



e-Framework Service Expression OpenURL + HTTP + Inline KEV Multiple Location Resolver

1 Rationale

This service expression is an adaptation of the OpenURL protocol for use in the FRED project, which provides infrastructure for repository federation within the e-Learning space in Australia. One of the goals of FRED is to provide a toolkit on which FRED stakeholders can base an appropriate copy service, to deploy in their own learning content federations. One of the behaviours required by FRED for such a service is making available as a service a listing of all available instances of a given object in a repository federation. This listing of available objects may be consumed by either a selection service or by a human end user, in order to select the most appropriate instance for the user to be obtained.

This service expression describes the context entity model specific to FRED, and the interface specification for OpenURL which a FRED Appropriate Copy service needs to use in order to support that model. FRED stakeholders are expected to customise any FRED Appropriate Copy toolkits (including this service expression), in order to address their specific needs when deploying an appropriate copy service in their own federations. This service expression does not concentrate on the requirements of any one stakeholder, but rather addresses the requirements common to FRED stakeholders.

2 Service Expression Definition

2.1 *Classification*^{1,2,3}

To be provided by the submitter:				
Domain(s)	<input checked="" type="checkbox"/> Learning &	<input type="checkbox"/> Research	<input type="checkbox"/> Administration	<input type="checkbox"/> Common

¹ Classification categories shown in **Bold** are required.

² Optional classification category "Deployment Scale" can be deleted from the table if not used.

³ See definitions of the Service Expression Classification Scheme categories and their allowable choices at :
<http://www.e-framework.org/Services/ServiceClassificationScheme/ClassificationSchemeForServiceExpression/tabid/816/Default.aspx>

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This work is created as part of the Federated Repositories for Education (FRED) Project within the Australian ADL Partnership Laboratory. The FRED project is sponsored by the Australian Commonwealth Department of Education, Science and Training under the Framework for Open Learning Programme. The Australian ADL Partnership Laboratory is supported by the University of Southern Queensland.

The template structure and format of this document are based on e-Framework documentation templates and guidelines, which are governed by the e-Framework Intellectual Property Rights Statement <http://www.e-framework.org/Default.aspx?tabid=738>

	Teaching	<input type="checkbox"/> Libraries	<input type="checkbox"/> IT Services
Development Status	<input type="checkbox"/> Proposed	<input checked="" type="checkbox"/> Developmental	<input type="checkbox"/> Prototype <input type="checkbox"/> Production
Maturity	<input checked="" type="checkbox"/> Immature	<input type="checkbox"/> Mature	
State Behaviour	<input type="checkbox"/> Stateful	<input checked="" type="checkbox"/> Stateless	
Transactional Behaviour	<input checked="" type="checkbox"/> Transactional and ACID	<input type="checkbox"/> Transactional but Non ACID	<input type="checkbox"/> Non-Transactional
Batch Behaviour(s)	<input checked="" type="checkbox"/> Individual	<input type="checkbox"/> Batch	
Time-Constraint Behaviour	<input checked="" type="checkbox"/> Hard Real Time	<input type="checkbox"/> Soft Real Time	<input type="checkbox"/> None
Service End Point	<input checked="" type="checkbox"/> Provider	<input type="checkbox"/> Requestor	<input type="checkbox"/> Transcoder (both requests and provides)
Authentication/ Authorization Dependency	<input type="checkbox"/> Auth-Dependent	<input checked="" type="checkbox"/> Auth-Independent	
Protocol Binding(s)	<input type="checkbox"/> Web Service <input type="checkbox"/> SOAP	<input checked="" type="checkbox"/> REST <input type="checkbox"/> HTTP	<input type="checkbox"/> Other
Service Genre Coverage	<input checked="" type="checkbox"/> Full	<input type="checkbox"/> Extended	<input type="checkbox"/> Subset <input type="checkbox"/> Overlapping
Deployment Scale	<input type="checkbox"/> Isolated	<input checked="" type="checkbox"/> Ubiquitous	
To be determined by the e-Framework:			
Status	<input type="checkbox"/> Approved	<input type="checkbox"/> Placeholder <input type="checkbox"/> Unapproved	<input type="checkbox"/> Superseded <input type="checkbox"/> Withdrawn
Confidence Level	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low

