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# **X2R Documentation**

***Release 1.0***

**Feng-Pu Yang**

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## INTRODUCTION

**X2R** is a tool for helping developers to translate existing data in a variety of formats into linked-data compatible formats. The **X**, **2** and **R** in its name stand for existing data in a variety of formats, to (the homonym of two) and linked-data compatible formats (i.e., RDF/XML), respectively.

The motivation is to ease the transformation of data into linked-data and thus lower the entry barrier of generating linked-data. Using X2R, more developers can easily translate existing data on-demand, and creating linked-data incrementally.

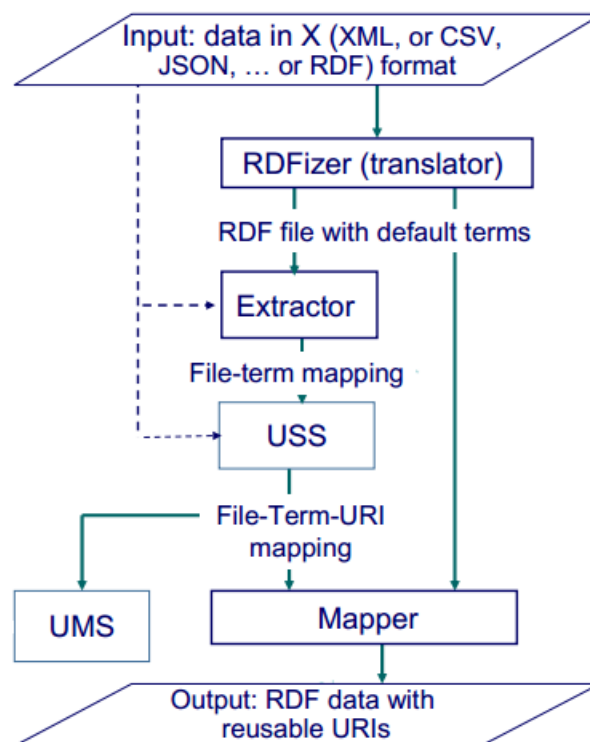


Figure 1.1: The dataflow of X2R converter.

X2R is comprised of four components: Extractor, USS, UMS and Mapper. Figure above shows the dataflow of these four components and existing RDFizer(translators). For a given raw data input in X (XML, CSV, JSON ...etc.) format, existing RDFizers can translated it into RDF serialization formats, such as Turtle, N-Triples, JSON-LD or RDF/XML. However,

## 1.1 Audiences

Targeted users of X2R include people who develop linked-data applications and need to transform their legacy data into linked data. They can use the X2R GUI (Graphic User Interface) or batch-mode CLI (Command Line Interface). Developers who are experienced in PHP. If they feel current X2R's functionalities are sufficient, and want to build linked-data applications based on X2R. They can use X2R through API functions of the tool.

People who are experienced in PHP and linked data and find that current X2R utilities are insufficient, they can extend the X2R framework based on the hooks provided by X2R.

## 1.2 How to Use This Document

The index of this document can be found in *genindex*. The search page, *search*, can be used to search within this document.

## USER GUIDE

This part of the document focuses on how to set up an environment for X2R and all its components: Extractor, Mapper and USS. A quickstart is then presented to give an overview of X2R and its components.

### 2.1 Installation

Three steps are needed to set up an X2R server, namely installing PHP, installing Composer and installing dependent packages. The detail instructions are listed as follows.

#### 2.1.1 Install PHP

X2R is written in PHP. Before using X2R, the PHP should be installed.

To install PHP, an official manual is available in <http://php.net/manual/en/install.php>.

- [Installation on Unix systems](#)
- [Installation on Mac OS X](#)
- [Installation on Windows systems](#)
- [Installation on Cloud Computing platforms](#)

#### 2.1.2 Install Composer

The dependency of X2R is managed by ‘composer,’ a PHP package management tool. Before trying X2R, get and install composer from <https://getcomposer.org/>.

Run this in your terminal to get the latest Composer version:

```
$ curl -sS https://getcomposer.org/installer | php
```

Or if you don't have curl:

```
$ php -r "readfile('https://getcomposer.org/installer');" | php
```

#### 2.1.3 Install Dependent Packages

Installing X2R is simple with [composer](#), just use this command:

```
$ php composer.phar install
```

If you did a global install of `composer`, run this instead:

```
$ composer install
```

## 2.2 Quickstart

Here is a simple usage scenario for grasping the whole picture of X2R by example. It assumes you already have X2R installed. If you do not, head over to the [Installation](#) section.

<Example>

X2R aims to improve the quality of RDF produced by typical format translators by replacing temporary or invalid URIs with valid and representative URIs.



## COMPONENTS

### 3.1 Extractor

Extractor is a tool that extracts URIs from a given RDF file, and then turns these URIs into query terms. The purpose of Extractor is to find URI that cannot be reached in the given RDF. These URIs are usually generated by typical format translators and violate linked data design rules proposed by Tim Berners-Lee, i.e., they cannot be looked up in the Web. By generating query terms for them, other X2R tools, USS and UMS, can help in finding or minting better URIs.

