

# Forward Linking

Revision: 1.0



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## Change History:

Ver	Date	Changed By:	Comments
0.1	Mar 14, 2003	C Koscher	Initial draft
0.2	Mar 24, 2003	E Pentz	Changes to section 5.0
		C Koscher	Added draft of FL query result schema
		C Koscher	Added diagrams in section 1.0
0.3	April 7, 2003	C Koscher	Incorporated reviewer comments <ul style="list-style-type: none"> <li>- see change bars in section 5</li> <li>- added 'author' in section 3 schemas</li> </ul>
1.0	April 14, 2003	C Koscher	Incorporated comments from the April 8 <sup>th</sup> meeting in NYC <ul style="list-style-type: none"> <li>- updated figures 1 and 2</li> <li>- expanded drafts of query and query results schemas</li> <li>- re-arranged paragraphs in section 5</li> </ul>

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## 1 Overview

### 1.1 The Purpose and Organization of This Document

Forward linking has been identified by the CrossRef board of directors as a high priority initiative and is part of our strategic planning of changes and improvements to be made or started in calendar 2003. Following the January 2003 board meeting the Forward Linking Working Group (FLWG) was formed to identify the technical and governance issues associated with such a service. The FLWG objectives were to synthesize the technical issues into a system requirements document and to surface the governance issues for consideration by the board or membership at large.

This document is the product of the FLWG efforts and is broken down as follows:

- Section 1.0 is an overview providing background information about the initiative
- Section 2.0 captures the system requirements
- Section 3.0 provides a detailed description of the FL transactions and interfaces
- Section 4.0 defines implementation constraints or considerations
- Section 5.0 captures the governance issues raised by the FLWG.

### 1.2 Description Of The Service

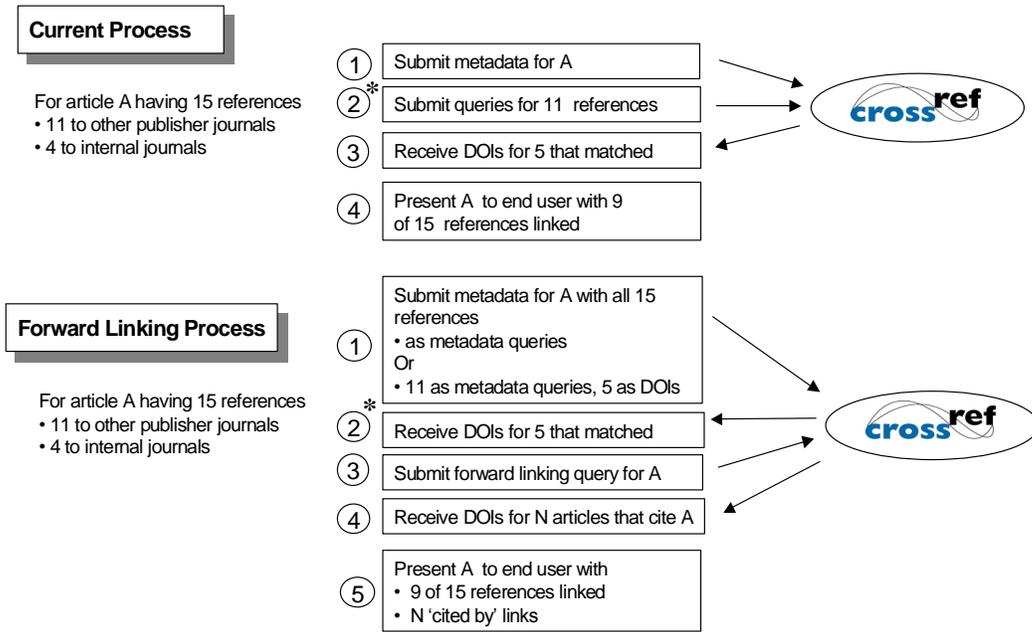
Forward linking will be a service offered by CrossRef that enables members to retrieve an extended metadata set and the DOI for external documents that make reference to a target document. This service allows our members to enrich their content by offering an up to date listing of citing links to the target. Figures 1 illustrate the differences between using the current CrossRef system and an expanded forward linking system. Figure 2 depicts the time ordered relationship between the deposit of metadata and the retrieval of forward linking (FL) information.