2.2 Service Genre

Multiple Resolve [To Be Written]

2.3 Version

- e-Framework Service Expression Version: v1.0

2.4 Version History

Version	Date	Author	Description	Organization / Project
V0.1	2007-06-04	Nick Nicholas	Initial Draft	FRED Project

2.5 Description

This service expression is a specialisation of the service genre *Multi-Resolve*, in which a set of parameters identifying an object are mapped to a listing of all the instances of the object known to the service genre, regardless of access restrictions or requester-appropriateness. Each instance in the listing is identified through a retrieval key (in this expression a URL); the service expression is intended expressly for orchestration with an Obtain service expression which takes one of those retrieval keys as its input parameter.

This service expression is an adaptation of the OpenURL protocol, used with an HTTP transport. The OpenURL protocol requires that only one instance of the

nominated object shall be returned by an implementation of an OpenURL service. This service expression uses the same input interface as OpenURL, so that it can be combined with an OpenURL service expression in the same system straightforwardly, through a common interface. However its output behaviour is inconsistent with OpenURL: the service expression allows access to multiple referents through their retrieval keys, instead of only one. Therefore this service expression is not a realisation of OpenURL, but an extension of it.

Communications under this service expression are through HTTP. There is no provision in this service expression for access control or authentication control of the resolution. This does not imply that there is no access or authentication control for the object instances that the service expression provides resolution to.

This service expression profiles the OpenURL input interface to the requirements of the FRED project. As a result, only certain OpenURL parameters are to be used.

2.6 Functionality

There is one request type in this service expression:

- Resolve to URLs. The request takes parameters specifying the context of a request to obtain: these parameters describe context entities. In this service expression, the context entities that the parameters identify are the *referent* (object to be obtained) and the *referrer* (the federation whose delivery system generates the request hyperlinks).
 - The parameter specifying the referent is mandatory. The referent is specified through an identifier. The identifier must be unique, but needs not be global. The identifier is actioned through this service expression, and needs not be resolvable independently of that service.
 - The parameter specifying the referrer is mandatory. The referrer is specified through an identifier. The identifier must be unique. The referrer parameter does not affect the functionality of the service expression within the FRED federation. Since this service expression has behaviour inconsistent with OpenURL, the referrer identifier is needed to alert other implementations of OpenURL that they will not be interoperable with this service expression.
- The response to this request is a listing of all retrieval keys of instances of the specified referent that are known to the service expression. What instances are known to the service expression (i.e. what mappings of referent identifiers to object instance URLs are available) is a policy decision for the service instance manager, and is not constrained by this service expression. Alternatives include:
 - All instances of the referent in a *single data source* (which permits duplicate objects).
 - All instances of the referent in provider data sources participating *in a federation*.
 - All *publicly obtainable* instances of the referent in provider data sources participating in a federation.
 - All instances of the referent in provider data sources participating in a given *range of federations*.
 - All *openly accessible* instances of the referent available, regardless of data source or federation, as registered by third parties (cf. OpenDOAR).

Communications to the service implementation are through HTTP. Service requests are made as an inline HTTP GET request. No other functionality is provided. The functionality defined SHALL NOT be extended.