RDF is comprised of three types of nodes: URI references, blank nodes or literals.

#### 3.1.1 Input/Output

**Input:** RDFGraph

**Output:** *X2R data exchange format*

Components of X2R share a common data exchange format: *X2R data exchange format*. The output of Extractor is in the format of X2R data exchange format. The detail spec. of this exchange format is described below. Note that the “replacedURI” name/value pair is intentionally left blank in the context of Extractor (the potential replacedURI is obtained in the context of USS, and is applied in the context of Mapper).

```
{ "metadata": [],
  "mapping":
    [
      {
        "status": value of status,
        "originalURI": value of original URI,
        "replacedURI": value of updated URI,
        "term": value of term
      }
    ]
}
```

name	value range/format
status	Range: {"N/A", "200", "303", "error"}
originalURI	A URI that can be found in input file and is valid
replacedURI	A valid URI
term	A string

### 3.1.2 Example

```
{ "metadata": [],
  "mapping":
  [
    {
      "status": "N/A",
      "replacedURI": "http://replaced_test1",
      "term": "facilities store245",
      "originalURI": "http://140.109.21.188/facilities#store245"
    },
    {
      "status": "N/A",
      "replacedURI": "http://replaced_test2",
      "term": "facilities store244",
      "originalURI": "http://140.109.21.188/facilities#store244"
    }
  ]
}
```

### 3.1.3 Design

#### Process

#### Major components

##### RDFGraph

one element of ["json", "ntriples", "turtle", "rdxml", "n3", "rdfa", "guess"] and string in a RDF serialization format

Extractor accepts a subset of RDF serialization formats. Users of Extractor should specify the input format in terms of “value” listed in the Table below. If users have no idea of what the format of input is, they can use the “guess” value to ask Extractor to recognize the input’s format for them (if it is one of the supported format list).

value	name	reference
json	RDF/JSON	<a href="http://n2.talis.com/wiki/RDF_JSON_Specification">http://n2.talis.com/wiki/RDF_JSON_Specification</a>
ntriples	N-Triples	<a href="http://www.w3.org/TR/n-triples/">http://www.w3.org/TR/n-triples/</a>
turtle	Turtle	<a href="http://www.dajobe.org/2004/01/turtle">http://www.dajobe.org/2004/01/turtle</a>
rdxml	RDF/XML	<a href="http://www.w3.org/TR/rdf-syntax-grammar">http://www.w3.org/TR/rdf-syntax-grammar</a>
n3	N3	<a href="http://www.w3.org/2000/10/swap/grammar/n3">http://www.w3.org/2000/10/swap/grammar/n3</a>
rdfa	RDFA	<a href="http://www.w3.org/TR/rdfa-core/">http://www.w3.org/TR/rdfa-core/</a>
guess		If user don't know the format

**Tokenizer** is a major component of extractor. It aims to tokenize the tail of extracted URIs into word chunks that can then be used as query terms to find better URIs.

In X2R Extractor, a tokenizer should implement two methods, `tokenizeArr(array $arr)` and `tokenizeStr($str)`.

X2R currently support two tokenizers, delimited-based tokenizer and cased-based tokenizer.

#### Web API Definition:

**POST** /extractor{?excludedNamespaces, checkUriStatus, rdfContent}

##### Query Parameters

- **excludedNamespaces** – (optional) This specifies a list of namespaces to be skipped. That is, if a found URI belonged to this list, the URI will not be processed anymore.

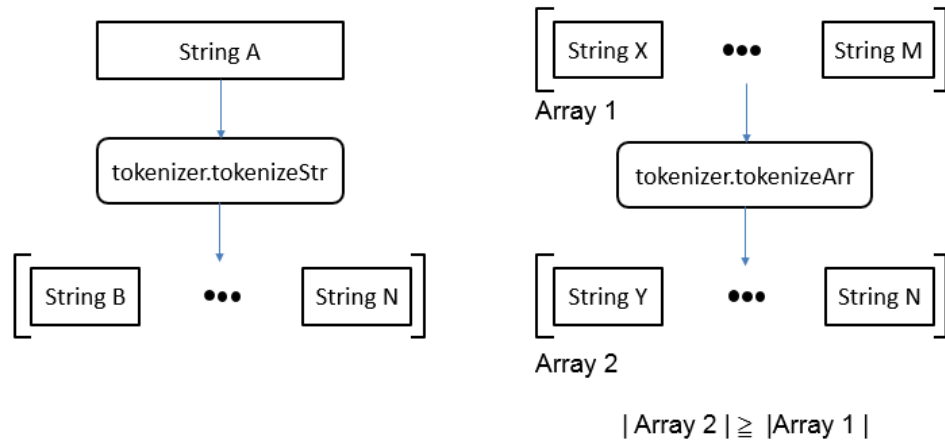


Figure 3.1: This is the caption of the figure (a simple paragraph).

For example, given  $n$  tokenizers,  $T_1$  to  $T_n$ , they can be chained as below.

