

LinkOut Help

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National Center for Biotechnology Information (US), Bethesda (MD)

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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.

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Welcome to LinkOut

Created: June 13, 2005; Updated: June 30, 2023.

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 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.

Information about LinkOut is also available in the [LinkOut website](#).

Examples of LinkOut Resources

Click the links below to see examples of LinkOut resources. See [Databases Available for Linking](#) for a complete list of databases 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.

[Consumer health information](#) – This example displays articles with links to the MedlinePlus consumer health resource. Expand “LinkOut – more resources” to see the MedlinePlus 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 SciCrunch, which aggregates related records from multiple databases:

<https://www.ncbi.nlm.nih.gov/pubmed/24859754>

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

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

Using LinkOut

Created: July 25, 2005; Updated: January 11, 2023.

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 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 displays only in the Abstract single citation format. The links are found under "LinkOut - more resources." In PubMed, you can also view full text links as icons.

[Advanced](#)

[User Guide](#)

[Search results](#)

[Mamm Genome](#). 2017 Feb;28(1-2):38-46. doi: 10.1007/s00335-016-9672-5. Epub 2016 Dec 2.

Complex genetics architecture contributes to Salmonella resistance in AcB60 mice

[Sean Beatty](#)^{1 2}, [Leila Rached-D'Astous](#)², [Danielle Malo](#)^{3 4 5}

[Affiliations](#) + expand

PMID: 27913859 DOI: 10.1007/s00335-016-9672-5

Abstract

Human infection with Salmonella is of global public health concern. In low- and middle-income countries, Salmonella infection is a major source of disease in terms of both mortality and morbidity, while in high-income nations, the pathogen is an ongoing threat to food security. The outcome of infection with Salmonella enterica serovar Typhimurium (Salmonella Typhimurium) in mouse models is dependent upon a coordinated and complex immune response. A panel of recombinant congenic strains (RCS) derived from the reciprocal double backcross of A/J and C57BL/6J mice has been screened for their susceptibility to Salmonella infection, and the RCS AcB60 was identified to be the most resistant strain to Salmonella infection, more resistant than the parental strain A/J. These mice are known to carry resistant alleles at three well-defined Salmonella susceptibility loci, Slc11a1^{Ity} (solute carrier family 11 member 1; Immunity to Typhimurium locus), Pklr^{Itv4} (pyruvate kinase liver and red blood cell; Ity4 locus), and Ity5. In the current study, we used interval mapping to validate a locus on Chr 15, named Ity8, linked to Salmonella resistance in AcB60 mice. Global gene expression analysis during infection identified AcB60-specific expression of genes involved in Ccr7 signaling, including downstream effector Mapk11 (mitogen-activated protein kinase 11), located within the Ity8 interval, and representing a potential positional candidate gene. An additional region on Chr 18 of C57BL/6J descent was shown to be associated with increase resistance in AcB60. These observations provide an opportunity to achieve new insight into the complex genetics of resistance to Salmonella infection in the context of mouse models of human infection with Salmonella Typhimurium.

Similar articles

[Survival analysis and microarray profiling identify Cd40 as a candidate for the Salmonella susceptibility locus, Ity5.](#)

[Beatty SC, Yuki KE, Eva MM, Dauphinee S, Larivière L, Vidal SM, Malo D.](#)

[Genes Immun.](#) 2016 Jan-Feb;17(1):19-29. doi: 10.1038/gene.2015.41. Epub 2015 Nov 12.

PMID: 26562079

FULL TEXT LINKS

ACTIONS

SHARE

PAGE NAVIGATION

[Title & authors](#)

[Abstract](#)

[Similar articles](#)

[References](#)

[Publication types](#)

[MeSH terms](#)

[Substances](#)

[Related information](#)

[Grant support](#)

[LinkOut - more resources](#)

LinkOut – more resources

Full Text Sources
[Springer](#) Links to electronic full text

Other Literature Sources
[scite](#) [Smart Citations](#) Links to related literature sources

Medical
[MedlinePlus Health Information](#) Links to consumer health information

Molecular Biology Databases
[Mouse Genome Informatics \(MGI\)](#) Links to related biological databases

Miscellaneous
[NCI CPTAC Assay Portal](#)

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.

Theileria parva strain Muguga

Taxonomy ID: 333668 (for references in articles please use NCBI:txid333668)

current name
Theileria parva strain Muguga

NCBI BLAST name: [apicomplexans](#)
 Rank: **strain**
 Genetic code: [Translation table 1 \(Standard\)](#)
 Mitochondrial genetic code: [Translation table 4 \(Mold Mitochondrial; Protozoan Mitochondrial; Coelenterate Mitochondrial; Mycoplasma; Spiroplasma\)](#)
 Plastid genetic code: [Translation table 11 \(Bacterial, Archaeal and Plant Plastid\)](#)

[Lineage \(full\)](#)
[cellular organisms](#); [Eukaryota](#); [Sar](#); [Alveolata](#); [Apicomplexa](#); [Aconoidasida](#); [Piroplasmida](#); [Theileriidae](#); [Theileria](#); [Theileria parva](#)

External Information Resources (NCBI LinkOut)

LinkOut	Subject	LinkOut Provider
GOLD: Go0000478	organism-specific	Genomes On Line Database
Related Immune Epitope Information	gene/protein/disease-specific	Immune Epitope Database and Analysis Resource
640281009: Theileria parva Muguga	organism-specific	Integrated Microbial Genomes
WebScipio: Theileria parva str. Muguga	organism-specific	WebScipio - eukaryotic gene identification
diArk: Theileria parva str. Muguga	organism-specific	diArk - a resource for eukaryotic genome research

Available resources will vary depending on which links have been assigned to the specific database record. A Gene database example of links to Chemical, Medical and Molecular biology resources.

Gene LinkOut

The following [LinkOut](#) resources are supplied by external providers. These providers are responsible for maintaining the links.

- Chemical Information**
 - [FREE Interologous Interaction Database](#)
- Medical**
 - [FREE Pancreatic Expression Database](#)
 - [FREE Genetics Home Reference](#)
 - [TP53 Gene](#)
 - [FREE Breast Cancer TissueBank Bioinformatics Portal](#)
- Molecular Biology Databases**
 - [FREE CutDB, Proteolytic Event Database \(part of Proteolysis MAP \(PMAP\), proteolysis reasoning environment\)](#)
 - [FREE Protein Ontology Consortium](#)

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 publishers, research institutes, and a variety of commercial and non-profit organizations.

Three types of icons appear in PubMed by default - icons that link to the full text at the journal publisher's site, icons that link to the full text at PubMed Central, and icons that link to other free full text resources such as institutional repositories. Full text articles at a publisher's site may require a subscription to view.

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

> [JAMA Dermatol.](#) 2022 Mar 1;158(3):300-313. doi: 10.1001/jamadermatol.2021.4926.