2.7 Usage Scenarios [optional]

Usage Scenarios for an Appropriate Copy service are available separately: [<http://fred.usq.edu.au/appropriatecopyscenarios.html>] . This service expression only applies to a subset of the usage scenarios enumerated:

- Scenario A: Resolve given only referent identifier: Search (single instance)
- Scenario B: Resolve given only referent identifier: Search (multiple instances)

Of the remaining scenarios,

- Scenario C: Resolve given referent identifier and requester affiliation: Search is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario D: Resolve given referent identifier and requester affiliation: Link from Object is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario E: Resolve given referent identifier and requester affiliation: External Link is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario H: Resolve given referent identifier and requester identity: DRM is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario I: Resolve given referent identifier, requester affiliation, and requester physical location is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario J: Resolve directly to object vs. to metadata is addressed by *OpenURL Appropriate Location + HTTP + Inline KEV*
- Scenario F: Resolve given referent identifier and requester accessibility profile is addressed by an Appropriate Version service expression
- Scenario G: Resolve given referent identifier and requester accessibility profile: Choice of Manifestation is addressed by an Appropriate Version service expression

2.8 Applicability [optional]

This service expression is not applicable in the contexts that OpenURL is designed for, and which *OpenURL Appropriate Location + HTTP + Inline KEV* realises—namely, in orchestration with Obtain HTTP/URL/Browser, in order to allow transparent access to a single object through a hyperlink, hiding the selection process from the user. This service expression is instead used when the selection process needs to be exposed:

- If the selection process is exposed to a human user, the delivery system has not been provided sufficient information on requester context, and forces the choice of most appropriate copy on the end user explicitly. This differs from true OpenURL behaviour, under which a single instance must be resolved to even in the absence of any information about the requester. An example is when a link to the object is emailed to a recipient, but the Referrer (party creating the link) cannot anticipate who the recipient (i.e. Requester) will be; this applies if a generic link is to be emailed to any federation user.
- If the selection process is exposed to another service, that service does the selecting of the most appropriate instance for delivery, out of those returned by this service expression. So the orchestration of this service expression and the selection service expression provides the functionality of an appropriate copy service expression, and one possible means of

realising the service expression *OpenURL Appropriate Location + HTTP + Inline KEV* .

This service expression is not expected to be used within a portal context, in which information about the requester is already available once the requester has logged in. However, this service expression may be orchestrated with an appropriate copy service expression specific to the portal.

This service expression is only applicable in contexts where a federation of data sources is centrally managed through a registry, which contains details of all available object instances; therefore it can only be deployed centrally. In cases where the appropriate copy system is deployed locally at each repository, and the appropriate copy service forms the Institutional Service Component (as is usual in the library use of OpenURL), the delivery system will only contain information about object instances on the one repository, and this service expression cannot be usefully populated.

This service expression assumes at least an information model in which digital objects that are identical in content and presentation are identified as belonging to the same Object Manifestation; the digital objects so related are considered to be Object Instances. The service expression specifies the object whose instances are to be listed (the referent) at the Manifestation level. That is to say, the given referent attributes may match several objects stored in the federation, but those objects may only differ in their storage location, and not in their content or presentation. The end user must not be able to detect any difference in the listing of objects obtained, whichever selection of object the service expression makes. That way, the user requirement to interact with a given object manifestation is not affected by the functionality of this service expression.

The service expression does not presume a full data model such as FRBR applies to the objects it selects amongst. The FRBR model can be used nonetheless to illustrate the applicability of the service expression. The object instances listed in the service expression response:

- Shall not differ in authorship (the object instances belong to the same FRBR Work)
- Shall not have major difference of content (the object instances belong to the same FRBR Work)
- Shall not have minor difference of content (the object instances belong to the same FRBR Expression)
- Shall not differ in file format (the object instances belong to the same FRBR Manifestation)
- Shall not have major difference of content presentation (the object instances belong to the same FRBR Manifestation)

As a result, the service expression is not applicable if the object is specified at the FRBR Instance level—e.g. if the end user specifies a retrieval key specific to a unique location to obtain the object. The service expression shall not be extended to allow object specification at the FRBR Instance level: A listing of location-specific retrieval keys is the result of a Multi-Resolve call, so invoking Multi-Resolve becomes redundant.

The service expression is not applicable if the user specifies the object at the FRBR Manifestation level, and a unique location to obtain the object. The service expression is not applicable if the user specifies the object at the FRBR Manifestation level, and a range of locations to obtain the object (which may be a proper subset of the locations in the federation): the service expression is defined to return all instances “known” to it (e.g. all instances in the federation), and not a subset. The service expression may be extended to include this functionality.