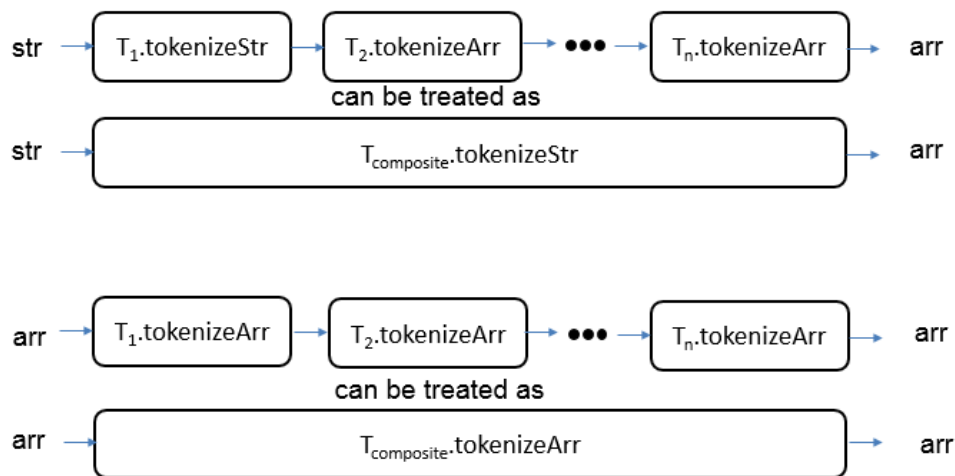


Figure 3.2: This is the caption of the figure (a simple paragraph).

- **checkUriStatus** – (*required*) This determines if *extractor* checks the status codes of found URIs.
- **rdfContent** – (*required*) This specifies the content of RDF to be processed.

### Response Headers

- **Content-Type** – application/json

### Status Codes

- **200** – no error
- **404** – exception

## Query Parameter Format Detail

**excludedNamespace**

**checkUriStatus**

**rdfContent**

## Response Format Detail

Content-Type: application/json

Response template:

```
{ "metadata": [],  
  "mapping":  
    [{ "status": "",  
        "originalURI": "",  
        "replacedURI": "",  
        "term": "",  
        "lineNumbers": ""  
      }  
    ]  
}
```

mapping entry:

```
[{ "status": "",  
    "originalURI": "",  
    "replacedURI": "",  
    "term": "",  
    "lineNumbers": ""  
  }  
]
```

## Example

**Example request:**

POST /**extractor?excludedNamespaces&checkUriStatus&rdfContent** HTTP/1.1

**Example response:**

```

HTTP/1.1 200 OK
Vary: Accept
Content-Type: application/json

{"metadata": [
  ],
  "mapping":
  [{"status": "N/A",
    "originalURI": "http://127.0.0.1/autoGeneratedUri",
    "replacedURI": "",
    "term": "auto generated uri",
    "lineNumbers": "3, 31"
  }
]}

```

## 3.2 Mapper

Mapper is a tool for systematically replacing URIs within a given RDF. When you have the mapping from original URIs to new URIs, Mapper can replace the URIs based on the mapping automatically.

### 3.2.1 Input/Output

**Input:** *X2R data exchange format* and *string in a RDF serialization format*

Components of X2R share a common data exchange format: *X2R data exchange format*. The output of Extractor is in the format of X2R data exchange format. The detail spec. of this exchange format is described below.

```

{ "metadata": [],
  "mapping":
  [
    {
      "status": status value,
      "originalURI": original URI value,
      "replacedURI": updated URI value,
      "term": term value
    }
  ]
}

```

**Output:** string in a RDF serialization format

Mapper allow user to specify the updated RDF in the format of a subset of RDF serialization formats listed in the Table below.

value	name	reference
json	RDF/JSON	<a href="http://n2.talis.com/wiki/RDF_JSON_Specification">http://n2.talis.com/wiki/RDF_JSON_Specification</a>
ntriples	N-Triples	<a href="http://www.w3.org/TR/n-triples/">http://www.w3.org/TR/n-triples/</a>
turtle	Turtle	<a href="http://www.dajobe.org/2004/01/turtle">http://www.dajobe.org/2004/01/turtle</a>
rdxml	RDF/XML	<a href="http://www.w3.org/TR/rdf-syntax-grammar">http://www.w3.org/TR/rdf-syntax-grammar</a>
n3	N3	<a href="http://www.w3.org/2000/10/swap/grammar/n3">http://www.w3.org/2000/10/swap/grammar/n3</a>
rdfa	RDFA	<a href="http://www.w3.org/TR/rdfa-core/">http://www.w3.org/TR/rdfa-core/</a>

## Web API Definition

**POST** /mapper{?rdfContent, mapping, format}

### Query Parameters

- **rdfContent** – (required) This specifies the content of RDF to be processed.
- **mapping** – (required) This specifies the information needed for *mapper* to update the URIs found in *rdfContent*.
- **format** – (optional) This specifies the format of output.

