Towards Federated Referatories

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http://dret.net/projects/bibtexml/

Abstract

Metadata usage often depends on schemas for metadata, which are important to convey the meaning of the metadata. We propose an architecture where users can extend the schema used by a system for managing referential metadata. Users can plugin new schemas and install custom filters for exporting metadata, so that users are not forced to limit their metadata to a fixed schema. The goal of this architecture is to provide users with a system that helps them managing their referatory, enables them with powerful tools to adapt the tool to their metadata, and still makes it possible to collect the metadata of several users in a central storage and exploit the common facets of the metadata. Our system is based on a specialized schema language, which has been built on top of the XML schema languages XML Schema and Schematron.

Outline

- Referatories and our Goals
- BibTeXML Metadata Management Tool
- BibSchema Language
- Implementation
- Q&A

What is Metadata?

- data about existing resources
  - describing the resources
  - using pre-defined schemas for description
    - metadata without a schema is not very useful

1. metadata using standardized schemas
   - semantics are (often...) strictly defined
   - limited vocabulary, trade-off usability/complexity
2. metadata using proprietary schemas
   - defined by users or user groups
   - optimized for the requirements of a closed group
     - easy to use for the schema's creators
     - hard to use and understand for other people
   - possible mappings to metadata standards

Where is Metadata?

- inside people's heads
  - some of it would be rather easy to formalize
  - other things are very vague and hard to formalize
- in people's notes
  - people forget, so they try to save their metadata
  - note "schemas" are informal and dynamic
  - notes are hard to formalize and classify
- on people's computers
  - many users keep text files for notes
  - others use existing applications
  - bibliographies are collections of metadata

Our Goals

- people know a lot about resources
  - much of this information is inaccessible
  - some is machine-readable, but off-line
- help people manage their metadata
  - giving them powerful tools
- help people share their metadata
  - show them that sharing helps them and others
- don't be dogmatic about metadata schemas
  - people use different schemas
  - don't hardcode metadata schemas
- reduce coding as much as possible
  - less coding makes software more flexible

Referatories

- a collection of references to resources
  - ISBN numbers
  - ISSN numbers, volume(number) and pages
  - URIs (Web browser bookmarks)
    - there are dozens of existing URI schemes
  - basically, anything that can be referred to
- many referatories contain metadata
  - authors of books
  - mirrors of Web pages
  - language information about resources
  - abstracts of papers
  - keywords describing resources

BibTeX as Metadata

- many people keep BibTeX files
  - for their bibliographic references
  - for references to other resources
- BibTeX is extensible (+)
  - unknown fields are ignored by BibTeX
  - fields may have any content (HTML, XML, ...)
- BibTeX is strange and fuzzy (-)
  - BibTeX schema is not nicely designed
  - some handling is buried in BibTeX style files
  - people use BibTeX differently
    - author and editor fields
    - inbook and incollection entry types

How to collect Metadata?

- convince rather than force people
  - give them tools that are attractive
  - design the tools so that people like them
    - … and that the tools create re-usable metadata
- many people don't like centralized systems
  - many years of work go into the bibliography
  - they want to "keep it"
- design centralized schemas
  - people use their local data (but centralized schemas)
  - people can register and use schema extensions
    - designed by them (unknown to anybody else)
    - designed by a group (used in a closed community)

BibTeX Example

```
@misc{xmlns10,
    author =         "Tim Bray and Dave Hollander and Andrew Layman",
    title =          "Namespaces in XML",
    howpublished =  "W3C, REC-xml-names-19990114",
    month =          "January",
    year =           1999,
    uri =            "http://www.w3.org/TR/1999/REC-xml-names-19990114",
    topic =          "xml[0.8] xmlns[1]" }
```

Why not use BibTeX?

- BibTeX is weird
  - many things are "defined by the program"
    - there is no authoritative BibTeX grammar
    - name handling uses clever but complex rules
  - character handling is very TeX-specific
  - structured fields are hard to implement
    - requiring some non-BibTeX syntax
  - defining new schemas is very hard
    - must be programmed in a BibTeX style file
- not a lot of BibTeX software is available
  - BibTeX (the program) and bibclean
- XML is the standard for structured data
  - many tools available (schema languages, XSLT, ...)