### 1.3 Impact On Members

Our ability to provide this service requires developing a logical relationship between the two activities that comprise the existing CrossRef service, depositing and querying. At the moment CrossRef members deposit metadata for their publications to establish a query-able identity for each discrete item. In a separate transaction they seek to activate the references made in the item's bibliography by searching the CrossRef holdings for the corresponding DOIs. To populate the necessary forward linking logical relationship in the CrossRef database, members will simply have to couple these two activities so that the references can be traced back to their source document's identifier.

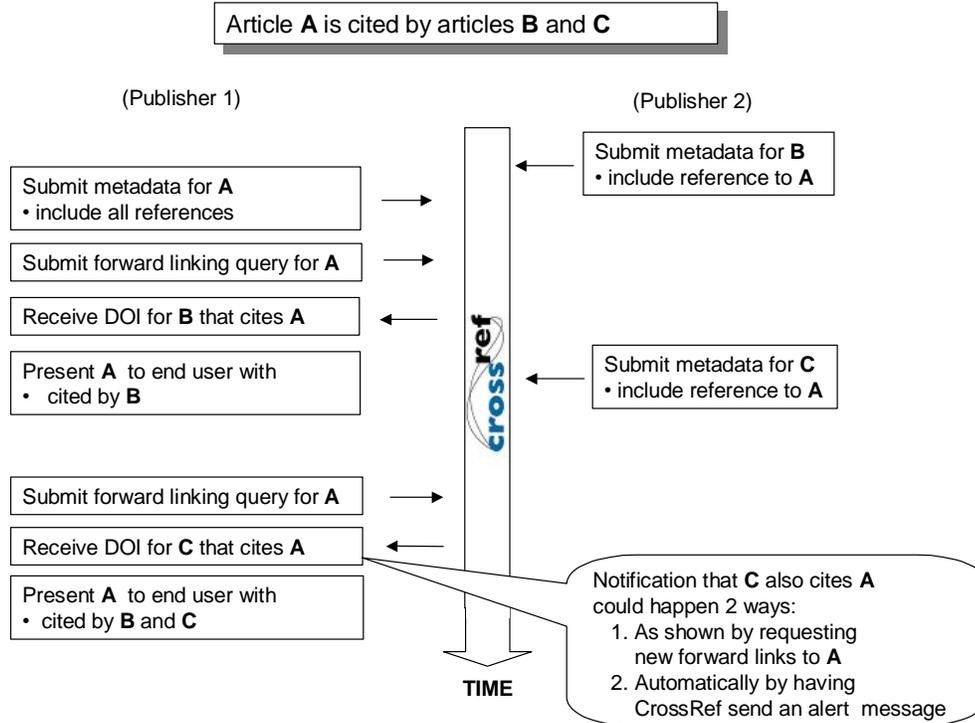
Forward linking has deposit and query transactions similar to the existing DOI lookup service. The deposit establishes the forward linking relationship as described above while the query is centered on a target identifier and retrieves, in an ongoing fashion, the external references made to the target.

In order to participate in forward linking, members will have to modify their existing deposit and/or query procedures or develop a new deposit process. They will also have to construct a new forward linking query transaction process.



\* NOTE: no need to query for 4 'self' journal articles, DOIs already available within the publisher

**Figure 1 – Comparison Of Current And Forward Linking Process**



**Figure 2 - Updating 'Cited-By' References**

## 2 Requirements

The functional requirements for forward linking are divided into three categories, base, extended and future. The base requirements are mandatory for establishing the initial capability of the service. The extended requirements provide an enhanced service. The future requirements identify functions that will be addressed after the base and/or extended functions are implemented.

