aspects will be considered. LinkOut resources must not impede or disrupt the work of NCBI database users through such problems as abnormally slow response times, sporadic availability, frequent systems errors, or poor interface design.

Resource providers should also consider the overall usability of their resources for NCBI database users. Generally, usability is concerned with factors such as interface design, navigability, layout, intelligibility, consistency, intuitiveness, and any other characteristics impacting people's ability to use a resource. Resources suffering from technical or usability problems severe enough to hinder NCBI database users' research will not be included in LinkOut.
c. Privacy policy: LinkOut encourages resource providers to respect the privacy of LinkOut users and to adopt privacy policies that express this respect. Providers should review the NLM Copyright and Privacy Notice and the NCBI Copyright and Disclaimers page. LinkOut also encourages resource providers to make any privacy policies or statements readily accessible to LinkOut users.

Relevance

The foremost requirement of LinkOut resources is that they be of potential use to NCBI database users. Useful LinkOut resources will extend, clarify, relate to, expand upon, or supplement information found in NCBI databases.

a. Level of linking: Links from NCBI database records to LinkOut resources should deliver the relevant information to NCBI database users with few or no intermediary steps. Users should not be required to perform further searching to retrieve the relevant information. For example, links to online full text should lead directly to the relevant full text, not to a journal homepage or table of contents. Links to database records should lead directly to the record, not to an intermediate search screen.

b. Specialization: LinkOut resources should be directly relevant to the specific subjects of the NCBI database records to which they will be linked. They must also be sufficiently specialized to be of value to NCBI database users' research and to not unnecessarily overburden NCBI’s resources. For example, LinkOut would not offer links from all NCBI database records to an online English language dictionary. Such a resource would be too general in content and too broad in application to be supported by LinkOut. However, links might be offered from citations for articles that use new, highly technical or specialized vocabularies to a glossary defining those specialized terms. Likewise, a website providing diabetes treatment guidelines would not be linked from all NCBI database records concerned with metabolic diseases but only from those concerned specifically with treatment of diabetes.

c. Labeling of links: The relevance of resources linked from NCBI database records should be readily apparent to users. If possible, the name of the resource or the button that serves as its link should convey something about the information that is being offered and its relevance. Providers should also make use of the Brief DTD element to describe themselves to NCBI database users. (For more information on the use of DTD elements in LinkOut files, see the LinkOut Technical Information.)

Additional Information for Commercial Interests

LinkOut is a service of the National Library of Medicine, a Federal agency, and as such it is produced using Federal computer and network facilities. Because these types of public facilities cannot be used for private commercial advertisement, endorsement, or competition, special care must be taken by resource providers with a commercial interest in using LinkOut. Although LinkOut may provide links to highly relevant commercial
products, resource providers should not attempt to use LinkOut as a form of advertising. Resource providers found willfully disregarding these guidelines may be barred from future participation in LinkOut.

**Provider Responsibilities**

Link providers are responsible for the following:

- **Maintaining the quality of resources and links**: Resource providers must ensure that the information LinkOut uses to generate URLs is correct, and that the links created will function correctly. They must also ensure that the resource itself is functioning properly and that sufficiently high quality is maintained to meet the evaluation criteria above.
- **Testing the Query and ObjId values in their files**: Resource providers must ensure that they select the correct NCBI database records to link to their resources before sending LinkOut files to NCBI. For more information on the use of the Query and ObjId elements, see Information for Full-Text Providers, Information for Other Resource Providers, or the LinkOut Technical Information.
- **Correcting broken, blind, or incorrect links in a timely manner**: Nonfunctional or mislabeled links must be corrected in a timely manner. NCBI reserves the right to remove or alter LinkOut files and related icons after they have been submitted.
- **As a part of the quality control process, NCBI conducts periodic automatic checking of LinkOut resources.** Providers should make their resource available and give appropriate access rights to the link checker. Providers should not block or reduce the blocking time for the link checker. Providers should inform NCBI when there is a change in the response to a request for resources which are not available in provider's site, so that NCBI can adjust the checking logic accordingly.
- **Maintaining LinkOut files, transferring any additions, changes, or deletions of links to NCBI**: If a resource is redesigned or altered in any way that invalidates existing links from NCBI database records to that resource, the resource provider must update their LinkOut files to generate functioning links. For example, if the format of the URLs for a resource is changed, the provider must update the Base and Rule values used to generate the links to that resource. For more information on the use of the Base and Rule elements, see Information for Full-Text Providers, Information for Other Resource Providers, or the LinkOut Technical Information.
- **Informing LinkOut about the addition or discontinuation of links**: Providers should inform LinkOut when adding links to a new resource or ceasing to supply links to an existing one. This is particularly important for providers of online full text. Publishers that submit links to online full text must inform LinkOut when
ownership of a journal is transferred to a new publisher. For more information, see Transferring Journals Between Publishers in LinkOut Help.