BibTeXML

- XML-based language for referatories
  - many tools for working with XML
- based on a specific schema language
  - completely configurable
  - mapping the schema language to others
    - reduce the amount of programming
    - much easier to port to other platforms

BibTeXML Entry Example

```
<s:misc key="xmlns10">
 <s:author>
  <b:bibperson>
   <b:firstname>Tim</b:firstname><b:lastname>Bray</b:lastname>
  </b:bibperson>
 </s:author>
 ...
 <s:title>Namespaces in XML</s:title>
 <s:howpublished>W3C, REC-xml-names-19990114</s:howpublished>
 <s:month>January</s:month>
 <s:year>1999</s:year>
 <u:uri>http://www.w3.org/TR/1999/REC-xml-names-19990114</u:uri>
 <t:topics>
  <t:topic name="xml" weight="0.8"/>
  <t:topic name="xmlns" weight="1"/>
 </t:topics>
</s:misc>
```

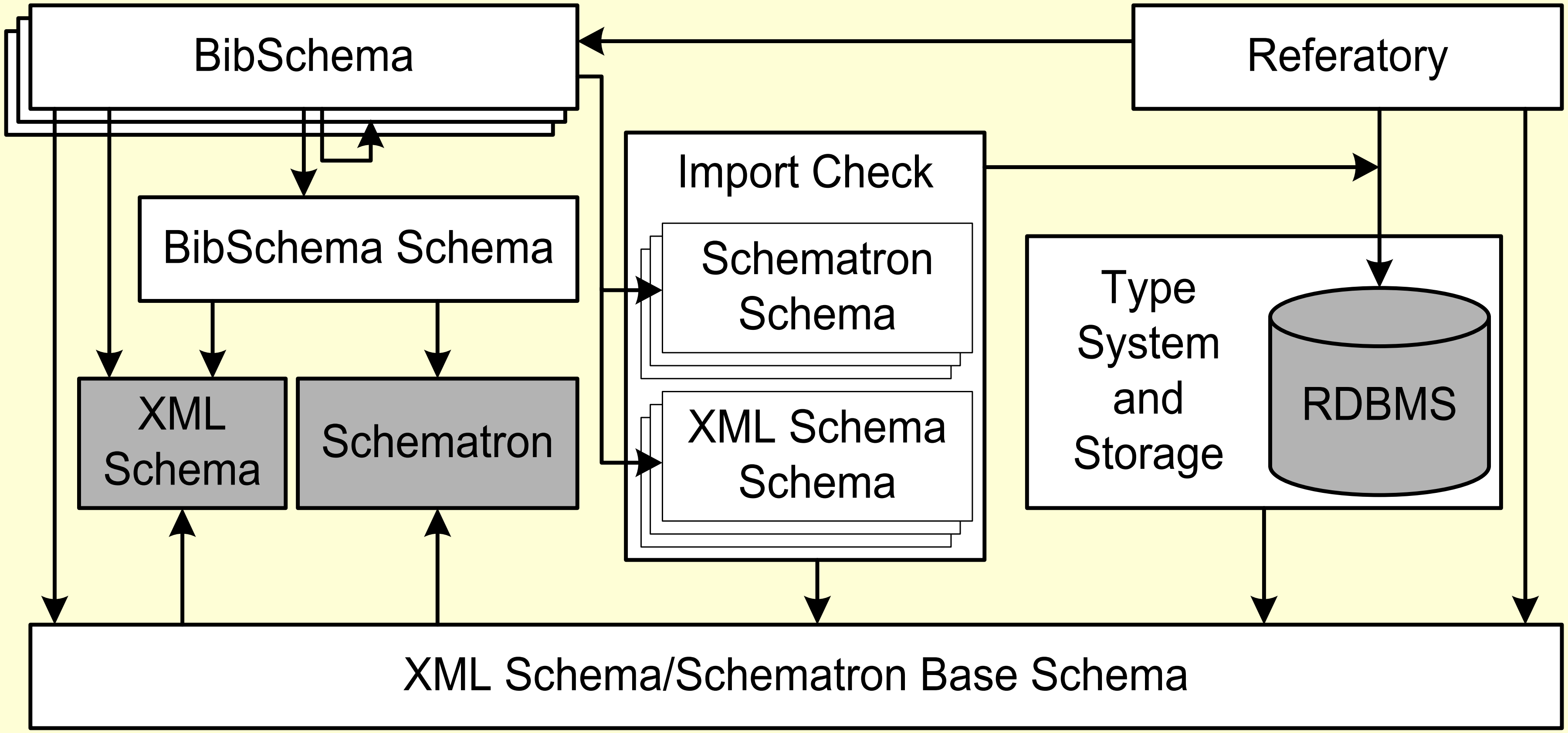
BibSchema

- do not hardcode any metadata schema
- schema language for metadata
  - entry types for metadata "records"
  - entry fields for record "contents"
  - field formats for content "structure"
- entry types defined by field occurrences
  - small grammar-like vocabulary
  - referring to field definitions
  - additional fields are always legal
- entry fields defined by allowed content
  - some special cases (for example, persons)
  - in general, a XML Schema type definition