Identification of Biomarkers and Critical Evaluation of Biomarker Validation in Hidradenitis Suppurativa: A Systematic Review

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Affiliations + expand

PMID: 35044423 PMCID: PMC9131897 DOI: 10.1001/jamadermatol.2021.4926

FULL TEXT LINKS

FULL TEXT
JAMA Dermatology

FREE Full text
PMC

ACTIONS

Cite

Collections

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 filter feature that groups search results by areas of interest. Filters are available for the following NCBI databases, 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. 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 resource User Name.

This filter will be effective for *that search only*.

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 to some articles may be obtained through links in PubMed. To locate these articles more easily, try limiting a search to citations with free full text by adding this filter to your search: free full text[sb]
Note: When you click on publisher icons or links in the LinkOut display, you leave PubMed and are directed to the full text at an external site. Please review use and copyright information on the full-text provider's site before distributing their material.
2. If you are a health professional or are affiliated with a hospital, university, or other institution, check with your local medical library for access information to journal collections that require a subscription.
3. You may also go directly to the publisher to purchase articles.

Additional Assistance

Please send comments and suggestions about LinkOut and report broken links to <https://support.nlm.nih.gov/support/create-case/>

Attention: LinkOut team.

Information for Libraries

Created: July 18, 2005; Updated: June 20, 2024.

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).

How LinkOut Works for Libraries

The LinkOut service for Libraries, Outside Tool, allows participating libraries to link directly from PubMed citations to their library's link resolver where library full text resources and Interlibrary Loan options are available to their users. Libraries icons and links to their link resolver display in all PubMed citations.

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

Outside Tool accounts are only issued to libraries. Outside Tool accounts are not created for test or trial purposes.

Setting Up Links to Library Holdings

For your library patrons to link directly from PubMed citations to your library's link resolver, you library would need to register for the Outside Tool service.

Outside Tool allows an institution to place a link on every PubMed record. Outside tool links point to the link resolver offered by a library for their users. For complete information about implementing an Outside Tool, please see the Outside Tool section of this manual.

PubMed and OpenURL-based Services

Section contents:

- About PubMed & OpenURL based Services
- Implementing Link Resolver Software in PubMed
- Evaluating Your Link Resolver

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 library link resolver software that use OpenURL syntax through Outside Tool. Outside Tool allows libraries to place a link to their link resolver software on all PubMed records. If your library has implemented a link resolver, see the section Evaluate your Link Resolver to see whether it qualifies for the Outside Tool service.

Implementing Link Resolver Software in PubMed

Fully implemented link resolver software can be registered with NCBI to provide a link from the Abstract display of PubMed records. Your library's link resolver can be implemented as an Outside Tool.

Outside Tool does not differentiate between online holdings, print holdings, or items that will have to be ordered from another institution. 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.

Evaluating Your Link Resolver

To register a link resolver for Outside Tool, we require the service to provide functional links to a landing page with the following qualified resources. This requirement allows us to best serve the PubMed user community, by avoiding "blind" links that do not provide useful and specific information for each 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 populated for the user. This is a requirement for Outside tool implementation. Due to the scope of PubMed, it is unlikely that any single library will be able to provide 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 articles the library does not hold.

Citation style information.

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 will not be assigned a new Outside Tool account. Instead, the existing link resolver with the same base URL should be used.

To determine whether your link resolver software meets the qualifications for implementation as an Outside Tool, construct a URL to your link resolver and retrieve the PubMed records listed below.

To construct the URL to your link resolver, combine the base URL of your service with a PMID:

Example
Base URL: https://baseURL/OpenURL_local
Tail: ?sid=Entrez:PubMed&id=pmid:
PMID: 12345678
Resulting URL: https://baseURL/OpenURL_local?sid=Entrez:PubMed&id=pmid:12345678

Please test all of the following PMIDs to verify that your service is working correctly. Your link resolver **MUST** provide at least two qualified resources for each PMID tested.

PMIDs for testing

18984876

20042755

14316043

15390390

12337850

12076440

12259237

All link resolvers must be implemented at the library's site before a registration request is submitted. If your link resolver cannot provide two qualified resources (ILL requirement + other from list above) for each PMID tested, it cannot be implemented as an Outside Tool.

Activating Library Icons in PubMed

Library icons may be activated in PubMed: through a special URL to access PubMed, by using a shared My NCBI account, or by signing in to My NCBI.

Displaying Library Icons through a special URL to access PubMed

To display a library's Outside Tool icon through a simple link to PubMed, use the following URL:

<https://pubmed.ncbi.nlm.nih.gov?otool=OutsideTool username>

Replace *OutsideTool* with the Outside Tool username assigned by NCBI.

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

<https://pubmed.ncbi.nlm.nih.gov?otool=OutsideTool1,OutsideTool2,OutsideTool3,OutsideTool4,OutsideTool5>

Replace each *OutsideTool* entry in the URL above with the Outside Tool **username** for each library.

Displaying Library Icons using a shared My NCBI account

My NCBI accounts can be configured so that database filter selections, Outside Tool selections, and highlighting selections can be shared by multiple users. 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 in My NCBI

Outside tool icons can be selected in My NCBI and displayed while the user is signed in to their My NCBI account. [See PubMed Preferences – Outside Tool](#).

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 via Outside Tool in PubMed, there are a variety of ways to customize the PubMed display, allowing users to link directly from PubMed to library services and other resources. This section provides information on:

About Cookies and Special URLs

Sharing My NCBI Account Settings

Clearing Settings Using a Special URL

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 preferences that will not time out on a workstation by signing the workstation in to My NCBI and selecting **Keep me signed in**.

Sharing My NCBI Account Settings

My NCBI accounts can be configured so that Filter selections, Outside Tool, and highlighting selections can be shared by multiple users.

To share account settings:

1. [Register](#) for a My NCBI account that will be used to share settings with patrons.
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, click **PubMed Filters and Icons**. On the resulting page search select a popular filter or create a custom filter.
 - b. To select an Outside Tool, click **Outside Tool**. On the next page, select the checkbox next to the desired libraries. You may select up to five libraries.
 - c. 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 next to the services you would like to share. Only the settings for a service where the **Share Selection** box is checked will be shared.

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

PubMed:

`https://pubmed.ncbi.nlm.nih.gov?myncbishare=MyNCBIusername`

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

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 Outside Tool icon:

https://pubmed.ncbi.nlm.nih.gov?otool=__reset

To clear the myncbishare setting:

https://pubmed.ncbi.nlm.nih.gov?myncbishare=__reset

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

Information for Full-Text Providers

Created: July 18, 2005; Updated: November 19, 2024.

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.

How It Works

LinkOut provides links from PubMed and other NCBI database records to online resources external to the NCBI network. 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.

Prerequisites for Participation

1. Journals must be included in PubMed for links to be created in PubMed citations. LinkOut works with two journal citation data sources: Journals indexed for MEDLINE and journals selected for full text deposit in PMC. To be included in MEDLINE, a journal must go through the MEDLINE selection process, see the details at:
 - a. https://www.nlm.nih.gov/medline/medline_how_to_include.html
 - b. https://www.nlm.nih.gov/medline/medline_journal_selection.html
 - c. To be included in PMC, a journal must go through the PMC selection process, see details at: <https://pmc.ncbi.nlm.nih.gov/pub/journalselect/>
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.
3. When a publisher submits links data without sending electronic citation data, links will be shown only under the PubMed "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.
4. 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.