### Response Headers

- **Content-Type** – application/rdf+xml

### Status Codes

- **200** – no error
- **404** – exception

## Query Parameter Format Detail

**rdfContent**

**mapping**

**format**

## Response Format Detail

Content-Type: application/rdf+xml

## Example

### Example request:

```
POST /mapper?rdfContent&mapping&format HTTP/1.1
```

### Example response:

```
HTTP/1.1 200 OK
Vary: Accept
Content-Type: application/rdf+xml
```

```
<?xml version="1.0" encoding="UTF-8"?>
  <rdf:RDF
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema#">
    <rdf:Description rdf:about="http://openisdm.iis.sinica.edu.tw/VR/DaTongSportsCenter">
      <rdf:type rdf:resource="http://www.w3.org/2003/01/geo/wgs84_pos#SpatialThing"/>
      <updatedAt xmlns="http://openisdm.iis.sinica.edu.tw/VR/"
        rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime">2013-07-31T03:23:47Z</updatedAt>
      <geo:long>121.516</geo:long>
      <hasTelephone xmlns="http://openisdm.iis.sinica.edu.tw/VR/">2592-0055</hasTelephone>
      <hasName xmlns="http://openisdm.iis.sinica.edu.tw/VR/">Da Tong Sports Center</hasName>
```

```

<geo:location>No.51, Dalong St., Datong Dist., Taipei City 103, Taiwan (R.O.C.)</geo:location>
<usedFor xmlns="http://openisdsm.iis.sinica.edu.tw/VR/">Sport</usedFor>
<createdAt xmlns="http://openisdsm.iis.sinica.edu.tw/VR/"
  rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime">2012-11-28T09:05:13Z</createdAt>
<geo:lat>25.0648</geo:lat>
</rdf:Description>
</rdf:RDF>

```

### 3.3 URI Search Service

URI Search Service (USS) is a federated search service. The general process of USS is listed below.

1. USS accepts a set of URI search requests
2. USS refines the search requests (e.g. fixing typos or replace with a better term)
3. USS composes corresponding SPARQL for each query request
4. USS issues SPARQL queries to a set of Endpoints, which are defined in USS's configuration
5. USS integrates all results returned from Endpoints
6. USS applies filters and rankers to remove the ambiguity or promote results that are commonly used
7. USS selects one result for each request

All steps listed above should be easily replacable. These steps can also be outsourced to human instead of heuristics. In order to make USS a flexible system, we provide the system with the following hooks.

In refined USS, seven **atomic hooks** can be replaced and extended, they are:

- **Query Parser**

Query Parser parses the plain text query string into set of query terms, term refinement qualifiers, result set qualifiers and corresponding integration commands.

- **Endpoint Cotainer**

- **Endpoint** (see also: [Endpoint](#))

Endpoint wraps the public Endpoint, such as DBpedia, and handles the errors, such as Endpoint service downtime. Endpoint accepts SQRQL query and return the result set in standard format of Endpoint.

- **Term Refiner**

Term Refiner takes one query term as its input and output a refined query term.

- **Result Ranker**

Result Ranker reorders the ranks of result set based on the heuristic that it wants to realize. In addition to heuristic, Result Ranker can also be a crowd sourcing task, which can be delegated to the crowd.

- **Result Filter**

Result Filter filters result set by patterns. The typical usage of Result Filter is to resolve ambiguity.

- **Result Integrator**

Result Integrator takes two or more result sets and integrates them as one ranked result set.

- **Result Selector**

### 3.3.1 Composition of atomic hooks

The atomic hooks can be composited through method chaining.

## 3.4 X2R User Interface

X2R is designed to be both human and machine friendly through an open API. Based on the API, the tool aims to provide two kinds of user interfaces for human users: a Web-based GUI and a command line Interface.

### 3.4.1 API Usage

The details of API usage can be found in next chapter.

### 3.4.2 User Interface

X2R 1.0 provides a JQuery-powered GUI and a command line Interface is planned to be included in version 2.0.



## API USAGE

Targeted Audience: **API users**

### 4.1 X2R API Usage Scenarios

#### 4.1.1 Operation Scenarios

Replace Bad URIs

#### 4.1.2 Configuration Scenarios

Set an Extractor

Set a Mapper

Set an USS

### 4.2 Extractor API Usage Scenarios

#### 4.2.1 Operation Scenarios

Extract URIs from a Given RDF

1. Include the file “**extractor.class.php**” in your program
2. Initialize a **Extractor** instance by passing a **rdfGraph**
3. Call the method **getQueryTerms()**

**Tokenize an URI into Query Terms**

Extractor can help in tokenizing URI task. To tokenize a given URI, you can use the method **tokenize(\$str)**, where the \$str is the URI that you want to tokenize.

Currently, we implements two representative tokenizers, **DelimitBasedTokenizer** and **CaseBasedTokenizer**, and the **tokenize(\$str)** applies these two tokenizers on the \$str.

## 4.2.2 Configuration Scenarios

### Set a RDF Parser

There are many RDF parsers available. In X2R, we allow developers to set or even introduce new RDF parsers for reasons, such as better performance or wider range of input formats.

Currently, we implement one wrapper, **Easy\_Rdf\_Adapter**, for EasyRdf. EasyRdf is a popular RDF parser implemented in PHP, and more information can be found in its [official site](#).

To set **Easy\_Rdf\_Adapter** as the RDF parser.