BibSchema Example

```
<bs:schema xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:bs="http://dret.net/xmlns/bibtexml/bibschema"
    defaultRefAndTargetNS="http://dret.net/xmlns/bibtexml/standard">
 <bs:entry name="misc">
  <bs:minOne>
   <bs:field ref="author"/>
   <bs:field ref="title"/>
   <bs:field ref="howpublished"/>
   <bs:field ref="month"/>
   <bs:field ref="year"/>
   <bs:field ref="note"/>
  </bs:minOne>
 </bs:entry>
 <bs:field name="author" isPerson="true" repeatable="true"/>
 <bs:field name="title" isSpecialText="true"/>
 <bs:field name="month">
  <restriction base="string">
   <enumeration value="January"/> ...
```

BibSchema Basic Design



BibSchema Usage

- server is based on one schema
  - the main schema of the referatory
- additional schemas may be installed
  - supporting additional metadata in entries
- metadata may be exported
  - in native XML format
  - in any other format generated by XSLT

BibSchema Extension Example

```
<bs:schema xmlns="http://www.w3.org/2001/XMLSchema"
           xmlns:bs="http://dret.net/xmlns/bibtexml/bibschema"
           defaultRefAndTargetNS="http://dret.net/xmlns/bibtexml/topic">
 <bs:field name="topics">
  <sequence>
   <element name="topic" maxOccurs="unbounded">