The service expression is not applicable if the user specifies the object at the FRBR Expression level or FRBR Work level. Other service expressions are

necessary to guide the user in the selection of the expression and manifestation of the object they require.

OpenURL as a standard allows intrinsic (meaningful) attributes of the referent to be used to identify the referent. Such attributes make OpenURL resemble Search. OpenURL is not applicable in a search context, i.e. when more than one objects differing in content matches the referent attributes. The service expression shall not be extended to return a listing of objects differing in content or format. Moreover, the FRED profile of OpenURL, and this service expression, require that intrinsic attributes of the referent not be used in service calls. (Referents are identified only through semantically opaque identifiers.)

2.9 Requests & Behaviours

The format for requests and responses shall follow the OpenURL v.1.0 specification. As noted under *Functionality*, the only descriptions of context entities supported by this service expression as parameters are those of referent and referrer. The following parameters describing context entities shall be supported by this service expression:

- *rft_id*: a single identifier for the referent. The identifier shall be a Handle. The identifier shall be encoded for use in the service expression interface through the `info:hdl:` namespace, as required by the OpenURL Standard.
- *rfr_id*: the identifier of the referrer. The referrer shall be deemed to be the institution hosting the repository federation, which is responsible for generating OpenURL hyperlinks to content inside the federation.

A single referent shall be identified through the referent descriptors (parameters). The Community Profile schema (see Interface Definition) does not allow the count of referent descriptors to be reduced to one; nonetheless only one referent descriptor shall be used for any call of the service expression.

A single referrer shall be identified through the referrer descriptors (parameters). The referrer is named to establish interoperability with OpenURL resolvers not specific to FRED; it does not affect functionality within the FRED federation. To quote the OpenURL implementation guidelines:

OpenURL Referrers are strongly encouraged to provide a genuine Referrer Identifier within the ContextObject as specified in Section 4.6. This will assist general OpenURL interoperability enabling the interpretation of local Identifiers, as well as Resolver functionality such the provision of usage statistics, and the prevention of circular links. Inclusion of this provenance within an OpenURL is an indication of its quality.

Any other context entities specified in calls to this service expression through the OpenURL interface are ignored.

The service expression may be extended to support other parameters and other context entities, though such extensions must be consistent with the functionality of this service expression, which is to return a listing of matching object instances rather than the most appropriate instance. For example:

- A service type may be specified through an `svc` descriptor. In that case, the returned listing of matching retrieval keys will all use the nominated service type to access the instances.

The service expression response is a list of URLs presented in an XML document. The list contains the URLs of instances of the object matching the referent descriptor. In a repository federation, these are the URLs of all instances of the object stored on any repository in the federation. In the FRED project, the URLs are made available to the service expression by an Instances Registry, which maintains the listing of all object instances in the federation, their retrieval keys (URLs), and the identifiers of the object manifestations they correspond to.

2.10 Use & Interactions

This service expression assumes use in conjunction with an Obtain delivery mechanism: each of the URLs returned by the service expression can invoke a service to obtain the object instance identified. The particular mechanism assumed is the service expression *Obtain HTTP/URL/Browser*: the input is a URL activated in a web browser, and the result is an object delivered across HTTP and rendered through the browser.

Since the service expression returns multiple such hyperlinks to *Obtain HTTP/URL/Browser*, it is not expected to be orchestrated with *Obtain HTTP/URL/Browser* as an HTTP redirect, as is the case with *OpenURL Appropriate Location + HTTP + Inline KEV*. If the service expression results are presented to a human end user, an XSL transformation is needed to convert the XML listing of hyperlinks returned into a web page that a user can select instances from. The web page presentation of the service expression results needs to differentiate between object instances according to their Data Source: each hyperlink must be branded with an easily understandable indication of the repository that contains it, and potentially metadata about that repository (physical location, access restrictions). The formulation of this XSL transformation is outside the scope of this service expression.