### 2.1 Definition of terms

Term	Definition
FL	Forward Linking
Target	The document being referenced (also known as the referent)
Source	The document containing a reference (also known as the referrer)
Reference	The bibliographic reference in a source document

### 2.2 Base Requirements

1. The system shall provide a bulk-loading interface primarily to be used to input FL relationships for articles, conference proceedings and books already deposited with CrossRef. This interface will accept data pairs listing the source and target documents. The data provided will be a DOI for the source document and may be either metadata or DOIs for the references.
2. The system shall provide a primary FL deposit interface based on the current metadata deposit interface and will use an extended version of the CrossRef Deposit Schema. The schema will be extended so that the <journal\_article>, <content\_item> and <conference\_paper> elements can list the references contained within the source item being deposited.
3. The primary FL deposit interface shall allow the depositor to specify the associated references in addition to being used to establish FL relationships and should also result in the return of a DOI to the depositor for each reference found to have one at the time of deposit (this option effectively combines into one transaction the current practice of deposits and separate metadata queries).
4. The system shall provide a FL query interface that will accept a DOI as the input and will return the metadata set described in section 2.5 for all referrer items.
5. The FL query interface shall accept a date range, which will be used to filter the returned result. Only those references established in the CrossRef database within the date range (exclusive) shall be returned in the results. The upper limit of the range shall default to the current date.
6. The FL query interface shall utilize access control options that allow an account to be authorized to perform FL queries using the asynchronous and/or synchronous interfaces.
7. In the FL query results each referring item shall be identified as a journal, conference proceeding or book.

8. The system shall automatically update the FL relationship database by creating relationships as the metadata for new items are deposited with CrossRef. This means that for any item deposited as a source of a reference and that reference does not resolve to a DOI at the time of the source's deposit that if that target item is subsequently deposited with CrossRef the FL relationship between the source and the target will be automatically established.

### 2.3 Extended Requirements

1. The system shall provide a mechanism that will initiate a notification that provides an FL update for a specified target item by supplying new referencing item information. This service shall be enabled/disabled during the deposit or update of the target item metadata.
2. The system shall provide a query interface to retrieve the number of referencing items for a given target item. The target item shall be supplied using its DOI.

### 2.4 Future Additions

1. The system shall provide an interface that accepts PDF documents as a deposit format. Upon receipt of a PDF document the system shall parse the file to locate the bibliographic references and extract the corresponding metadata. This metadata shall be treated as the list of references for the source document represented by the PDF file. The identifier for the source document will be submitted as an additional data item when the PDF file is submitted.

### 2.5 Query Result Sets

Name	Comment
Full Journal Title	
Abbreviated Journal Title	
ISSNs	More than 1
Journal DOI	
Article Title	
Contributors	All authors, given and surname up to a max of 10 (when >10 list as et al)
Volume	
Issue	
Page	Page range
Article DOI	
Article Identifier	<identifier> or <item_number>

**Table 1 - Article Referrer Item Result Set**

Name	Comment
Full article/chapter title	
Contributors	(see table 1)
Book/Reference Work Title	
Book/Reference DOI	DOI at the publication level
Online publication date	
Pagination or identification	
Item DOI	
Chapter number	
Chapter author	if any; as distinct from book author
Editor of book	if any; as distinct from author of book
Book edition number	
Series	
(Volume) number in series	
p-ISBN, o-ISBN	but not e-ISBN, which is netLibrary et al. I believe
Publisher, city of publisher, year of publication	as in biblio cite

**Table 2 -Book/Reference Referrer Item Result Set**

Name	Comment
Book Title	
Book DOI	
Chapter Title	
Contributors	(see table 1)
Editor of proceedings book	
Conference Title	
Conference Date	(Year)
Conference Location	(New York, NY)
Online publication date	
Pagination or identification	
p-ISBN, o-ISBN	
DOI	

**Table 3 -Conference Proceeding Referrer Item Result Set**

### 3 Transaction Descriptions

There is the potential for 4 new transactions with the CrossRef system resulting from the addition of a forward linking service.

1. FL data bulk load
2. Metadata w/ FL data deposit
3. FL query
4. FL query update notification

The first three will be performed using existing HTTP interfaces with modifications to allow for data unique to forward linking. These interfaces include the file upload interface currently used to deposit metadata, upload asynchronous batch queries and to effect DOI ownership transfers and the synchronous HTTP query interface.