- Keeping LinkOut informed of continued participation: Providers should update LinkOut files at least once a year to verify continued participation in LinkOut.

- Updating Contact Information: Resource providers must designate someone who will serve as a reliable contact person for the resource. If there are problems with links, NCBI must be able to easily contact the provider responsible for those links. The contact person should be able to get in touch with and should be able to respond to inquiries or problem reports from NCBI in a timely fashion.

- Promoting their resource: NCBI provides the links in its databases and promotes the LinkOut feature. It is the provider's responsibility to promote their resource(s) to existing and potential users.

NCBI reserves the right to remove, correct, or otherwise alter LinkOut files and related icons after they have been submitted. This is usually done in situations where links are broken or incorrect and the provider has not replied to notifications sent by the LinkOut team. Occasionally, if a small error is identified, it will be corrected in the file and the provider will be notified. Icons may be altered if they do not adhere to the guidelines for icon design, i.e. they do not fit within the required size parameters or do not provide sufficient information to clearly identify the resource.

**Participation in LinkOut and Use of Links**

Participation in LinkOut is free and voluntary, and so may be discontinued at any time. Submission of links is at the provider’s discretion; participants may choose not to submit links to certain portions of their resource. For online full text, this means that links may not be available for all journals, issues, or articles available on the provider’s website.

In addition to the NCBI Web interface, all links submitted to LinkOut are available through the NCBI Programming Utility, ELink. Other systems may retrieve links through this utility and display them at their sites using a different interface.

**Access to LinkOut, Outside Tool, and Document Delivery Service**

When a user accesses a LinkOut resource or a service implemented through Outside Tool or DDS, all access restrictions assigned by the resource provider or the institution sponsoring the service are retained. Access to restricted resources is based on pre-existing agreements with the resource provider or on access parameters set by the institution. For example, if access to a resource is limited by IP address, users will only have access from computers within the approved IP range. If access is password protected, users must still enter the password.

If access to a LinkOut resource is limited, providers **must** indicate this by including the appropriate attributes in their files (more about LinkOut Attributes). Services that are restricted must respond with an indication that the resource is restricted. Providers may not rely on an http “access denied” response to indicate that access is restricted.
LinkOut does not perform any user verification, including IP recognition.

**Assignment of Accounts**

Each provider will be given only one NCBI account. A single provider may submit links on behalf of multiple publishers; different icons may be used in PubMed to establish the identity for each journal.

Accounts will not be created for testing purposes. All links submitted to NCBI, including links to OpenURL-based services and Document Delivery Services can be tested by constructing URLs to the resource. URLs for online full text and other resources can be constructed by concatenating the <Base> and <Rule> elements in the provider's files.

To construct URLs for an OpenURL-based service or Document Delivery Service, please see Evaluating Your OpenURL-based service or Evaluate your DDS.

For Outside Tool and Document Delivery Service, one account will be assigned to each unique Base URL for an Outside Tool and DDS.

**Copyright Restrictions**

When a user clicks on an icon or link to access a LinkOut resource, they leave PubMed and are directed to the resource at an external site. Users should review and adhere to copyright restrictions set forth on the provider's site when reproducing, redistributing, or making commercial use of the provider’s resource(s).

LinkOut provides access to the URL of the resource as submitted to NCBI by the resource provider. NCBI does not hold ownership of the link or the linked resource.

For additional information about Copyright and NCBI databases, see NCBI’s Copyright and Disclaimers page.

**Default Icons**

Three types of icons appear by default in PubMed’s Abstract display:

1. **PubMed Central icons**: PubMed Central (PMC) icons appear on all citations for which full text is available from PMC.
2. **Publisher icons**: When a publisher submits electronic citation or full text data to NCBI for a journal currently indexed for MEDLINE or a PubMed Central full participation journal, before submitting full-text links to LinkOut, the publisher’s icon will appear by default in PubMed’s Abstract display. Please see Information for Publishers for details about submitting electronic data to PubMed. Should a publisher decide to submit full-text links without submitting PubMed citations electronically, the publisher’s links will appear in the "LinkOut- more resources" display only.
   The default icon is assigned to the provider who submitted the citation or full text
data at the time of publication, even if the journal changes hands. If a link to the original provider is no longer working, the link and icon will be removed. The copyright holder of a journal may request that NCBI display the default icon for a specific provider on all PubMed citations for the journal.

3. **Free full text**: Icons linking to free full text will be displayed by default. In situations where the full text is not free on the publisher’s site, but it is freely available at another provider’s site, PubMed will display two default icons, one for the publisher’s site and one for the free full text.