1. Initialize an instance of **Easy\_Rdf\_Adapter**
2. Initialize a **Extractor** instance by passing the instance just initialized

### Set an URI Filter

If there are some URIs that you want to ignore in the whole URI replacement process, you can use **addFilterUri(\$furi)** to incrementally build the URI filter.

You can also use **getFilteredUris()** method to get the current list of URIs that are ignored.

## 4.3 USS API Usage Scenarios

### 4.3.1 Operation Scenarios

#### Search URIs by terms

1. Include the file “**urisearchservice.class.php**” in your program
2. Initialize a **UriSearchService** instance
3. Call the method **uriSearch** with a **query string** as the parameter. After receiving all Endpoints’ responses, the **result set** is returned

### 4.3.2 Configuration Scenarios

After initializing a **UriSearchService** instance, the default components are already set. If you want to change the default setting, you can reset the components as the guidances listed below.

The configuration methods can be chained. Here is a code example.

```
include_once (urisearchservice.class.php);
$exampleUss = new UriSearchService();
//... Initialize components as $parser, $selector ...etc.
$exampleUss->setFederatedSearch($federatedSearch)
    ->setParser($parser)
    ->setProcessor($resultProcessor)
    ->setSelector($selector);
```

### Set a Parser

1. Initialize a parser
2. Assign the new parser through the method `setParser($parser)`

### Set FederatedSearch

1. Initialize a federatedSearch
2. Assign the new federatedSearch through the method `setFederatedSearch($federatedSearch)`

### Set a Result Processor (Filter and Ranker)

1. Initialize a resultProcessor
2. Assign the new resultProcessor through the method `setProcessor($resultProcessor)`

### Set a Selector

1. Initialize a selector
2. Assign the new selector through the method `setSelector($selector)`

## 4.4 Mapper API Usage Scenarios

### 4.4.1 Operation Scenarios

#### Replace Original URIs with Specified URIs

1. Include the file “`mapper.class.php`” in your program
2. Initialize a **Mapper** instance by passing a **rdfGraph**
3. Call the method `refactoring($refType, $change)`
4. Call the method `serialize($format)`

### 4.4.2 Configuration Scenarios

#### Change a Refactor (URI Replacement)

Change different refactors can let Mapper be able to do different refactoring on the given RDF. In order to decouple the **Mapper** from specific **Refactor**, their dependency is injected during runtime through the method `refactoring($refType, $change)`.

Currently, we only implement one type of **Refactor**, called **Rename** (defined in “`refaRename.class.php`”). Its corresponding change is an associative array, which saves the mapping from original URI to replaced URI. There is one example of **change** that the refactor, **Rename**, accepted.

```
$exampleChange = array('http://original.uri.1' => 'http://replaced.uri.1',  
                      'http://original.uri.2' => 'http://replaced.uri.2');
```

## Set a RDF Parser

There are many RDF parsers available. In X2R, we allow developers to set or even introduce new RDF parsers for reasons, such as better performance or wider range of input formats.

Currently, we implement one wrapper, **Easy\_Rdf\_Adapter**, for EasyRdf. EasyRdf is a popular RDF parser implemented in PHP, and more information can be found in its [official site](#).

To set **Easy\_Rdf\_Adapter** as the RDF parser.

1. Initialize an instance of **Easy\_Rdf\_Adapter**
2. Initialize a **Mapper** instance by passing the instance just initialized

## API REFERENCE

This part of the documentation dedicates to people who are looking for information on a specific function, class or method.

### 5.1 API

#### 5.1.1 Extractor

**class `Extractor`**

Extractor class is the class for modeling the URI extracting & analyzing process as below.

Step 1. Load the RDF content to a Graph data structure

Step 2. Traverse the Graph to finding all the URIs

Step 3. Transform filtered URIs to search friendly terms, where the filtered URI means the all but those URI listed in the *filtered URI list*

Step 4. Wrap these terms as a JSON output

**`getQueryTerms ()`**

Extract terms from URIs of given RDF, and wrap terms with their contextual information.

**Returns** A JSON string of terms derived from extracted URIs of a given RDF file with corresponding metadata,

including *originalURI*, *replacedURI*, *status*, *lineNumbers*.

**`getFilteredUris ()`**

Get current URI filter list.

**Returns** An array of filtered URI.

**`addFilteredUri ($furi)`**

Add the given URI, \$furi, to the URI filter list.

**Parameters**

- **`$furi`** (*string*) – The URI to be filtered

**Returns** Either false on failure, or the true for success.

**`removeFilteredUri ($furi)`**

Remove the given URI, \$furi, from the URI filter list.

**Parameters**

- **`$furi`** (*string*) – The URI to be filtered

**Returns** Either false on failure, or the true for success

### 5.1.2 RdfGraph

#### class **RdfGraph**

RdfGraph class is a standard interface for wrapping or adapting existing RDF parsers into X2R.

**parseRdf** (*\$data*)

**Parameters**

- **\$data** (*string*) – The content of RDF file.

**Returns** Either false on failure, or the true for success.

**serializeRdfAs** (*\$format*)

**Parameters**

- **\$format** (*string*) – The file format of serialized RDF.