The forth transaction is a form of callback where the CrossRef system initiates a communication to send pre-requested updates. The use of SMTP as the transport for this interface is an option, however, alternatives should be explored due to the lower reliability of email. In addition, using an alternative transport for the first three transactions may be implemented in a subsequent phase of development.

#### 3.1 Metadata with Forward Linking Data Deposit

The normal ongoing method of depositing forward linking data will be to include it with the existing metadata deposits for journal articles, conference proceedings and books. This will require a modification to the deposit schema to allow for the inclusion of a reference list. A draft XML schema section for journal articles is shown below.

If any part of processing for a deposit record fails the entire record should be aborted (e.g. references should not be processed if there are errors in the metadata section).

References may be updated with the addition of new records or the deletion /modification of existing records.

```

<xsd:element name = "journal_article">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "titles" maxOccurs = "20"/>
      <xsd:element ref = "contributors" minOccurs = "0"/>
      <xsd:element ref = "publication_date" maxOccurs = "10"/>
      <xsd:element ref = "pages" minOccurs = "0"/>
      <xsd:element ref = "publisher_item" minOccurs = "0"/>
      <xsd:element ref = "doi_data"/>
      <xsd:element ref = "references" minOccurs = "0"/>
    </xsd:sequence>
    <xsd:attributeGroup ref = "publication_type.atts"/>
    <xsd:attributeGroup ref = "language.atts"/>
  </xsd:complexType>
</xsd:element>

```

```

<xsd:element name = "references">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "ref_item" minOccurs = "1"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>

<xsd:element name = "ref_item">
  <xsd:complexType>
    <xsd:choice>
      <xsd:sequence>
        <xsd:element ref = "title" minOccurs = "0" maxOccurs = "1"/>
        <xsd:element ref = "issn" minOccurs = "0" maxOccurs = "2"/>
        <xsd:element ref = "author" minOccurs = "0" maxOccurs = "1"/>
        <xsd:element ref = "volume" minOccurs = "0" maxOccurs = "1"/>
        <xsd:element ref = "issue" minOccurs = "0" maxOccurs = "1"/>
        <xsd:element ref = "year" minOccurs = "0" maxOccurs = "1"/>
        <xsd:element ref = "first_page" minOccurs = "0" maxOccurs = "1"/>
      </xsd:sequence>
      <xsd:element ref = "doi" minOccurs = "0" maxOccurs = "1"/>
    </xsd:choice>
  </xsd:complexType>

  <xsd:attribute name = "return_query_result" default="disabled">
    <xsd:simpleType>
      <xsd:restriction base = "xsd:NMTOKEN">
        <xsd:enumeration value = "enable"/>
        <xsd:enumeration value = "disable"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>
</xsd:element>

```

### 3.2 Forward Linking Query

A forward linking query will utilize an XML formatted request and response. This request will be incorporated into the redesign of the current metadata and DOI piped query format into an XML format. This redesign is currently planned for implementation in the second quarter 2003. FL queries will be accepted via a synchronous HTTP exchange or as a file upload. For a file upload the results will be returned using SMTP (email). A draft schema for XML queries, including forward linking support, is shown below.

```

<?xml version = "1.0" encoding = "UTF-8"?>
<xsd:schema xmlns:xsd = "http://www.w3.org/2001/XMLSchema"
  targetNamespace = "http://www.crossref.org/qschema/1.0"
  xmlns = "http://www.crossref.org/qschema/">

  <xsd:element name = "query_request">
    <xsd:complexType>