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

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

```
<?xml version="1.0"?>
<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"http://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<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 -->
  <Brief>
    An international publisher of biomedical journals and books
  </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, 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

The resource file describes the PubMed records to which your links to the article full text will be applied and contains the information that LinkOut needs to generate the URLs. 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 alphanumeric 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

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**.

```
<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[<!ENTITY icon.url "https://www.goodpublisher.com/icon/goodpublisher.jpg">
<!ENTITY base.url "https://www.goodmedical.org/cgi/content/" > ]>
<LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>8888</ProviderId>
    <IconUrl>&icon.url;</IconUrl>
    <ObjectSelector>
      <Database>PubMed</Database>
      <ObjectList>
        <Query> "J Cell Biol" [ta] AND 1997/06/15:2010[dp]</Query>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>&base.url;</Base>
      <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
      <Attribute>full-text online</Attribute>
    </ObjectUrl>
  </Link>
</LinkSet>
```

<ObjectList>: Selecting Records in a Resource File

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

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

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

Example: Select records with PMIDs 9679140 and 12589072

```
<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. 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.

```
<ObjectList>
<Query> "J Mol Dis" [ta] AND 1997/06/15:2010 [dp]</Query>
</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.

```
<ObjectList>
<Query> "J Mol Dis" [ta] AND Smith J [au] </Query>
</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.

```
<ObjectList>
<Query> "J Mol Dis" [ta] AND 1997/06/15:2010 [dp]</Query>
<Query>"J Feet"[ta] AND 2000:2010[dp]</Query>
</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.

```
<ObjectList>
<Query> “J Mol Dis” [ta] AND 1997/06/15:2010 [dp] NOT “last 6 months”[dp]</Query>
</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.

```
<ObjectList>
<Query> “J Mol Dis” [ta] AND 1997:2010 [dp] NOT “last 6 months”[dp] NOT future[sb]</Query>
</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”.

```
<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.

Creating a URL for a 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.

Example: Create the URL <https://www.goodmedical.com/articles.asp?AID=1988>

```
<Base>https://www.goodmedical.com/articles.asp?</Base>
<Rule>AID=1988</Rule>
```

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.

Example: Create URLs following the pattern: [https://www.goodmedical.org/cgi/full/id=\[PMID\]](https://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: `https://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: `https://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.

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>
<Attribute>full-text PDF</Attribute>
<Attribute>full-text PostScript</Attribute>
```

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

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 version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
```

```
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[<!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>
    <ObjectList>
      <ObjId>98765432</ObjId>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>AID=1988</Rule>
    <Attribute>subscription/membership/fee required</Attribute>
    <Attribute>full-text PDF</Attribute>
  </ObjectUrl>
</Link>
<Link>
  <LinkId>2</LinkId>
  <ProviderId>1234</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <ObjId>87654321</ObjId>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>AID=1989</Rule>
    <Attribute>subscription/membership/fee required</Attribute>
    <Attribute>full-text PDF</Attribute>
  </ObjectUrl>
</Link>
</LinkSet>
```

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: [https://www.goodmedical.org/cgi/full/\[ISSN\]/\[volume number\]/\[start page\]](https://www.goodmedical.org/cgi/full/[ISSN]/[volume number]/[start page])

```
<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<LinkSet>
<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodmedical.org/icon/goodmedical.jpg</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query>"J Feet" [ta] AND 1997/06/15:2010[dp]</Query>
      <Query>"Skin Graft Int" [ta]</Query>
```

```

    </ObjectList>
  </ObjectSelector>
<ObjectUrl>
  <Base>https://www.goodmedical.org/cgi/full/</Base>
  <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
  <Attribute>full-text online</Attribute>
</ObjectUrl>
</Link>
</LinkSet>

```

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**.

```

<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[ <!ENTITY icon.url "https://www.goodpublisher.com/icon/goodpublisher.jpg">
<!ENTITY base.url "https://www.goodmedical.org/cgi/content/" > ]>
<LinkSet>
<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <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>
      <Query>"J Mol Dis" [ta] AND Smith J [auth]</Query>
    </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>
      <Query>"J Mol Dis" [ta] AND 1997:2010 [dp]</Query>
      <Query>"J Biol Chem" [ta] AND 1996:2010[dp]</Query>
    </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.

Example
<p>Retrieved record: Journal [ISSN 1234-5678]. 2004 Sep; 27(1):3-10 PMID: 98765432 DOI:10.1096/ajs59-5497 PII:12345678/2713</p>
<p>Link using DOI: <Base>https://doi.org/</Base> <Rule>&lo.doi;<Rule> Resulting URL: https://doi.org/10.1096/ajs59-5497</p>
<p>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</p>

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 alphanumeric 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
- Resource File CSV Format
- Resource CSV File Examples

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, Pregnotato S, Mellersh CS.

Vet Ophthalmol. 2014 Mar;17(2):126-30. doi: 10.1111/vop.12122. Epub 2013 Nov 21.

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.

Field 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]

Field 4: URL. <https://www.bioscience.org/2001/v6/d/highland/fulltext.htm>

Field 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 4: URL. <https://www.bioscience.org/2001/v6/a/torshin/fulltext.htm> and <https://www.bioscience.org/2001/v6/d/highland/fulltext.htm>

Field 5: IconUrl. <https://www.bioscience.org/images/medlink.jpg>

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.

PrId	DB	UID	URL	IconUrl	UrlName	SubjectType	Attribute
1234	PubMed	11282572	https://www.bioscience.org/2001/v6/a/torshin/fulltext.htm	https://www.bioscience.org/images/medlink.jpg			Subscription/membership/fee required
1234	PubMed	11532607	https://www.bioscience.org/2001/v6/d/highland/fulltext.htm	https://www.bioscience.org/images/medlink.jpg	Review		Subscription/membership/fee required

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

Field 3: Query. "Korean J Pathol"[ta] AND 48[vol] AND 466[pg] and "Korean J Pathol"[ta] AND 48[vol] AND 462[pg]

Field 4: URL. <https://koreanjpathol.org/archive/view.php?year=2014&vol=48&no=6&startpage=466> and <https://koreanjpathol.org/archive/view.php?year=2014&vol=48&no=6&startpage=462>

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.

PrId	DB	Query	URL	IconUrl	UrlName	SubjectType	Attribute
1234	PubMed	"Korean J Pathol"[ta] AND 48[vol] AND 466[pg]	https://koreanjpathol.org/archive/view.php?year=2014&vol=48&no=6&startpage=466	https://www.koreanjpathol.org/image/kjpathol_linkout.gif		publishers/providers	Full-text Online
1234	PubMed	"Korean J Pathol"[ta] AND 48[vol] AND 462[pg]	https://koreanjpathol.org/archive/view.php?year=2014&vol=48&no=6&startpage=462	https://www.koreanjpathol.org/image/kjpathol_linkout.gif		publishers/providers	Full-text Online

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.

Validate the files using the LinkOut <https://www.ncbi.nlm.nih.gov/projects/linkout/doc/file-validator.html>.

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 private 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/file-validator.html> and transfer all files via FTP. Place the files in the “holdings” directory of your account. No subdirectories may be created in the holdings subdirectory.

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. 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 sent 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

Month	Number of Hits
-----	-----
8/2005	7097
7/2005	6144
6/2005	6150
5/2005	7015
4/2005	8867
3/2005	6547
2/2005	5250
1/2005	5209
12/2004	4460
11/2004	6144
10/2004	3608
9/2004	3605
8/2004	2791
7/2004	2249

By Journal (for the most recent two months):

Month: August 2005	Total number of hits: 4303
Journal Medline Abbreviation(ISSN)	Number of Hits
-----	-----
Journal 1 (1234-5678)	3293
Journal 2 (8765-4321)	1010
Month: July 2005	Total number of hits: 3714
Journal Medline Abbreviation(ISSN)	Number of Hits
-----	-----
Journal 1 (1234-5678)	2803
Journal 2 (8765-4321)	911

Additional Information about Linking

Section Contents

- Deleted PMIDs
- Adding/Changing DOI/PII in PubMed Records (for Linking Purposes Only)
- Transferring Journals Between Publishers

Deleted PMIDs

From time to time, records are deleted from the PubMed database. 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 deleted PMIDs is available here:

<https://ftp.ncbi.nlm.nih.gov/pubmed/deleted.pmids.gz>

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.

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, 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.)

Both old and new provider links should be working during the transition

Information for Other Resource Providers

Created: September 14, 2005; Updated: June 30, 2023.

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.

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 (see below File Preparation). The identity file contains the information about your organization needed to list your resource in LinkOut. The resource file describes the database records you will link from and contains the information that LinkOut needs to generate URLs.

Prerequisites for Participation

Resources submitted for inclusion in LinkOut will be evaluated individually to determine whether they meet our 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 and provide a couple URL examples of your database records and their corresponding NCBI database records.
- Describe any restrictions on access to the resource.

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.

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