**Returns** Either false on failure, or the string representation of serialized RDF in specified format.

### EasyRdfAdapter

#### class **EasyRdfAdapter**

EasyRdfAdapter class is an implemantion of RdfGraph. It is a warpper of an open source RDF parser - EasyRDF.

**parseRdf** (*\$data*)

**Parameters**

- **\$data** (*string*) – The content of RDF file.

**Returns** Either false on failure, or the true for success.

**Raises ValueError** Raise if the \$data cannot be parsed successfully.

**serializeRdfAs** (*\$format*)

**Parameters**

- **\$format** (*string*) – The file format of serialized RDF.

**Returns** Either false on failure, or the string representation of serialized RDF in specified format.

**Raises ValueError** The \$format is not an element of ‘supported\_format’, which includes ‘jsonld’, ‘rdfoxml’.

### 5.1.3 Tokenizer

#### class **Tokenizer**

Tokenizer class is a standard interface for X2R developers to extend X2R with new types of tokenizers. Currently, two tokenizers, i.e. CaseBasedTokenizer and DelimitBasedTokenizer, are implemented and bundled with X2R::Extractor.

**tokenizeString** (*\$str*)

**Parameters**

- **\$str** (*string*) – The string to be tokenized.

**Returns** An array of tokenized strings.

**tokenizeArrayOfStrings** (*\$arr*)

**Parameters**

- **\$arr** (*array*) – The array of strings to be tokenized

**Returns** An array of tokenized strings.

**arrayToString** (*\$arr*)

**Parameters**

- **\$arr** (*array*) – The array of strings to be tokenized

**Returns** A string which is consisted of elements from given array \$arr and is concatenated by whitespace.

## CaseBasedTokenizer

**class CaseBasedTokenizer**

CaseBasedTokenizer class

**tokenizeString** (*\$str*)

**Parameters**

- **\$str** (*string*) – The string to be tokenized.

**Returns** An array of tokenized strings.

**tokenizeArrayOfStrings** (*\$arr*)

**Parameters**

- **\$arr** (*array*) – The array of strings to be tokenized

**Returns** An array of tokenized strings.

## DelimitBasedTokenizer

**class DelimitBasedTokenizer**

DelimitBasedTokenizer class

**tokenizeString** (*\$str*)

**Parameters**

- **\$str** (*string*) – The string to be tokenized.

**Returns** An array of tokenized strings.

**tokenizeArrayOfStrings** (*\$arr*)

**Parameters**

- **\$arr** (*array*) – The array of strings to be tokenized

**Returns** An array of tokenized strings.

### 5.1.4 Refactor

#### class Refactor

Refactor is the class that reserves the flexibility for introducing new kind of RDF refactoring into this RDF analyzing and manipulation framework.

**refactoring** (*\$change*)

##### Parameters

- **\$change** (*int*) – The change spec. for the refactoring.

**Returns** Either false on failure, or the true for success.

### ReplaceUri

#### class ReplaceUri

ReplaceUri is an implemetation of Refactor class. It is the default refactoring used in X2R project. The replaceUri is to replace an existing URI with a new URI.

**refactoring** (*\$change*)

##### Parameters

- **\$change** (*int*) – The change spec. for the refactoring.

**Returns** Either false on failure, or the true for success.

### 5.1.5 MappingEntry

#### class MappingEntry

X2R's components are integrated by standard message passing, where the standard message is the *mapping from original URI, terms and replaced URI*. This MappingEntry is the class used to model one entry of such mapping message.

**MappingEntry** (*\$originalURI, \$replacedURI, \$term, \$lineNumbers*)

##### Parameters

- **\$originalURI** (*string*) – The change spec. for the refactoring.
- **\$replacedURI** (*string*) – The change spec. for the refactoring.
- **\$term** (*string*) – The change spec. for the refactoring.
- **\$lineNumbers** (*string*) – The change spec. for the refactoring.

**Returns** Either false on failure, or the true for success.

**getOriginalURI** ()

**Returns** Either false on failure, or the *Original URI* for success.

**getReplacedURI** ()

**Returns** Either false on failure, or the *Replaced URI* for success.

**getQueryTerm** ()

**Returns** Either false on failure, or the *Query Term* for success.

**getLineNumbers** ()



**Returns** Either false on failure, or the *Line Numbers* for success.

### 5.1.6 MappingCollection

**class MappingCollection**

The MappingCollection is a collection of MappingEntry. The MappingCollection object can be serialized as JSON, and serves as the integration glue among X2R's components.

**addMappingEntry** (*\$mappingentry*)

**Parameters**

- **\$mappingentry** (*MappingEntryint*) – An entry of mapping.

**Returns** Either false on failure, or the true for success.

**toJson** ()

**Returns** Serialize the collection of mappings in Json format.

### 5.1.7 Mapper

**class Mapper**

Mapper is the class for modeling the RDF transformation (refactoring) process.

Currently, the Mapper only support one kind of transformation (refactoring) - replaceURI.

The replaceURI is to replace an existing URI with a new URI..

**Mapper** (*\$graph*)

**Parameters**

- **\$graph** (*rdGraph*) – The RDF, which is holded in the rdGraph data structure, to be refactored.