```

```

<xsd:sequence>
  <xsd:element ref = "email_address" minOccurs = "1" maxOccurs = "1"/>
  <xsd:element ref = "tracking_id"    minOccurs = "0"/>
  <xsd:element ref = "query"         minOccurs = "1"/>
</xsd:complexType>
<xsd:attribute name = "since-date" >
  <xsd:simpleType>
    <xsd:restriction base = "xsd:NMTOKEN">
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>
</xsd:element>

<xsd:element name = "query">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "title"          minOccurs = "0" maxOccurs = "2"/>
      <xsd:element ref = "issn"          minOccurs = "0" maxOccurs = "2"/>
      <xsd:element ref = "contributor"   minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "volume"        minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "issue"         minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "component"     minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "year"          minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "first_page"    minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "key"           minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "doi"           minOccurs = "0" maxOccurs = "1"/>
    </xsd:sequence>
  </xsd:complexType>

  <xsd:attribute name = "query_type" default="meta">
    <xsd:simpleType>
      <xsd:restriction base = "xsd:NMTOKEN">
        <xsd:enumeration value = "journal-meta"/>
        <xsd:enumeration value = "conf-book-meta"/>
        <xsd:enumeration value = "forward-linking"/>
        <xsd:enumeration value = "doi"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>

  <xsd:attribute name = "enable-multiple-hits" default="false">
    <xsd:simpleType>
      <xsd:restriction base = "xsd:NMTOKEN">
        <xsd:enumeration value = "false"/>
        <xsd:enumeration value = "true"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>

  <xsd:attribute name = "fuzzy-match" default="enable">
    <xsd:simpleType>
      <xsd:restriction base = "xsd:NMTOKEN">
        <xsd:enumeration value = "enable"/>
        <xsd:enumeration value = "disable"/>
        <xsd:enumeration value = "enable-show-indicators"/>
      </xsd:restriction>
    </xsd:simpleType>
  </xsd:attribute>

```

```
<!-- Alerts may be enabled as a feature in the user's system account forcing all queries -->
<!-- to be enabled for alerts, thereby eliminating the need to set this attribute -->
```

```
<xsd:attribute name = "enable_alerts" default="false">
  <xsd:simpleType>
    <xsd:restriction base = "xsd:NMTOKEN">
      <xsd:enumeration value = "false"/>
      <xsd:enumeration value = "true"/>
    </xsd:restriction>
  </xsd:simpleType>
</xsd:attribute>
```

```
</xsd:element>
```

... Other elements defined the same as in the CrossRef deposit schema

```
</xsd:schema>
```

### 3.3 Forward Linking Query Results

A forward linking query result will utilize an XML formatted response. This response will be incorporated into the redesign of the current XML query response into an extended format. This redesign is currently planned for implementation during 2003.

A draft XSD query result schema is shown below.

```
<?xml version = "1.0" encoding = "UTF-8"?>
<xsd:schema xmlns:xsd = "http://www.w3.org/2001/XMLSchema"
  targetNamespace = "http://www.crossref.org/qschema/1.0"
  xmlns = "http://www.crossref.org/qschema/">

  <xsd:element name = "fl_result">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref = "email_address" minOccurs = "1"/>
        <xsd:element ref = "tracking_id" minOccurs = "0"/>
        <xsd:choice>
          <xsd:element ref = "standard" maxOccurs = "unbounded"/>
          <xsd:element ref = "forward_link" maxOccurs = "unbounded"/>
        </xsd:choice>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
```

```
<!-- The following element is used to return results for a metadata or DOI query -->
```

```
<xsd:element name = "standard">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "meta_data" minOccurs = "0" maxOccurs = "unbounded"/>
      <xsd:element ref = "fuzzy_rule" minOccurs = "1" maxOccurs = "1"/>
    </xsd:sequence>

    <xsd:attribute name = "type" >
      <xsd:simpleType>
```

```

    <xsd:restriction base = "xsd:NMTOKEN">
      <xsd:enumeration value = "meta-data"/>
      <xsd:enumeration value = "multiple-meta-data"/>
      <xsd:enumeration value = "doi"/>
    </xsd:restriction>
  </xsd:simpleType>
</xsd:attribute>

</xsd:complexType>
</xsd:element>

<!--The following element contains the results of a standard metadata or DOI query -->
<!-- All fields within the record will be filled in with values from the holdings database -->
<!--The 'key' field will retain the value input along with the incoming query -->

<xsd:element name = " meta_data ">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "title" minOccurs = "0" maxOccurs = "2"/>
      <xsd:element ref = "issn" minOccurs = "0" maxOccurs = "2"/>
      <xsd:element ref = "contributor" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "volume" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "issue" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "component" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "year" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "first_page" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "key" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "doi" minOccurs = "0" maxOccurs = "1"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>

<!--The following element defines the fuzzy search mode used to perform the query. -->
<!-- When set to 'verbose' the contents of this element will be an encoded string identifying -->
<!-- the fuzzy search rules activated to produce a result set -->

<xsd:element name="fuzzy_rule">
  <xsd:complexType>
    <xsd:simpleContent>
      <xsd:extension base="xsd:string">
        <xsd:attribute name="mode">
          <xsd:simpleType>
            <xsd:restriction base = "xsd:NMTOKEN">
              <xsd:enumeration value = "enabled"/>
              <xsd:enumeration value = "verbose"/>
              <xsd:enumeration value = "disabled"/>
            </xsd:restriction>
          </xsd:simpleType>
        </xsd:attribute>
      </xsd:extension>
    </xsd:simpleContent>
  </xsd:complexType>
</xsd:element>

<xsd:element name = " forward_link ">
  <xsd:complexType>