    <complexType>
     <attribute name="name" type="NCName"/>
     <attribute name="weight">
      <simpleType>
       <restriction base="decimal">
        <minInclusive value="0"/>
        <maxInclusive value="1"/>
        <fractionDigits value="1"/>
       </restriction>
      </simpleType>
     </attribute>
    </complexType>
   </element>
  </sequence>
 </bs:field>
</bs:schema>
```

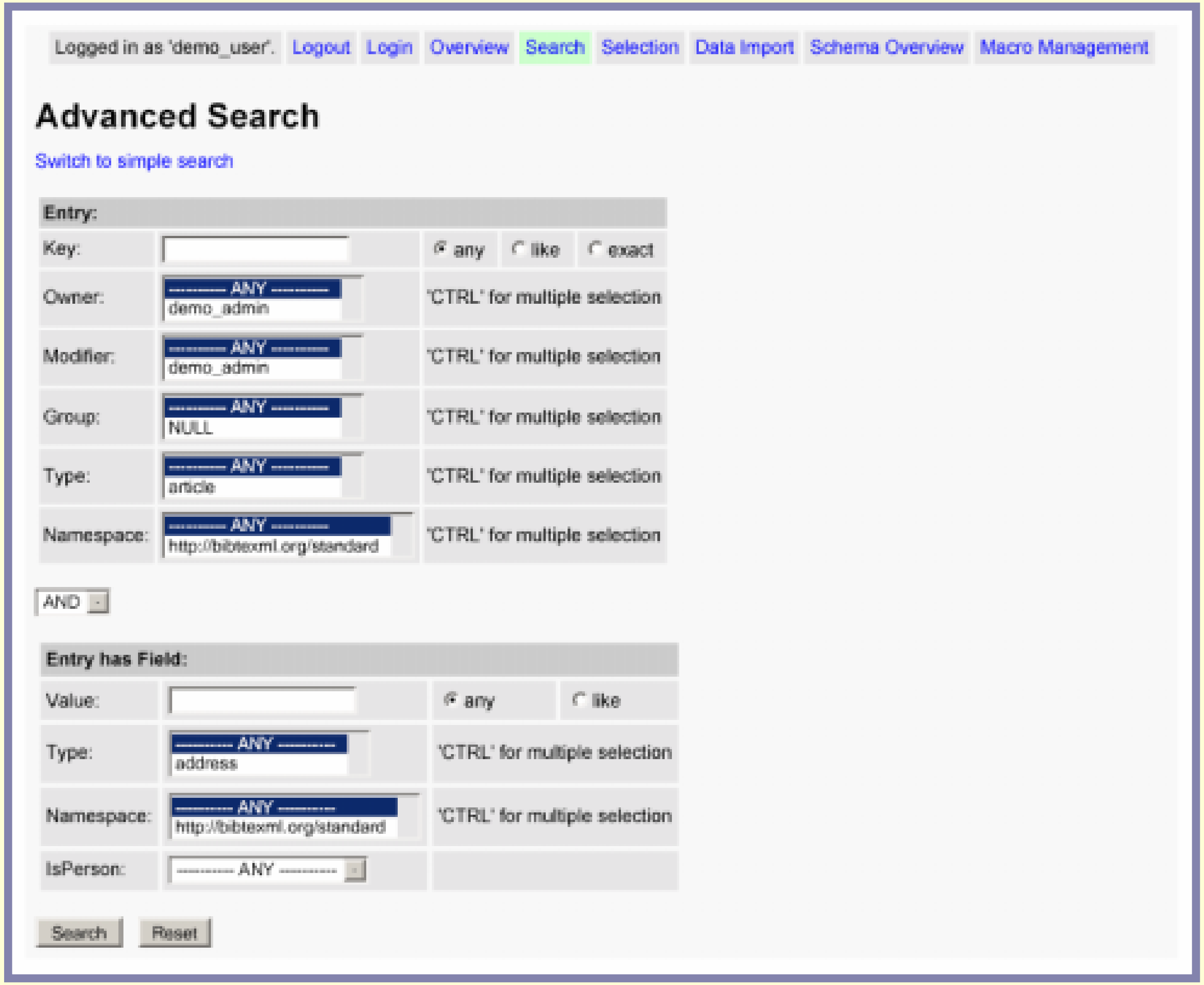
BibTeXML Entry Example

```
<b:bibliography xmlns:b="http://dret.net/xmlns/bibtexml/base"
   xmlns:s="http://dret.net/xmlns/bibtexml/standard"
   xmlns:t="http://dret.net/xmlns/bibtexml/topic"
   xmlns:u="http://dret.net/xmlns/bibtexml/uri">
 <b:entries>
  <s:misc key="xmlns10">
   <s:author>
    <b:bibperson>
     <b:firstname>Tim</b:firstname><b:lastname>Bray</b:lastname>
    </b:bibperson>
   </s:author>
   ...
<s:title>Namespaces in XML</s:title>
   <s:howpublished>W3C, REC-xml-names-19990114</s:howpublished>
   <s:month>January</s:month>
   <s:year>1999</s:year>
   <u:uri>http://www.w3.org/TR/1999/REC-xml-names-19990114</u:uri>
   <t:topics>
    <t:topic name="xml" weight="0.8"/>
    <t:topic name="xmlns" weight="1"/>
   </t:topics>
  </s:misc>
 </b:entries>
</b:bibliography>
```