```
<?xml version="1.0"?>
<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"http://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<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

The resource file describes the database records to which your links will be applied and contains the information that LinkOut needs to generate URLs. 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.

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.

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

```
<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[ <!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[dp]. 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>
<Query>Caenorhabditis elegans [orgn] AND 1996:1999 [pdat]</Query>
</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.

```
<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.

```
<Database>Genome</Database>
<ObjectList>
<Query>chimpanzee [orgn] AND 2000:2010[dp]</Query>
<Query>human [orgn] AND 2002:2010[dp] </Query>
</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.

```
<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.

Example: Use MeSH headings to select citations on acupuncture therapy methods in PubMed.

```
<Database>PubMed</Database>
<ObjectList>
<Query>"Acupuncture Therapy/methods"[majr:noexp] </Query>
</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.

Creating a URL for a Link

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

```
<Base>https://www.webdatabase.com/ cgi-bin/elegans?<Base>
<Rule>OID=1988</Rule>
```

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.

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

<Base>https://www.webdatabase.com/cgi-bin/</Base>
<Rule> an_lookup=&lo.pacc;</Rule>
```

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&id_lookup=&lo.id;&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.

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&id_lookup=&lo.id;&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.

```

<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[<!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\[SNP ID\]](https://gti.com/Gateway?source=SNP&res=Assays&ap1=rs[SNP ID])

```

<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[<!ENTITY base.url
"https://gti.com/Gateway?source=SNP&res=Assays&ap1=rs[SNP ID]">]>
<LinkSet>
  <Link>
    <LinkId>1</LinkId>
    <ProviderId>4321</ProviderId>
    <ObjectSelector>
      <Database>SNP</Database>
      <ObjectList>
        <ObjId>7928656</ObjId>
        <ObjId>2049045</ObjId>
        <ObjId>1811350</ObjId>
        <ObjId>1871598</ObjId>
      </ObjectList>
    </ObjectSelector>
  </Link>
</LinkSet>

```

```

        <ObjId>7947824</ObjId>
        <ObjId>681267</ObjId>
        <ObjId>1947741</ObjId>
    </ObjectList>
</ObjectSelector>
<ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>ap1=rs&lo.id;</Rule>
    <UrlName>Genotyping Assays</UrlName>
</ObjectUrl>
</Link>
</LinkSet>

```

Example 3: A record may be retrieved by more than one <Query>. When this happens, link assignment will be handled as described in the LinkOut Policy: 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. 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**.

```

<?xml version="1.0"?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd"
[<!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] AND 1997:1999 [pdat] AND smith j [auth]</Query>
      </ObjectList>
    </ObjectSelector>
    <ObjectUrl>
      <Base>&base.url;</Base>
      <Rule>auth_lookup=j-smith&view=pdf</Rule>
      <Attribute>Full-text PDF</Attribute>
      <Attribute>preference</Attribute>
    </ObjectUrl>
  </Link>

  <Link>
    <LinkId>2</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;&amp;view=full</Rule>
</ObjectUrl>
</Link>
</LinkSet>

```

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 in to 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 alphanumeric 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: <https://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 to content.

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

Query. A query that retrieves the Nucleotide records selected: Caenorhabditis elegans [orgn] AND 2011:2015[pdat] AND smith j [auth]

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

Field 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.msp?product=HCLONES&term=1B%20%28VP%29>

Field 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.

PrId	DB	Query	URL	IconUrl	UrlName	SubjectType	Attribute
1234	Nucleotide	BX284601.5[pacc]	http:// www.origene.com/cdna/ search-all.msp?product=HCLONES&term=1B(VP2)		Caenorhabditis elegans chromosome I		Subscription/ membership/ fee required

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 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>

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.

PrId	DB	Query	URL	IconUrl	UrlName	SubjectType	Attribute
1234	Gene	APOE[sym] AND chromosome 7	https://biogps.org/#goto=genereport&id=11816			gene/protein/ disease-specific	Registration required

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 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

Field 4: URL. <https://www.marinespecies.org/aphia.php?p=taxdetails&id=611463>

Field 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.

PrId	DB	UID	URL	IconUrl	UrlName	SubjectType	Attribute
1234	Taxonomy	314297	https://www.marinespecies.org/aphia.php?p=taxdetails&id=611463		Compsopogon hookeri Montagne		

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 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.

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

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.

Example: The following will both create a link to the URL <http://www.webdatabase.com/cgi-bin/elegans?OID=1988>

```
-----
rule: https://www.webdatabase.com/ cgi-bin/elegans?OID=1988
-----
base: https://www.webdatabase.com/cgi-bin/elegans?
rule: OID=1988
-----
```

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.

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.

Example: Create URLs following the pattern: [http://www.webdatabase.com/cgi-bin/an_lookup=\[PACC\]](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](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&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
attr: full-text PDF
-----
```

```

linkid: 70389516
uids: 15736310
base: &base.url;
rule: 01jan20051800/edocket.access.gpo.gov/2005/pdf/05-3829.pdf
attr: full-text PDF
-----

```

```

linkid: 70379232
uids: 15732197
base: &base.url;
rule: 01jan20051800/edocket.access.gpo.gov/2005/pdf/05-3728.pdf
attr: full-text 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 do not suffice.

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.