```

```

<xsd:sequence>
  <xsd:element ref = "target_doi" minOccurs = "1" maxOccurs = "1" />
  <xsd:element ref = "fl_source" minOccurs = "0" />
</xsd:sequence>

</xsd:complexType>
</xsd:element>

<xsd:element name = "fl_source">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref = "full_title" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "title_abrv" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "issn" minOccurs = "0" maxOccurs = "2"/>
      <xsd:element ref = "volume" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "issue" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "year" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "first_page" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "article_title" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "contributor" minOccurs = "0" />
      <xsd:element ref = "component" minOccurs = "0" maxOccurs = "1"/>
      <xsd:element ref = "doi" minOccurs = "1" maxOccurs = "1"/>
    </xsd:sequence>

    <xsd:attribute name = "source-type" >
      <xsd:simpleType>
        <xsd:restriction base = "xsd:NMTOKEN">
          <xsd:enumeration value = "journal-article"/>
          <xsd:enumeration value = "conference-proceeding"/>
          <xsd:enumeration value = "reference"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>

  </xsd:complexType>
</xsd:element>

... Other elements defined the same as in the CrossRef deposit schema

</xsd:schema>

```

### 3.4 Forward Linking Query Update Notification

(The interface for this transaction is TBD. I would like to explore alternative to SMTP)

### 3.5 Forward Linking Bulk Load

In order to facilitate the loading of FL data for older articles already deposited with CrossRef there will be a tab delimited file format that can be uploaded using a new operation (doFLUpload) value. This file will contain the source document's DOI in column one with the reference, listed as a DOI or as pipe delimited metadata query, in column two This method of depositing FL data is primarily intended for use during a start

up period when the CrossRef FL repository is being primed with data. However, this method will be retained as an alternative to the combined metadata with FL data method.

Example:

```
H:email=name@address.com
[source document DOI] tab [|||||||reference DOI]
[source document DOI] tab [issn|journal|author|volume|issue|page|year]
[source document DOI] tab [reference DOI]
...
```

Constraints:

- The source document DOI must exist in CrossRef prior to using this method.
- If the reference is supplied as a DOI, that DOI must exist in CrossRef
- For bulk loads no metadata query results will be returned.
- One cited reference per line

### 3.6 Real Time Forward Linking Queries

Most current CrossRef members use synchronous HTTP transactions for queries since that is all that was offered in the first version of the CrossRef system. As a result users performing real-time (on the fly when a page is presented or a link is clicked) queries are indistinguishable from those who are simply updating their own back end systems. CrossRef does not currently advocate the performance of real-time queries primarily as a result of not being able to guaranty an adequate level of service (response time).

Since forward linking will be a new endeavor for everyone our starting position will be to consider the asynchronous transactions to be the standard level of service and the synchronous HTTP transaction to be a premium level of service (see section 5.5, 'Fees'). In addition, the real-time query connection configuration planned for development this year for metadata or DOI queries will also be available for forward linking. This configuration will maintain an open connection between the member and CrossRef systems eliminating much of the overhead associated with the current synchronous HTTP transaction.