System Implementation

- based on a standard LAMP implementation
  - Linux/Apache/MySQL/PHP
  - very simple Web-based interfaces
- user interface
  - data import
  - data export using transformations
  - searching in the database
- management interface
  - all normal user functions
  - managing supported schemas
  - managing export formats
  - managing users and user groups

Search Interface



Logged in as 'demo_user'. Logout Login Overview Search Selection Data Import Schema Overview Macro Management

Advanced Search

Switch to simple search

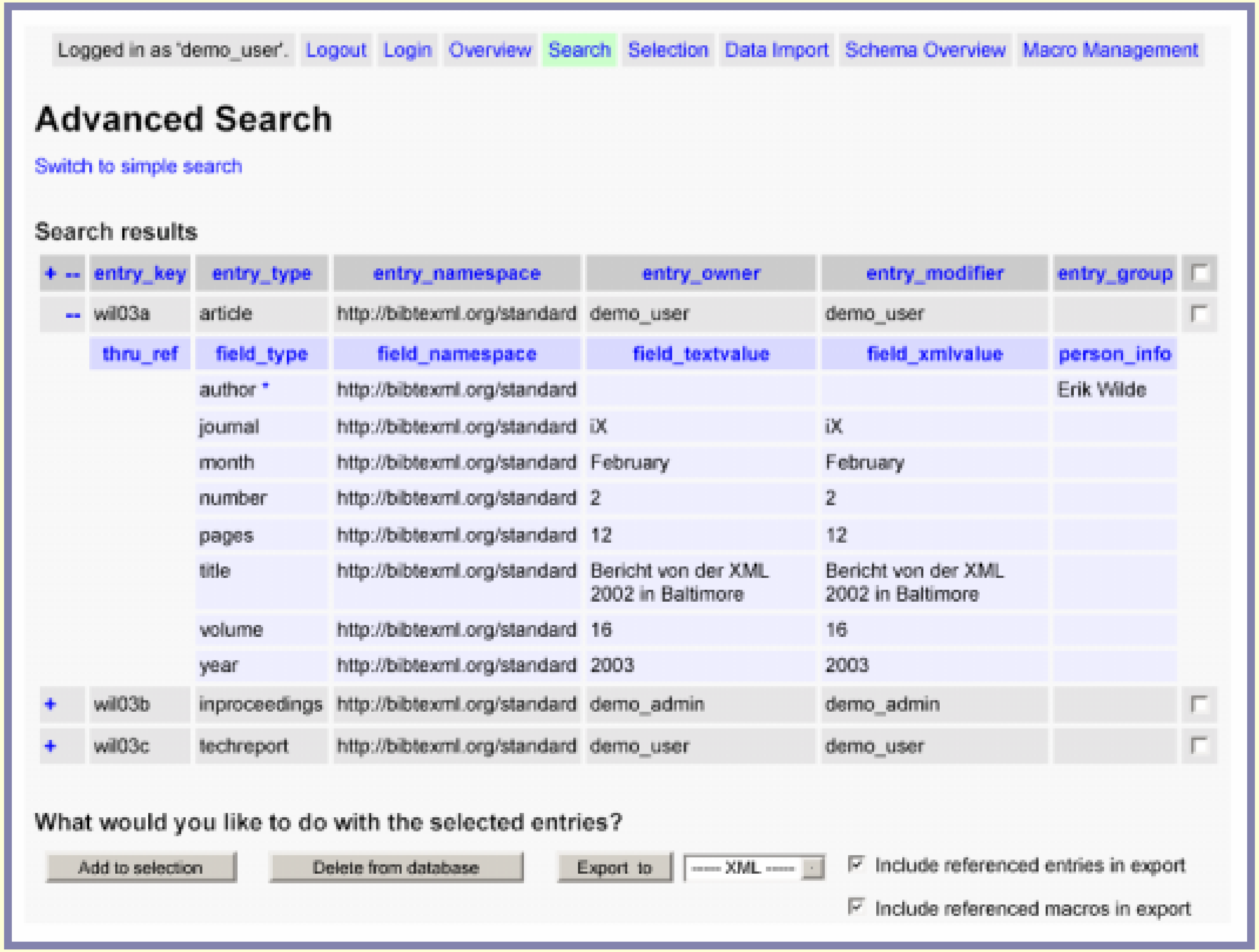
Entry:		
Key:		● any ○ like ○ exact
Owner:	---------- ANY ---------- demo_admin	'CTRL' for multiple selection
Modifier:	---------- ANY ---------- demo_admin	'CTRL' for multiple selection
Group:	---------- ANY ---------- NULL	'CTRL' for multiple selection
Type:	---------- ANY ---------- article	'CTRL' for multiple selection
Namespace:	---------- ANY ---------- http://bibtexml.org/standard	'CTRL' for multiple selection

AND

Entry has Field:		
Value:		● any ○ like
Type:	---------- ANY ---------- address	'CTRL' for multiple selection
Namespace:	---------- ANY ---------- http://bibtexml.org/standard	'CTRL' for multiple selection
IsPerson:	---------- ANY ----------	

Search Reset

Search Result Interface



Logged in as 'demo_user'. Logout Login Overview Search Selection Data Import Schema Overview Macro Management