```

-----NCBI taxonomy bookmark links -----
prid: 3206
dbase: Taxonomy
-----Apis mellifera)-----
linkid: 1
query: Apis mellifera [name]
rule: http://beelab.cas.psu.edu/intro.html
name: Honey Bee Lab (Penn State)
-----
linkid: 2
query: Apis mellifera [name]

```

```

rule:  http://www.barc.usda.gov/psi/brl/
name:  Bee Research Lab (USDA Beltsville)
-----
linkid: 3
query:  Apis mellifera [name]
rule:  http://www.hgsc.bcm.tmc.edu/projects/honeybee/
name:  Baylor Honey Bee Genome
-----
linkid: 4
query:  Apis mellifera [name]
rule:  http://titan.biotec.uiuc.edu/bee/honeybee_project.htm
name:  Honey Bee Brain EST Project
-----
linkid: 5
query:  Apis mellifera [name]
rule:  http://ourworld.compuserve.com/homepages/Beekeeping/weblinks.htm
name:  Bee Web Links
-----

```

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\[SNP ID\]](https://genotypinc.com/servlet/web.Gateway?source=NCBI.SNP&res=genotypAssay&ap1=rs[SNP ID])

```

-----Geotypes SNP links global info ---
prid:  4321
dbase: SNP

-----Begin Links ---
linkid: 1
uids:  7928656 2049045 1811350 1871598 7947824 681267 1947741
base:  https://genotypinc.com/servlet/web.Gateway?
      source=NCBI.SNP&res=genotypAssay&
rule:  ap1=rs&lo.id;
name:  Genotyping Assays
-----

```

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.

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
query: Caenorhabditis elegans [orgn] AND
      1997:1999 [pdat] AND smith j [auth]
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/
-----
linkid: 1
query: U65398[pacc]
base:      &base;
rule:     7.html
name:     REBASE enzyme AatII

-----
linkid: 2
query: X62690[pacc]
base:      &base;
rule:     8.html
name:     REBASE enzyme AbrI

-----
linkid: 3
query: D10671 [pacc]
base:      &base;
rule:     18.html
name:     REBASE enzyme AccI

-----
```

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 private 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 subdirectory.

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. 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 providers’ 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.

```
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

Month                Number of Hits
-----                -
8/2005                126
7/2005                195
6/2005                142
5/2005                155
4/2005                11
```


Related Services: Outside Tool

Created: July 18, 2005; Updated: June 21, 2023.

The Library Outside Tool service places a link to a link resolver 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 a library to place a link on every PubMed record. This link points back to a link resolver offered by the institution for their users. Only one Outside Tool can be set up for each link resolver software unique base URL.

To best serve users, 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, an institution must demonstrate that their link resolver software 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 (ILL form with prepopulated citation metadata is a requirement)**

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 implemented locally 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 link resolver base URL. 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 software would then use [E-Utilities](#) to obtain citation information.

You can test your link resolver by constructing URLs as described above.

Register Your Outside Tool Service

Library LinkOut accounts are only issued to libraries. The Outside Tool service is not available for trial purposes.

Library link resolver software should be in place before a registration request is submitted. For your Outside Tool registration, you must provide:

1. The base URL of your link resolver software in the following format <https://yourbaseURL?sid=Entrez:PubMed&id=pmid>: Note that the base URL should be unique to your institution. For example:
<https://goodlibrary.linkresolver.com/openurl?sid=Entrez:PubMed&id=pmid>:
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:

Full-text <https://goodlibrary.linkresolver.com/openurl?sid=Entrez:PubMed&id=pmid:20639561>

Pre-filled ILL form <https://goodlibrary.linkresolver.com/openurl?sid=Entrez:PubMed&id=pmid:12345678>

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 e-mail 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 [Library LinkOut Help Desk](#) 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. Must include test URL to ILL service with citation prepopulated form**
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 Library LinkOut username

Manage Your Outside Tool

After initial implementation of Outside Tool, libraries can manage their Outside Tool accounts through the Outside Tool Account Settings. See the **Outside Tool Account Settings** chapter of this manual. Please note that any changes to the Outside Tool settings or icon takes 48 hours to be implemented.

In the **Outside Tool Account Settings** 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

In addition, Outside Tool users can access statistics recorded by clicking “View Usage Statistics.” Statistics are kept for the last 12 months.

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=username* to the PubMed URL and enter PubMed through the resulting URL:

<https://pubmed.ncbi.nlm.nih.gov?otool=username>

Replace *username* with the Outside Tool Username assigned by NCBI.

Appending **otool=username** 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.

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 and send a general announcement so that other departments in your institution 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.

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 services available

Outside Tool Account Settings

Created: February 27, 2008; Updated: June 20, 2024.

The Outside Tool Account Settings is a Web module that is password-protected, and it is used to manage Outside Tool accounts. In the Outside Tool Account Settings, users can manage:

- Contact Information
- Basic Settings
- Outside Tool Icon Settings
- Usage Statistics

To **login** into the Outside Tool Account Settings module:

1. Go to the [login portal](#)
2. Log in with your library's Username and Password. Both Username 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 e-mail address(es) registered with LinkOut.

LinkOut[®]

Outside Tool Account Settings Login

The Outside Tool Account Settings pages are password protected and only available to libraries that partipate in Outside Tool. Registration information for Outside Tool can be found at [LinkOut Help: Outside Tool](#).

Note: User name and password are case sensitive.

User Name:

Password:

Sign In

[Forgot your password?](#) 

If you do not remember your library's Outside Tool username, go to the [Outside Tool provider list](#).

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.

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 e-mail and to allow the LinkOut team to contact you in the event of a problem with your account.

1. Click **Add/Edit Contacts** to see your current contact information. 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.