**refactoring** (*\$refactorType*, *\$change*)

Based on the type of refactoring (*\$refactorType*) and the desired change (*\$change*) to conduct the refactoring on target RDF.

**Parameters**

- **\$refactorType** (*string*) – The type of refactor.
- **\$change** (*array*) – The month.

**Returns** Either false on failure, or the datetime object for method chaining.

```
//This is an example of $change
array('http://127.0.0.1/sport_center' => 'http://openisdms.iis.sinica.edu.tw/sport_center',
      'http://127.0.0.1/park' => 'http://openisdms.iis.sinica.edu.tw/park');
```

---

**Note:** Currently, only one type refactor is supported, that is, *replaceUri*. More refactors can be implemented and integrated into Mapper.

---

**serialize** (*\$format*)

Return the RDF content in the format specified by *\$format*.

**Parameters**

- **\$format** (*string*) – The format of output file.

**Returns** Either false on failure, or the string of refactored RDF's content in the specified format.

## 5.1.8 WebUtilities

**GetParameter** (*\$para*)

Get the value of HTTP GET request by parameter's name

**Parameters**

- **\$para** (*string*) – The parameter's name.

**Returns** The value of given parameter's name.

**Raises ValueError** Raise if the \$para cannot be found in the request.

## 5.1.9 USS

**class Endpoint**

Endpoint is the class for modeling the public Endpoint, such as DBpedia. (refer to [URI Search Service](#))

**issueSparqlQuery** (*\$sparqlQuery*, *\$resultFormat*)

**Parameters**

- **\$sparqlQuery** (*string*) – The SPARQL query.
- **\$resultFormat** (*string*) – The format of returned result.

**Returns** The string of result in the specified format.

**Raises NoResponseError** Raise if the timeout is reached.

**Raises ValueError** Raise if the sparql is invalid.

**class SparqlQueryComposer**

SparqlQueryComposer is a class to aggregate a variety of SPARQL composition methods. Currently, only plain text terms are supported.

**term2Sparql** (*\$term*)

Turn plain text terms to SPARQL query.

**Parameters**

- **\$term** (*string*) – The desired query term..

**Returns** The SPARQL query string.

**class Dbpedia**

Dbpedia is a wrapper of Dbpedia Endpoint.

**composeQuery** (*term*, *\$dataSourceName* = "", *\$limit* = 10, *\$filters* = array(""))

**Parameters**

- **\$term** (*string*) – The SPARQL query in plain text.
- **\$dataSourceName** (*string*) – the name of data source

- **\$limit** (*int*) – the max number of results
- **\$filters** (*array*) – an array of URIs that will be ignored

**query** (*\$sparqlQueryString*)

#### Parameters

- **\$sparqlQuery** (*string*) – The SPARQL query.

**class LinkedGeoData**

LinkedGeoData is a wrapper of LinkedGeoData Endpoint.

**composeQuery** (*term*, *\$dataSourceName* = '', *\$limit* = 10, *\$filters* = array(''))

#### Parameters

- **\$term** (*string*) – The SPARQL query in plain text.
- **\$dataSourceName** (*string*) – the name of data source
- **\$limit** (*int*) – the max number of results
- **\$filters** (*array*) – an array of URIs that will be ignored

**query** (*\$sparqlQueryString*)

#### Parameters

- **\$sparqlQuery** (*string*) – The SPARQL query.

## 5.1.10 X2R

**class X2R**

X2R models the process of translating an imperfect RDF, especially for those with invalid URIs, to RDF with relatively higher quality.

**transform** (*\$rdfGraph*, *\$configuration*)

#### Parameters

- **\$graph** (*rdfGraph*) – The RDF, which is holded in the *rdfGraph* data structure, to be refactored.
- **configuration** – to be defined.

**Returns** The refactored RDF.

## 5.1.11 Hot Spots

**class QueryRefiner**

QueryRefiner is an one-to-one adapter, which processes the raw query with the logics defined in it. A variety of refinement heuristics or methods can be introduced into X2R through extending this class.

**refine** (*\$query*)

#### Parameters

- **\$query** (*string*) – The query that is directly extracted and tokenized from original URI.

**Returns** The refined query.

**class SearchResultSelector**

SearchResultSelector is a many-to-one selector, which selects one fittest result from a given result set. A variety of fitness function can be introduced into X2R through extending this class.

**select** (*\$resultSet*)

**Parameters**

- **\$resultSet** (*array*) – A given result set.

**Returns** The fittest result.

## HOOKS

Targeted Audience: **Code contributors**

This section focuses on two topics, i.e. **hook templates** and **hook instances**. The term “hook” is used to present the cookbook or guidance for extending X2R in many different aspects. Because some hooks are similar to each other, the hook templates are extracted based on the similarity among existing hooks. Extracted hook templates can be used to instantiate more hook instances to cover more aspects for increasing X2R’s flexibility.

### Hook Templates

## 6.1 Template: Add USS Components

### 6.1.1 Involved Classes

{List of involved classes with links}

### 6.1.2 Mechanism

1. Based on component’s type, create a new class in `/USS/{component_type}/`
2. Based on the component’s type, the new class should extends corresponding parent class
3. Open `ussContainer.class.php`, and add the dependency by adding “`include_once`” statement in it
4. Based on component’s type, find corresponding method and add the `{id, class_factory}` mapping to the method’s switch/case block.