Advanced Search

Switch to simple search

Search results

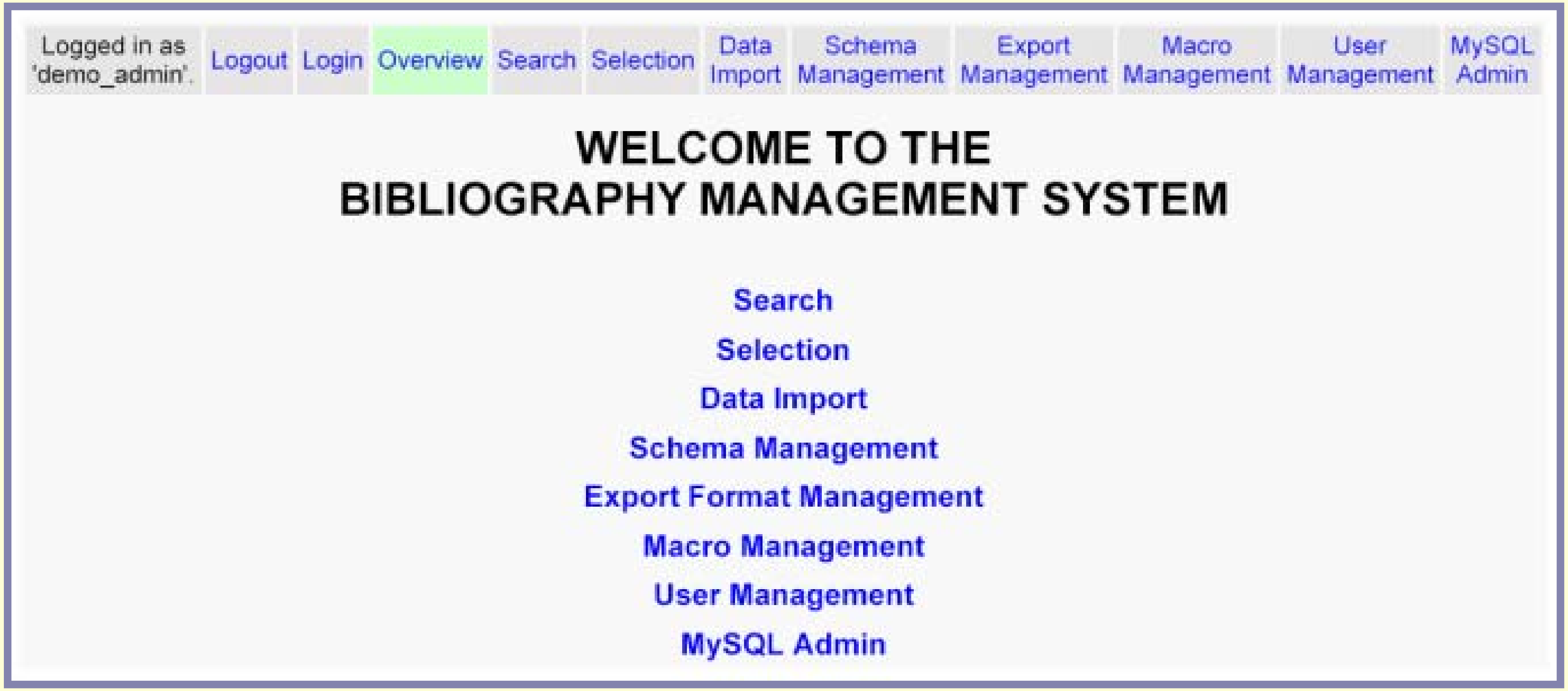
+ --	entry_key	entry_type	entry_namespace	entry_owner	entry_modifier	entry_group	□
--	wil03a	article	http://bibtexml.org/standard	demo_user	demo_user		□
	thru_ref	field_type	field_namespace	field_textvalue	field_xmlvalue	person_info	
		author *	http://bibtexml.org/standard			Erik Wilde	
		journal	http://bibtexml.org/standard	iX	iX		
		month	http://bibtexml.org/standard	February	February		
		number	http://bibtexml.org/standard	2	2		
		pages	http://bibtexml.org/standard	12	12		
		title	http://bibtexml.org/standard	Bericht von der XML 2002 in Baltimore	Bericht von der XML 2002 in Baltimore		
		volume	http://bibtexml.org/standard	16	16		
		year	http://bibtexml.org/standard	2003	2003		
+	wil03b	inproceedings	http://bibtexml.org/standard	demo_admin	demo_admin		□
+	wil03c	techreport	http://bibtexml.org/standard	demo_user	demo_user		□

What would you like to do with the selected entries?

☑ Include referenced entries in export

☑ Include referenced macros in export

Management Interface



Logged in as 'demo_admin'.	Logout	Login	Overview	Search	Selection	Data Import	Schema Management	Export Management	Macro Management	User Management	MySQL Admin