## 4 Implementation Constraints and Considerations

This section describes factors that impact the way in which the forward linking solution is implemented. These factors may result from maintenance, operation or deployment issues.

### 4.1 Database Architecture

The size and organization of the underlying RDMS of the existing CrossRef system when expanded to include forward linking data raises concern over the manageability and operational performance of the database. Specific items which must be addressed by a proposed implementation:

- 1) The growth in database file size should be projected over the next three years and recommendations made regarding changes to be made to the hardware configuration currently being used to support the database to accommodate this growth
- 2) System performance is dependant on the ability of the underlying hardware platform to adequately service the demands place on the RDBMS by the application. Recommendations must be made regarding changes to the current hardware configuration upon which the Oracle RDBMS operates.
- 3) Database configuration settings

## 5 Policy and Governance Issue

Several policy issues have been identified by the FLWG that must be addressed as part of establishing the forward linking service.

### 5.1 Participation

In order for forward linking to be of maximum value and effectiveness, the amount of data being deposited must be of a sufficient quantity. Since the current CrossRef membership obligations require that a member deposit their metadata and query to insert outbound links in their content, the additional burden to deposit data that contributes to forward linking relationships should be viewed as minimal. The technical hurdles to being able to perform existing metadata queries are almost identical to that of providing forward linking enabled deposits.

The issue is to determine whether the forward linking service will be provided as a core CrossRef function available to all members or should it be offered as a premium service. Whether FL is offered as a core service or a premium service, the important issue is whether FL will be mandatory for members (as depositing and retrieving are currently or whether members can either 'opt-in' or 'opt-out').

Possible options:

1. Depositing FL references and retrieving FL data are both optional
2. Depositing FL references is mandatory for all members, retrieving is optional
3. Depositing and retrieving are both mandatory \*.

(\* preferred)

In all cases it would not be an option to retrieve without depositing.

### 5.2 Access to Forward Linking Data

Issues related to access control over forward linking data are listed below. In some cases the resolution of one issue may obviate the need for a resolution of other issues.

#### 5.2.1 Member Access To Forward Linking Data

- 1) Only those members currently contributing FL enabled deposits should be entitled to retrieve FL information.
- 2) Members would only be allowed to retrieve forward links to articles they own (indicated by their ownership of the DOI for the target)
- 3) Should FL data be restricted to the use of only the primary member organization or should the right to use be extended to subordinate secondary organizations.
- 4) Agents need to be able to retrieve FL data for their client organizations.

### 5.2.2 Non-member Access to Forward Linking Data

- 1) Should CrossRef be allowed to establish an interface for retrieving forward linking data that is accessible to the entire CrossRef community or even the general public? This interface would be similar to the current CrossRef guest query form.
- 2) Should third party organizations be allowed access to FL data?

### 5.2.3 Local Hosting

- 1) Should CrossRef be allowed to provide the forward linking database to members in a bulk fashion whereby such a member would have the entire database available locally to be used by custom processes developed for the sole use of that member?
- 2) Should non-members be allowed to local host the forward linking data?

## 5.3 Fees

Implementing FL will incur significant costs (~\$300,000) so recovering those costs is an issue. It would be possible to charge an annual fee for participation, a higher deposit fee to collect the FL data and a FL retrieval fee. Each of these fees presents problems: an annual fee may discourage participation under an opt-in model, a higher deposit fee could discourage deposits (the system will be more valuable the more deposits there are) and CrossRef is moving away from regular retrieval fee, so imposing them for this would go against that. Two other possible fees are to have real-time FL queries through a Premium Query Account (real-time, on-the-fly FL queries) and to have an automatic notification system (see section 2.3).

FL is a core service that will benefit all CrossRef members so it would be better not to charge annual participation, deposit or query fees but consider the basic FL service to be included in the regular CrossRef annual membership and deposit fees. Annual administrative fees can be charged for real-time queries and the automatic notification service.