LinkOut[®]

Outside Tool Account Contact Information

[Account Settings](#) | [Contact Information](#) | [View Usage Statistics](#)

*Input fields with a * are required*

Contact Name * Contact Email *

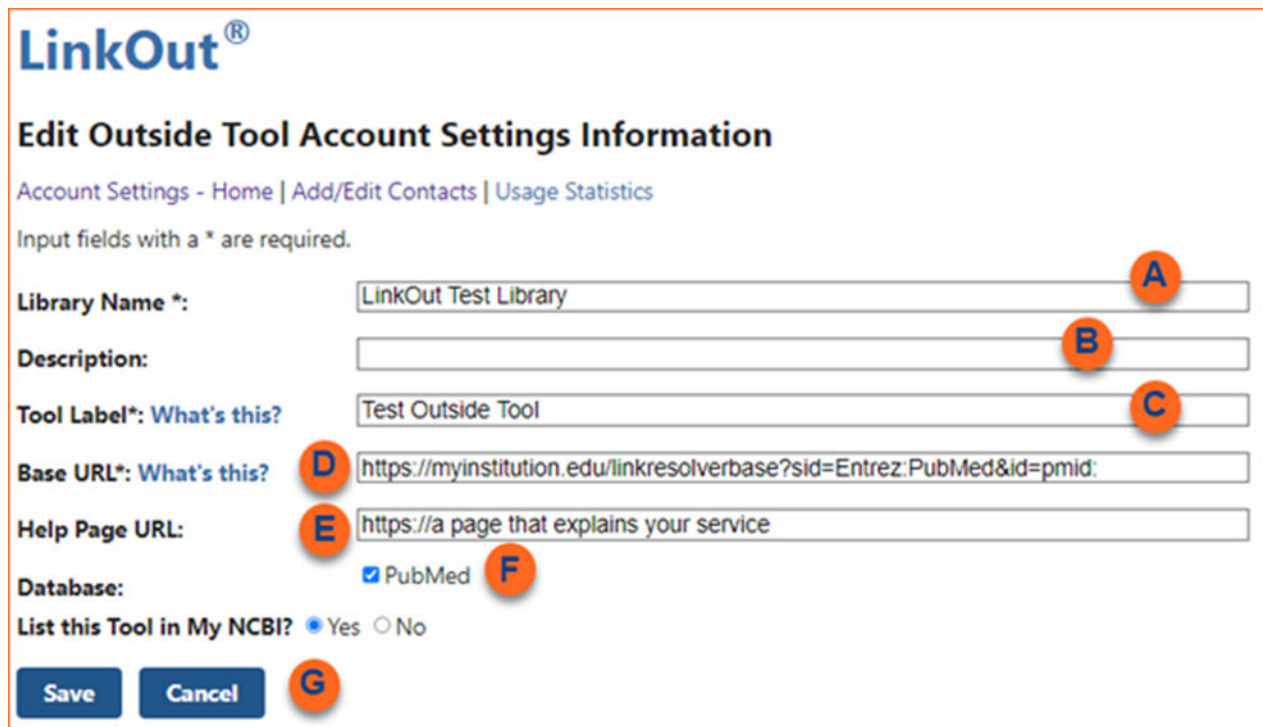
Outside Tool contact name contactemail@yourlibrary.edu **Delete**

Add Contact **Save** **Cancel**

Basic 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 MyNCBI. The label must begin with your institution's name. NCBI reserves the right to adjust this label.
 - D. **Base URL:** Enter your institution's link resolver base URL, right before where the PubMed ID (PMID) number is supposed to go. For example:

https://myinstitution.edu/linkresolverbase?sid=Entrez:PubMed&id=pmid:
 - E. **Help Page URL:** The URL of a HTML help page that explains your service, to be used in My NCBI
 - F. **Databases:** Indicate whether you would like your Outside Tool to be listed in MyNCBI
2. Click **Save (G)**. Updates take effect in PubMed in 48 hours.



LinkOut[®]

Edit Outside Tool Account Settings Information

Account Settings - Home | Add/Edit Contacts | Usage Statistics

Input fields with a * are required.

Library Name *: **A**

Description: **B**

Tool Label*: What's this?: **C**

Base URL*: What's this?: **D**

Help Page URL: **E**

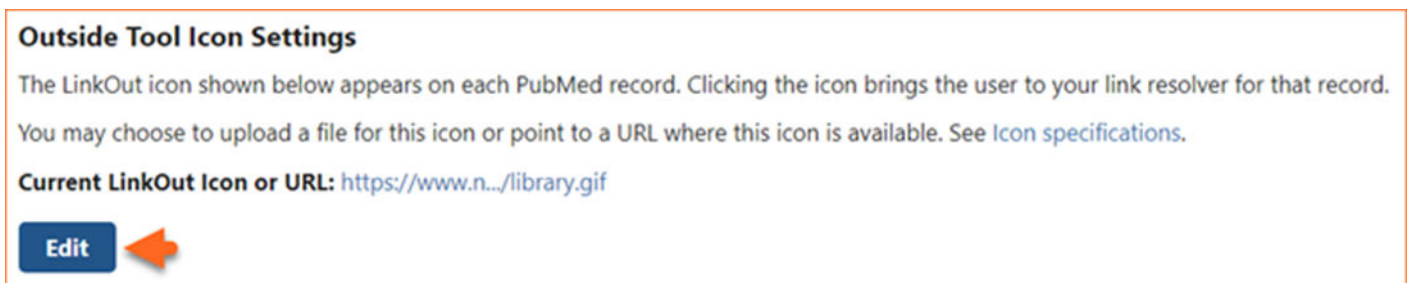
Database: PubMed **F**

List this Tool in My NCBI? Yes No

Save **Cancel** **G**

Outside Tool Icon Settings


- At the bottom of the Outside Tool main page click **Edit** to upload an icon file or enter a URL that leads to your library's icon file.



Outside Tool Icon Settings

The LinkOut icon shown below appears on each PubMed record. Clicking the icon brings the user to your link resolver for that record. You may choose to upload a file for this icon or point to a URL where this icon is available. See [Icon specifications](#).

Current LinkOut Icon or URL: <https://www.n.../library.gif>

Edit 

- To use the default Outside Tool icon, choose the option **Use the default icon** (See **A** below). This is the default Outside Tool icon: [Online Full-text](#)
- To provide an image located on a publicly accessible Web server, enter the URL under **Use an icon available on the Internet** (See **B** below). The URL must point directly to the icon file, not to an HTML page.
- To upload an image file from your computer, choose the option **Upload an icon** and then click on the **Choose File** 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 those image file formats can be used for your library icon.
- Click **Save** (**D** in the image below).

Add or Edit LinkOut Icon

[Account Settings - Home](#) | [Add/Edit Contacts](#) | [Usage Statistics](#)

Use the options below to specify a LinkOut icon that will be displayed for users to click on to go to your link resolver.

[Learn more about LinkOut icon design requirements](#)

Use the default icon **A**

Use an icon available on the Internet

URL: **B**

Upload an icon **C**

File: No file chosen

Save

Cancel

D

Note: New icon will display on the next business day soon after 2 p.m. Eastern Time.

Usage Statistics

To see the usage statistics recorded for your library, click **Usage Statistics**. Usage statistics are stored only for the last twelve months. Usage statistics can be displayed for daily, weekly, monthly or yearly numbers, and CSV file (to MS Excel for example) and text file formats are available for data downloads.

Outside Tool Account Settings

Outside Tool displays an icon linked to the article via your link resolver on all PubMed records.

[Account Settings - Home](#) | [Add/Edit Contacts](#) | [Usage Statistics](#) 

The following statistics are available:

Total: The aggregation of the number of times users click on Outside Tool links and icons.

Outside Tool: Number of times users click on your library's Outside Tool 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.

Note: Statistics may change during the first 2 weeks that they are available for your library. After 2 weeks, statistics will be stable.