### 6.1.3 Instances

- *Add a new refiner*
- *Add a new filter*
- *Add a new ranker*
- *Add a new selector*
- *hook\_query\_parser*

### Hook Instances

## 6.2 Add a new Endpoint

### 6.2.1 Involved Classes

Endpoint.class.php

### 6.2.2 Mechanism

1. Create a new class in /USS/endpoints
2. The new class should extends Endpoints

### 6.2.3 Example

- Dbpedia
- LinkedGeoData

## 6.3 Add a new RDF refactor

### 6.3.1 Involved Files

Refactor.class.php

### 6.3.2 Mechanism

1. Create a new class in /EM/
2. The new class should extends Refactor

### 6.3.3 Example

- ReplaceUri

## 6.4 Add a new selector

### 6.4.1 Involved Files

Resultselector.class.php, UssContainer.php

### 6.4.2 Mechanism

1. Create a new class in /USS/selector/
2. The new class should extends ResultSelector, for example 'newSelector.class.php'

3. Open `ussContainer.class.php`, and add the dependency by adding “`include_once selector/newSelector.class.php;`” statement in it
4. Add a case block of the new class into `getSelector()` method’s switch block

### 6.4.3 Template

*Template: Add USS Components*

## 6.5 Add a new ranker

### 6.5.1 Involved Files

`ResultRanker.class.php`, `UssContainer.php`

### 6.5.2 Mechanism

1. Create a new class in `/USS/ranker/`
2. The new class should extends `ResultRanker`, for example ‘`newRanker.class.php`’
3. Open `ussContainer.class.php`, and add the dependency by adding “`include_once ranker/newRankerclass.php;`” statement in it
4. Add a case block of the new class into `getRanker()` method’s switch block

### 6.5.3 Template

*Template: Add USS Components*

## 6.6 Add a new refiner

### 6.6.1 Involved Files

`QueryRefiner.class.php`, `UssContainer.php`

### 6.6.2 Mechanism

1. Create a new class in `/USS/refiner/`
2. The new class should extends `QueryRefiner`, for example ‘`newRefiner.class.php`’
3. Open `ussContainer.class.php`, and add the dependency by adding “`include_once refiner/newRefiner.class.php;`” statement in it
4. Add a case block of the new class into `getRefiner()` method’s switch block

### 6.6.3 Template

*Template: Add USS Components*

## 6.7 Add a new filter

### 6.7.1 Involved Classes

ResultFilter.class.php, UssContainer.php

### 6.7.2 Mechanism

1. Create a new class in /USS/filter/
2. The new class should extends ResultFilter, for example 'newFilter.class.php'
3. Open `ussContainer.class.php`, and add the dependency by adding "`include_once filter/newFilter.class.php;`" statement in it
4. Add a case block of the new class into `getFilter()` method's switch block

### 6.7.3 Template

*Template: Add USS Components*

## 6.8 Add a wrapper for new RDF parser

### 6.8.1 Involved Classes

rdfGraph.class.php

### 6.8.2 Mechanism

1. Create a new class in /EM/
2. The new class should extends `rdfGraph`

### 6.8.3 Example

- `EasyRdfAdapter`

## 6.9 Add a new tokenizer

### 6.9.1 Involved Classes

Tokenizer.class.php



### 6.9.2 Mechanism

1. Create a new class in `/EM/`
2. The new class should extends `Tokenizer`

### 6.9.3 Example

- `CaseBasedTokenizer`
- `DelimitBasedTokenizer`



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*Version 3, 29 June 2007*

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```
<one line to give the program's name and a brief idea of what it does.> Copyright (C) <year>
<name of author>
```

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```
<program> Copyright (C) <year> <name of author> This program comes with ABSOLUTELY
NO WARRANTY; for details type show w. This is free software, and you are welcome to
redistribute it under certain conditions; type show c for details.
```

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## 7.2 Conventions

### 7.2.1 Coding Style

This project follows the Python official coding style [PSR-2](#).

### 7.2.2 Versioning

The versioning follows [Semantic Versioning 2.0](#).

Here quote the summary of Semantic Version below:

Given a version number MAJOR.MINOR.PATCH, increment the:

MAJOR version when you make incompatible API changes, MINOR version when you add functionality in a backwards-compatible manner, and PATCH version when you make backwards-compatible bug fixes.

Additional labels for pre-release and build metadata are available as extensions to the MAJOR.MINOR.PATCH format.

### 7.2.3 Documentation

For documentation, this project uses [Sphinx](#), which is a Python documentation generator. The syntax used in Sphinx is [reStructuredText](#).

Here is a full code comment example quoted from **'Documenting Your Project Using Sphinx'**.

## HTTP ROUTING TABLE

**/extractor{?excludedNamespaces,  
checkUriStatus, rdfContent}**

POST /extractor{?excludedNamespaces,  
checkUriStatus, rdfContent},??

**/mapper{?rdfContent, mapping, for-  
mat}**

POST /mapper{?rdfContent, mapping,  
format},??