WELCOME TO THE
BIBLIOGRAPHY MANAGEMENT SYSTEM

Search

Selection

Data Import

Schema Management

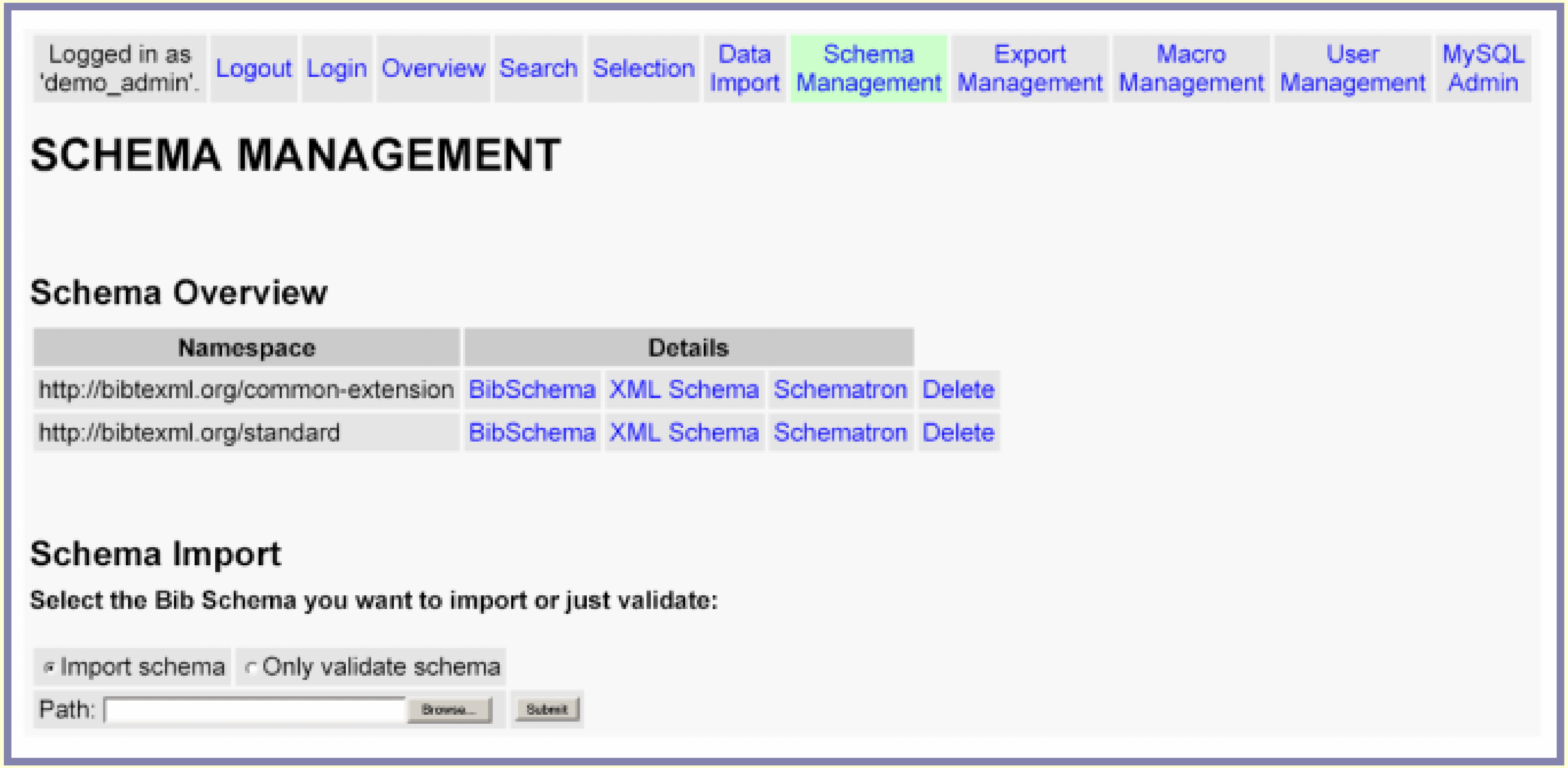
Export Format Management

Macro Management

User Management

MySQL Admin

Metadata Schema Management



SCHEMA MANAGEMENT

Schema Overview

Namespace	Details			
http://bibtexml.org/common-extension	BibSchema	XML Schema	Schematron	Delete
http://bibtexml.org/standard	BibSchema	XML Schema	Schematron	Delete

Schema Import

Select the Bib Schema you want to import or just validate:

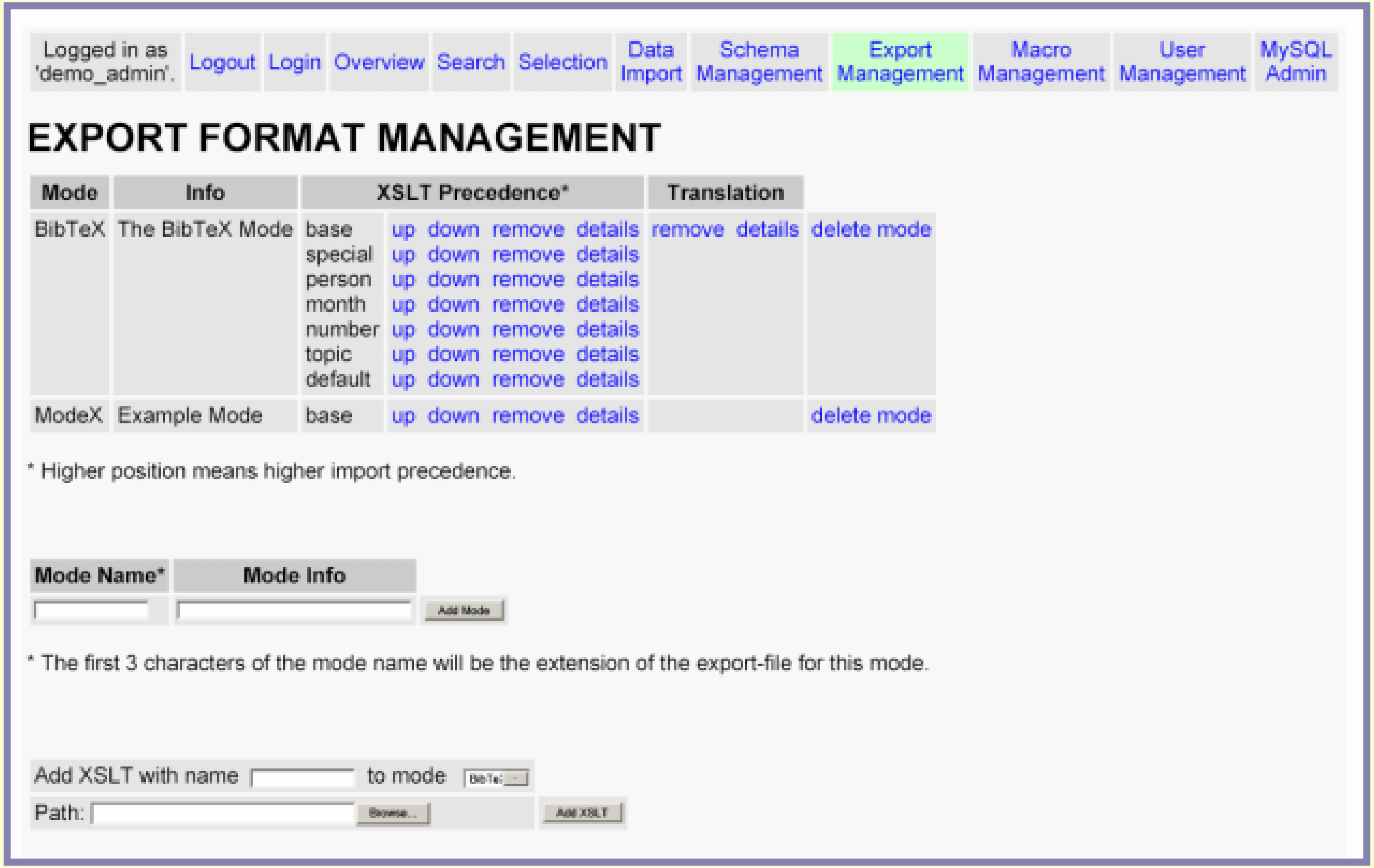
● Import schema ○ Only validate schema

Path:

Metadata Schema Import

1. the BibSchema is uploaded
   - only allowed for administrators
2. converted using XSLT into two schemas
   - an XML Schema describing the fields
   - a Schematron schema describing constraints
3. all three schemas are installed
   - can be reviewed by administrators
4. uploading entries uses the schemas
   - conceptually: BibSchema validation
   - implementation: XML Schema & Schematron
     - currently very slow (XSLT is very slow)

Export Format Management



EXPORT FORMAT MANAGEMENT

Mode	Info	XSLT Precedence*		Translation	
BibTeX	The BibTeX Mode	base	up down remove details	remove details	delete mode
		special	up down remove details		
		person	up down remove details		
		month	up down remove details		
		number	up down remove details		
		topic	up down remove details		
		default	up down remove details		
ModeX	Example Mode	base	up down remove details		delete mode

* Higher position means higher import precedence.

Mode Name*	Mode Info	
		Add Mode

* The first 3 characters of the mode name will be the extension of the export-file for this mode.

Add XSLT with name ______ to mode BibTeX

Path: ______

Export Formats

- collections of XSLT programs
  - and translation tables
- export format is a container XSLT
  - generated on the fly for export requests
  - importing a number of installed XSLTs
  - import precedence can be configured
- encouraging re-use of XSLT modules
- translation tables are simple XML documents
  - XML is based on Unicode (90'000 characters)
  - export formats often are more limited
  - a set of mappings (e.g., ä → \"{a})

Conclusions

- supporting metadata handling
  - better management of their own metadata
  - access to metadata of others
  - easy conversion to different formats
    - BibTeX for writing papers
    - HTML for having it available online
    - HTML for using it as bookmarks
    - RDF for shipping it to partners
- prototype implementation
  - performance problems for large data volumes
  - management functions need to be improved
  - central service provision would be ideal

Thank You! — Q&A

Project Page: http://dret.net/projects/bibtexml/

Paper: http://dret.net/netdret/publications#wil03j