Technical Information

Created: July 18, 2005; Updated: March 3, 2021.

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, and other web resources, can display links to their sites on records from the NCBI databases.

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.

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). Additional information and file examples for publishers and other full-text providers are available in [Information for Full-Text Providers](#).

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.

LinkOut DTD

The LinkOut Document Type Definition (DTD) specifies the XML elements used in LinkOut files. The LinkOut DTD is available at [LinkOut.DTD](#).

The URL for the DTD must be included in the prolog of a LinkOut file.

In the identity file, use:

```
<!DOCTYPE Provider "-//NLM//DTD LinkOut 1.0//EN" "https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
```

In a resource file, use:

```
<!DOCTYPE LinkSet "-//NLM//DTD LinkOut 1.0//EN" "https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
```

<!-- 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.doi - 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.nlmid - 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)

-->

<!ENTITY lo.id	"lo.id">
<!ENTITY lo.pii	"lo.pii">
<!ENTITY lo.doi	"lo.doi">
<!ENTITY lo.issn	"lo.issn">
<!ENTITY lo.essn	"lo.essn">
<!ENTITY lo.issnl	"lo.issnl">
<!ENTITY lo.jtit	"lo.jtitle">
<!ENTITY lo.vol	"lo.vol">
<!ENTITY lo.iss	"lo.iss">
<!ENTITY lo.page	"lo.page">
<!ENTITY lo.year	"lo.year">
<!ENTITY lo.yr	"lo.yr">
<!ENTITY lo.yl	"lo.yl">
<!ENTITY lo.eyear	"lo.eyear">
<!ENTITY lo.eyr	"lo.eyr">
<!ENTITY lo eyl	"lo.eyl">
<!ENTITY lo.month	"lo.month">
<!ENTITY lo.mon	"lo.mon">
<!ENTITY lo.mo	"lo.mo">
<!ENTITY lo.emonth	"lo.emonth">
<!ENTITY lo.emon	"lo.emon">
<!ENTITY lo.emo	"lo.emo">
<!ENTITY lo.day	"lo.day">
<!ENTITY lo.eday	"lo.eday">
<!ENTITY lo.auth	"lo.auth">
<!ENTITY lo.authln	"lo.authln">
<!ENTITY lo.nlmid	"lo.nlmid">
<!ENTITY lo.bookacc	"lo.bookacc">
<!ENTITY lo.bookname	"lo.bookname">
<!ENTITY lo.elocationid	"lo.elocationid">
<!ENTITY lo.pacc	"lo.pacc">
<!ENTITY lo.scientificname	"lo.scientificname">
<!ENTITY lo.genus	"lo.genus">
<!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

-->

<!ELEMENT Attribute (#PCDATA)>

<!-- can be one of the following; see LinkOut SubjectTypes and Attributes at
https://www.ncbi.nlm.nih.gov/books/NBK3807/#files.Special_Elements_Attribute

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*,ExclObjId*,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;)*>
<!-- used to mark up strings that require padding to create
      fixed-length string attributes. -->

<!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">
<!-- with a character to pad with (required)width result string size (required)
(integer)align the text should align to (left|right) (default:right)
      Examples:
      <apad with = "0" width = "6">E32</apad>  => "E00032"
      <apad with = "0" width = "6">640</apad> => "000640"
-->

<!ELEMENT subs                               (%rule.data;)*>
<!-- substitute one string for another in the element's content -->
<!ATTLIST subs
      for                CDATA                #REQUIRED
      with               CDATA                #REQUIRED>
<!-- for the string to replace with the string to substitute -->

<!ELEMENT toupper                             (%rule.data;)*>
<!-- convert element content into upper case -->
<!ELEMENT tolower                             (%rule.data;)*>
<!-- convert element content into lower case -->
<!ELEMENT strip                               (%rule.data;)*>
<!-- strip off spaces/letters/digits in the element's content -->

<!ATTLIST strip
      what   (spaces|letters|nondigits|digits)  #REQUIRED>

<!ELEMENT normalize                           (%rule.data;)*>
<!-- are used for normalization of &lo.vol, &lo.iss; elements. Examples:
      "Pt 5"                                ==> "5"
      "3 Suppl"                              ==> "3"
      "2A Pt 3"                              ==> "2A"
      "10 Suppl 2 Pt 1"                      ==> "10"
      "2/3"                                  ==> "2"
-->

<!ELEMENT Rule                               (%rule.data;)*>
<!ELEMENT UrlName                             (#PCDATA)>
<!ELEMENT RuleToMany                          (Rule, Separator)>
<!ELEMENT Separator                          (#PCDATA)>

```

```
<!-- End of ObjectUrl group -->
<!-- End of Link group -->
<!-- End of LinkSet group -->
```

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.

| Database Name | Db Abbreviation |
|---|-------------------|
| https://www.ncbi.nlm.nih.gov/bioproject | BioProject |
| https://www.ncbi.nlm.nih.gov/biosample/ | BioSample |
| https://www.ncbi.nlm.nih.gov/cdd | Conserved Domains |
| https://www.ncbi.nlm.nih.gov/gene | Gene |
| https://www.ncbi.nlm.nih.gov/nucleotide | Nucleotide |
| https://www.ncbi.nlm.nih.gov/est | NucEST |
| https://www.ncbi.nlm.nih.gov/gss | NucGSS |
| https://www.ncbi.nlm.nih.gov/pubmed | PubMed |
| https://www.ncbi.nlm.nih.gov/pccompound | PubChem Compound |
| https://www.ncbi.nlm.nih.gov/protein | Protein |
| https://www.ncbi.nlm.nih.gov/taxonomy | Taxonomy |

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. Note that LinkOut is able to link only to 5% of the total database records (depending on database size).

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. 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



Other provider icons



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 and other resource providers.

```
<?xml version="1.0"?>
<!DOCTYPE Provider PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"http://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<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" "http://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. For other providers, this is the name of the organization.

NameAbbr (*required*): A short one-word name for the resource provider. 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.

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 fieldname="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 displays 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 and other resource providers.

Using ObjectSelector (standard format)

```
<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"http://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<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 FileName (requires a supplementary uid file)

```
<?xml version="1.0" ?>
<!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN"
"http://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.dtd">
<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)

Document Type Declaration (*required*): <!DOCTYPE LinkSet PUBLIC "-//NLM//DTD LinkOut 1.0//EN" "https://www.ncbi.nlm.nih.gov/projects/linkout/doc/LinkOut.

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 **Object Selector**, 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 must be valid for the query to be used for linking.

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>.

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 alphanumeric 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.

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). 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, Pregmolato S, Mellersh CS.

Vet Ophthalmol. 2014 Mar;17(2):126-30. doi: 10.1111/vop.12122. Epub 2013 Nov 21.

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.

Field 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

VERSION AL032671.1

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. 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:

```

-----
query: <species1> [name]
query: <species2> [name]
rule:  <http://...my_species1or2_page.html>
-----

```

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.