### Duplicate Links

Providers should not send duplicate links to the same resource for any NCBI database record. Links are considered as duplicates when they lead to the same target content. For example, a publisher or data provider supplies a link to a portal page which lists the article full text on multiple platforms; this link would be considered a duplicate if the same provider supplies a separate link to the article full text on any of the platforms already listed in the portal page.

If duplicate URLs are submitted for the same NCBI database record, link assignment will be handled as follows:

1. If identical URLs are submitted for a record, only one link to that URL will be applied to the record.
2. If duplicate URLs are submitted for a record but the SubjectType and/or Attributes assigned to the URL are different, LinkOut’s internal de-duping schema will determine which link is displayed, unless the attribute “preference” is used to indicate which link should be applied. If “preference” is not used, links will be applied according to the following priority: free resource, full-text online, full-text PDF, full-text PostScript, author manuscript. If link descriptions do not fall into this priority, links will be randomly assigned.

In the following example, multiple `<Link>` elements are submitted with `<Query>` elements that may retrieve some duplicate citations. The same URL is included in `<ObjectUrl>`, but different `<Attributes>` have been applied. In this case, LinkOut’s internal de-duping schema will determine which link is displayed.

```xml
<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
  </ObjectUrl>
</Link>
```
By adding <Attribute>preference</Attribute> to LinkId 1, as shown below, the link provider can instruct LinkOut to apply the URL with the Attributes described in LinkId 1 and to ignore the duplicate citations retrieved in LinkId 2.

<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  &lt;IconUrl&gt;https://www.goodpublisher.com/pubmed/smith.gif&lt;/IconUrl&gt;
  &lt;ObjectSelector&gt;
    &lt;Database&gt;PubMed&lt;/Database&gt;
    &lt;ObjectList&gt;
      &lt;Query&gt; "J Mol Dis" [ta] AND Smith J [auth]&lt;/Query&gt;
    &lt;/ObjectList&gt;
  &lt;/ObjectSelector&gt;
  &lt;ObjectUrl&gt;
    &lt;Base&gt;&lt;/Base&gt;
    &lt;Rule&gt;&lt;/Rule&gt;
    &lt;Attribute&gt;full-text PDF&lt;/Attribute&gt;
    &lt;Attribute&gt;preference&lt;/Attribute&gt;
  &lt;/ObjectUrl&gt;
&lt;/Link&gt;

<Link>
  &lt;LinkId&gt;2&lt;/LinkId&gt;
  &lt;ProviderId&gt;8888&lt;/ProviderId&gt;
  &lt;IconUrl&gt;&lt;/IconUrl&gt;
  &lt;ObjectSelector&gt;
    &lt;Database&gt;PubMed&lt;/Database&gt;
    &lt;ObjectList&gt;
      &lt;Query&gt; "J Mol Dis" [ta] AND 1997:2010 [pdat]&lt;/Query&gt;
    &lt;/ObjectList&gt;
  &lt;/ObjectSelector&gt;
  &lt;ObjectUrl&gt;
    &lt;Base&gt;&lt;/Base&gt;
    &lt;Rule&gt;&lt;/Rule&gt;
    &lt;Attribute&gt;full-text PDF&lt;/Attribute&gt;
  &lt;/ObjectUrl&gt;
&lt;/Link&gt;
Multiple Links

If an NCBI database record is retrieved by multiple queries in a provider's file(s), link assignment will be handled as follows:

1. If duplicate URLs are submitted for a record, links will be assigned as described in Duplicate Links.
2. If multiple, unique URLs are submitted for a record, all links will be showing in the LinkOut display of the record. Note that each unique URL should point to an unique information resource.
3. In PubMed, regardless of how many links are assigned to a record, only one default icon will be assigned. If the attribute “preference” is assigned to a link, the default icon will link to that URL. If “preference” is not used, the link from the default icon will be assigned according to the following priority: free resource, full-text online, full-text PDF, full-text PostScript, author manuscript.

In the example below, the records in LinkId 1 may also be retrieved by the <Query> in LinkId 2. Unique URLs are provided in each Link. As the attribute “preference” has not been used, the default icon will always link to the full-text online link described in LinkId 2.

<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
    <Attribute>full-text online</Attribute>
    <Attribute>subscription/membership/fee required</Attribute>
  </ObjectUrl>
</Link>
By adding <Attribute>preference</Attribute> to LinkId 1, as shown below, the link provider can tell LinkOut to apply the URL in LinkId 1 to the default icon, with the Attributes described in LinkId 1, overriding the LinkOut priority.
Contact LinkOut

Please send questions and comments to linkout@ncbi.nlm.nih.gov.