The service expression may be extended as necessary in order to be used in conjunction with other context-sensitive services, except where such extension is prohibited in this document.

2.11 Structure [optional]

This service expression presupposes the data model for OpenURL defined in the OpenURL v.1.0 standard:

This service expression presupposes the data model for OpenURL defined in the OpenURL v.1.0 standard:

- Any request for a service involves six *context entities*.
- These context entities provide the context for the service call.
- The descriptions of these context entities are aggregated into a single *ContextObject*.
- Therefore specifying the ContextObject specifies the context for the service call.
- Context entities may be described through attributes (given in-line or by reference to an external file), or specified through identifiers. These attributes and identifiers are *Descriptors*, and constitute the parameters of an OpenURL service call.
- The context entities constituting a ContextObject are:
 - *Referent*: an object to be operated on by the service.
 - *Service Type*: the service to be applied, specified at the genre or expression level.
 - *Requester*: the end user requesting the service.
 - *Resolver*: the resource processing the service request (i.e. the resource hosting the OpenURL service expression).
 - *Referring Entity*: the resource containing the reference to the referent which triggers the service call (for this service expression, the resource containing the hyperlink which triggers the service expression call).
 - *Referrer*: the resource generating the call to the OpenURL service expression (typically for this service expression, the federation as an institutional entity).

This service expression presupposes a federation of repositories hosting content, with each participating repository a candidate for the Data Source (Location)

identified by the service as hosting one of the matching object instances—i.e. the Data Source in the retrieval key pair (Data Source, Label). The service expression presupposes a further data source: an Instances Registry, containing a listing of all the instances of all objects in the federation.

2.12 Interface Definition [recommended]

The service expression requests shall conform to v.1.0 of the OpenURL standard. The service expression responses do not conform to the OpenURL standard, so the service expression is not a realisation of the standard.

The service expression requests shall use the KEV ContextObject Format; this includes the KEV ContextObject serialisation (key-value pairs, i.e. service call expressed as an HTTP GET query), and the Z39.88-2004 constraint language (native to OpenURL v.1.0). The service expression shall use the UTF-8 character encoding. The service expression shall use the Inline OpenURL HTTP transport. Alternate formats and transports are allowed (e.g. XML/SOAP), but a choice of different format or transport shall result in a new service expression.

These choices listed above an OpenURL Community Profile. As required by OpenURL, the FRED Community Profile is described in machine readable form at <http://fred.usq.edu.au/files/fredprofile.xml> , following the [Community Profile Schema](#)

(<http://alcme.oclc.org/openurl/servlet/OAIHandler/extension?verb=GetMetadata&metadataPrefix=xsd&identifier=info:ofi/fmt:xml:xsd:pro-2004>). This profile is intended to be submitted for registration.

As required by the Inline OpenURL transport, all descriptors (parameter values) shall be URL-encoded.

As required by the Inline OpenURL transport, all calls to the service expression shall include the parameter `url_ver=Z39.88-2004`, giving the version of OpenURL. All calls shall include the parameter `url_ctx_fmt=info%3Aofi%2Ffmt%3Akev%3Amtx%3Actx`, nominating the KEV ContextObject format. Calls shall not include the `url_tim` parameter, giving the timestamp of the OpenURL creation.

The service expression shall not use as parameters administrative data keys describing the ContextObject. (Of these, `ctx_ver` is identical to `url_ver`; `ctx_tim` is identical to `url_tim`; the identifier of the OpenURL ContextObject `ctx_id` is not applicable to the expected use of OpenURLs as dynamic hyperlinks; the character encoding `ctx_id` is implicit in the FRED Community Profile.)