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.

losubjtSubjectTypeName [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 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 PubMed as follows:

- Resources from "individual online article", "publishers/providers" are grouped under the heading "Full Text Sources".
- The SubjectTypes: "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.

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.

images: Links to online images from the NCBI database records that they are relevant to or referenced by.

institutional repository: Links to materials, such as datasets or full text documents, deposited to an online archive of an institution.

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 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 diseases or conditions, or that offer information, support, and/or other resources to people suffering from 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 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 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 an organism or group of organisms.

population/variation: Databases providing data on sequence variation within 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 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. Based on the 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 in the search box.

loattrAttribute*AttributeName* [sb]

Replace *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.

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.

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.

- [Molecular Biology Databases](#)
 - [FREE](#) [The Comparative Toxicogenomics Database](#)
 - [FREE](#) [ORDER](#) [GenScript](#)
 - [FREE](#) [Kyoto Encyclopedia of Genes and Genomes](#)
 - [dre:100302659](#)
- [Research Materials](#)
 - [ORDER](#) [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 several 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:

Entity	Corresponding value from NCBI database record
&lo.id;	Unique identifier (PMID, TaxID, etc.)

For PubMed only:

Entity	Corresponding value from NCBI database record
&lo.auth;	First Author. Example: Smith JE.
&lo.authln;	First Author Last Name. Example: Smith.
&lo.day;	Two-digit day of the publication date. Example: 01; 31.
&lo.doi;	Article DOI. Must be submitted by Publisher.
&lo.eday;	Two-digit day of electronic publication date. Example: 01; 31.
&lo.emo;	Two-digit month of electronic publication date. Example: 01; 12.
&lo.emon;	Three-letter month abbreviation of electronic publication date. Example: Sep.
&lo.emonth;	Month of electronic publication date. Example: September.
&lo.eyear;	Four-digit year of electronic publication date. Example: 1998.
&lo.eyl;	Last digit of year of the electronic publication date. Example: 1999 =9.
&lo.eyr;	Last two digits of year of electronic publication date. Example: 98; 00.
&lo.essn;	Journal electronic ISSN code.
&lo.iss;	Journal issue.
&lo.issn;	Journal print ISSN code.
&lo.issnl;	Journal print ISSN code with the dash stripped.
&lo.jtit;	Journal title (NLM's Title Abbreviation).
&lo.mo;	Two-digit month abbreviation of the publication date. Example: 01.

Table continued from previous page.

Entity	Corresponding value from NCBI database record
&lo.mon;	Three-letter month abbreviation of the publication date. Example: Sep.
&lo.month;	Month of the publication date. Example: September.
&lo.otit;	Article title.
&lo.page;	First page.
&lo.pii;	Publisher Item Identifier. Must be submitted by journal publishers.
&lo.vol;	Journal volume.
&lo.year;	Four-digit year of the publication date. Example: 1998.
&lo.yl;	Last digit of year of the publication date. Example: 1999 =9.
&lo.yr;	Last two digits of year of the publication date. Example: 98.

For Sequence databases (Nucleotide, Protein, Structure, Genome):

Entity	Corresponding value from NCBI database record
&lo.pacc;	Primary accession for sequences.

For Taxonomy only:

Entity	Corresponding value from NCBI database record
&lo.scientificname;	Scientific name. Example: "Homo sapiens neanderthalensis"

For UniGene only:

Entity	Corresponding value from NCBI database record
&lo.clusterid;	Cluster Id.

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.

Character	XML Encoding
&	&
<	<
>	>
©	©
®	®
™	™

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. 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.
- “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:

1. At a command prompt type: ftp-private.ncbi.nlm.nih.gov and press enter.
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.

Policies

Created: July 18, 2005; Updated: October 7, 2022.

This section contains LinkOut policies on the evaluation, management, assignment, and display of links included in or considered for inclusion in LinkOut.

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.

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** to ensure that they select the correct NCBI database records to link to their resources before sending LinkOut files to NCBI.
- **Correcting broken, blind, or incorrect links.** 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. Provider 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 their resource.

If a resource is no longer available or changes are made to properties of the resource file, these changes

must be updated promptly. This is particularly important if access restrictions to a LinkOut resource changes, or if a resource will no longer be available after a date, because LinkOut should not contain mislabeled or nonfunctional links.

- 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.
- 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 enough 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.

Access to Content via LinkOut Links and Outside Tool

When a user accesses a LinkOut resource or a service implemented through Outside Tool, 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. 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 can be tested by constructing URLs to the resource.

For Library Outside Tool, one library account will be assigned to each unique Base URL. The Library Outside Tool service is not available for trial purposes.

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. Should a publisher decide to submit full-text links without submitting PubMed citations electronically, the publisher's links will appear in PubMed under "LinkOut- more resources" only. The default icon is assigned to the provider who submitted citation or full text data at the time of publication. 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.

```
<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND Smith J [auth]</Query>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.issn;/&lo.vol;/&lo.page;</Rule>
    <Attribute>full-text PDF</Attribute>
  </ObjectUrl>
</Link>
```

```
<Link>
  <LinkId>2</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND 1997:2010 [pdat]</Query>
    </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 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>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND Smith J [auth]</Query>
    </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>
```

```

    </ObjectUrl>
</Link>

<Link>
  <LinkId>2</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND 1997:2010 [pdat]</Query>
    </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>

```

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 above in Duplicate Links.
2. If multiple, unique URLs are submitted for a record, all links will be displayed in the LinkOut section of a database record. Note that each unique URL should point to a 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>
      <Query> "J Mol Dis" [ta] AND Smith J [auth]</Query>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.auth;/&lo.issn;/&lo.page;</Rule>
    <Attribute>full-text PDF</Attribute>
    <Attribute>subscription/membership/fee required</Attribute>
  </ObjectUrl>
</Link>

<Link>

```

```

<LinkId>2</LinkId>
<ProviderId>8888</ProviderId>
<IconUrl>&icon.url;</IconUrl>
<ObjectSelector>
  <Database>PubMed</Database>
  <ObjectList>
    <Query> "J Mol Dis" [ta] AND 1997:2010 [pdat]</Query>
  </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.

```

<Link>
  <LinkId>1</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>https://www.goodpublisher.com/pubmed/smith.gif</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND Smith J [auth]</Query>
    </ObjectList>
  </ObjectSelector>
  <ObjectUrl>
    <Base>&base.url;</Base>
    <Rule>&lo.auth;/&lo.issn;/&lo.page;</Rule>
    <Attribute>full-text PDF</Attribute>
    <Attribute>subscription/membership/fee required</Attribute>
    <Attribute>preference</Attribute>
  </ObjectUrl>
</Link>

```

```

<Link>
  <LinkId>2</LinkId>
  <ProviderId>8888</ProviderId>
  <IconUrl>&icon.url;</IconUrl>
  <ObjectSelector>
    <Database>PubMed</Database>
    <ObjectList>
      <Query> "J Mol Dis" [ta] AND 1997:2010 [pdat]</Query>
    </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>

```

Contact LinkOut

Please send questions and comments to linkout@ncbi.nlm.nih.gov.