As recommended by OpenURL, the referrer identifier `rfr_id` shall have a value of the format `info:sid/DNS` or `info:sid/DNS:COLLECTION`. In accordance with the [info:sid specification](#) (<http://alcme.oclc.org/openurl/docs/pdf/info-sid.pdf>), `DNS` shall be the DNS-resolvable internet domain or subdomain associated with the referrer institution; `COLLECTION` is an optional description of the federation. (e.g. `info:sid/thelearningfederation.gov.au`, `info:sid/www.learningplace.com.au:qld-school-repository-federation` .) The identifier shall be URL-encoded when it appears as an OpenURL parameter.

Service Implementations must support HTTP GET OpenURL hyperlinks of at least 2048 bytes length.

Foreign keys are service call parameters of a form not defined by the standard, i.e. not prefixed by a prefix matching the regular expression:

`m/url_|ctx_|(rft|rfe|req|rfr|res|svc)[_./]`. Foreign keys shall be ignored by service implementations.

The service expression response shall be an XML document containing the URLs of all objects known to the service expression and corresponding to the referent identifier. The XML document shall be of the form:

```
<urls>
  <url>URL 1</url>
  <url>URL 2</url>
  ...
  <url>URL n</url>
</urls>
```

2.13 Applicable Standards

- American National Standards Institute 2005. *The OpenURL Framework for Context-Sensitive Services*. Bethesda (Md.): NISO Press. ANSI/NISO Z39.88-2004. ISSN: 1041-5653. http://www.niso.org/standards/standard_detail.cfm?std_id=783
- International Federation of Library Associations and Institutions. 1998. *Functional Requirements for Bibliographical Records*. Munich: K.G. Saur. ISBN 3-598-11382-X. <http://www.ifla.org/VII/s13/frbr/frbr.pdf>
- info:sid specification. <http://alcme.oclc.org/openurl/docs/pdf/info-sid.pdf>

2.14 Design Decisions & Tradeoffs [optional]

2.14.1 Centralised Provision

The typical use of OpenURL in the library community is to provide a different OpenURL link server address for each institutional repository. Each OpenURL link server will often have access to only one instance of a referent in one repository, so that its function becomes to deliver the locally held copy as the appropriate copy. Even when multiple instances are available at the institution, the choice of instance may be dictated by the referring entity or the referrer. By contrast, this service expression is envisioned as provided by the federation of repositories, and multiple instances of the referent are expected to be available from different provider repositories in the federation.

2.15 Implementation Guidance & Dependencies [recommended]

Implementation guidelines for OpenURL applications using the KEV ContextObject format are available from

http://alcme.oclc.org/openurl/docs/implementation_guidelines/index.html .

By-reference parameters (for which the values of a ContextEntity descriptor are retrieved from an external on-line file instead of being passed into the service request as in-line parameters) are a security risk, as discussed in the Implementation Guidelines, App. C.1. By-reference parameters are not used in this service expression.

As recommended in the Implementation Guidelines, App. C.2, service implementations shall not fetch metadata from a network location specified in an OpenURL with an invalid version string.

2.16 Known Uses [optional]

Actual: None

Potential: The service expression may be used in a repository federation, as part of an appropriate copy system. The service expression provides a listing of instances, based on which users may select the most appropriate instance of an

object. Users may either do so on their own, or through an appropriate copy selection service, which may be informed about requester context and other context objects.

2.17 Service Expression Dependencies [recommended]

<type text here>

2.18 Related Service Expressions [optional]

- *Obtain HTTP/URL/Browser*
- *OpenURL Appropriate Location + HTTP + Inline KEV*

2.19 Related Service Usage Models (SUMs) [optional]

- *Manage Resolver SUM*: service usage model describing application through which the possible mappings of ContextObjects to URLs carried out through this service expression are populated, updated, maintained. Includes initial population, and orchestration of updating OpenURL Data Source with updating location of object accessed through OpenURL.
- *Multi-Resolve + Select SUM*: An appropriate copy selection service selects the most appropriate instance of an object to deliver to a requester, out of the instances available to it as reported by the Multi-Resolve service. The output of the multi-resolve service is thus used as a data source by the selection service.

2.20 Related CoRe SUMs [optional]

<type text here>