EUROMUSE: A web-based system for the management of MUSEum objects and their interoperability with EUROpeana

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Chania, November 2011

Overview

- **Motivation**
- Contribution
- Background technologies
- Functional specification
- The ESE-CHO Application Profile
- System Architecture
- GUI Design Specification
- Implementation
- Evaluation
- Conclusion

Motivation

- Expansion of the traditional model of museums to include high resolution images of their exhibits
  - Acceleration in the digitization of information.
  - Increasing capacity of digital information storage.
- Interconnection of museum objects with the outside world for exploration from any place with Internet connectivity
- Museums don't have the ability to purchase a complex system for **publishing**, **organizing** and **authoring** museum objects
- Lack of semantic linkage with already published global vocabularies
- Lack of a system that supports standard-based metadata description of museum objects

Motivation

- **Europeana foundation**
  - Started by the presidents of major European nations
  - Financed by the member states and eu programs
- **Europeana internet portal**
  - web portal exposing increasingly impressive amounts of digitized cultural heritage objects from various sources throughout Europe.
- **Main purpose**: enable people to explore the digital resources of Europe's museums, libraries, archives and audio-visual collections.
- Contribution from 1500 European institutions (Louvre, British Library)
- More than 15.000.000 items

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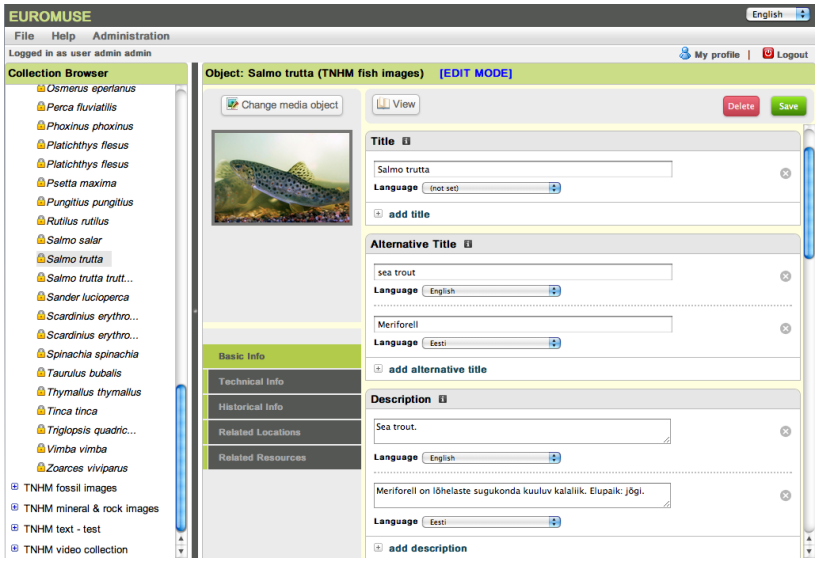
Contribution

- **EuroMuse**
  - Allows the publishing of cultural heritage objects
  - Facilitates the authoring and metadata enrichment of cultural heritage objects
  - Establishes the interoperability between museums and Europeana
  - Provides seamless ingestion of legacy metadata.



Contribution

- Main features
  - Web-based management system
  - Shared access for multiple users with concurrency control mechanisms
  - Supports a rich metadata element set(ESE-CHO Application Profile)
  - Semantic linkage of the objects with well-established controlled vocabularies
  - Supports a variety of the most popular multimedia formats.

Contribution

- Developed in the context of Natural Europe project.
  - Connect the digital collections of *European Natural History Museums* with *Europeana*
- Used by NHMs
  - Natural History Museum of Crete
  - National Museum of Natural History
  - Jura-Museum Eichstaett
  - Arctic-Center
  - Estonian Museum of Natural History
  - Hungarian Natural History Museum
- Already includes over 2000 fully described museum objects
- Target:16.000 museum objects

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Background technologies

- **XML/XML Schema**
  - Set of rules for encoding documents in machine-readable form.
  - Description of a type of xml document.
- **XML Beans**
  - Java to XML binding framework
- **RDF**
  - Standard language for representing information about resources in the World Wide Web
- **Europeana Semantic Elements (ESE)**
- **Google Web Toolkit (GWT)**
- **Simple Knowledge Organization System (SKOS)**

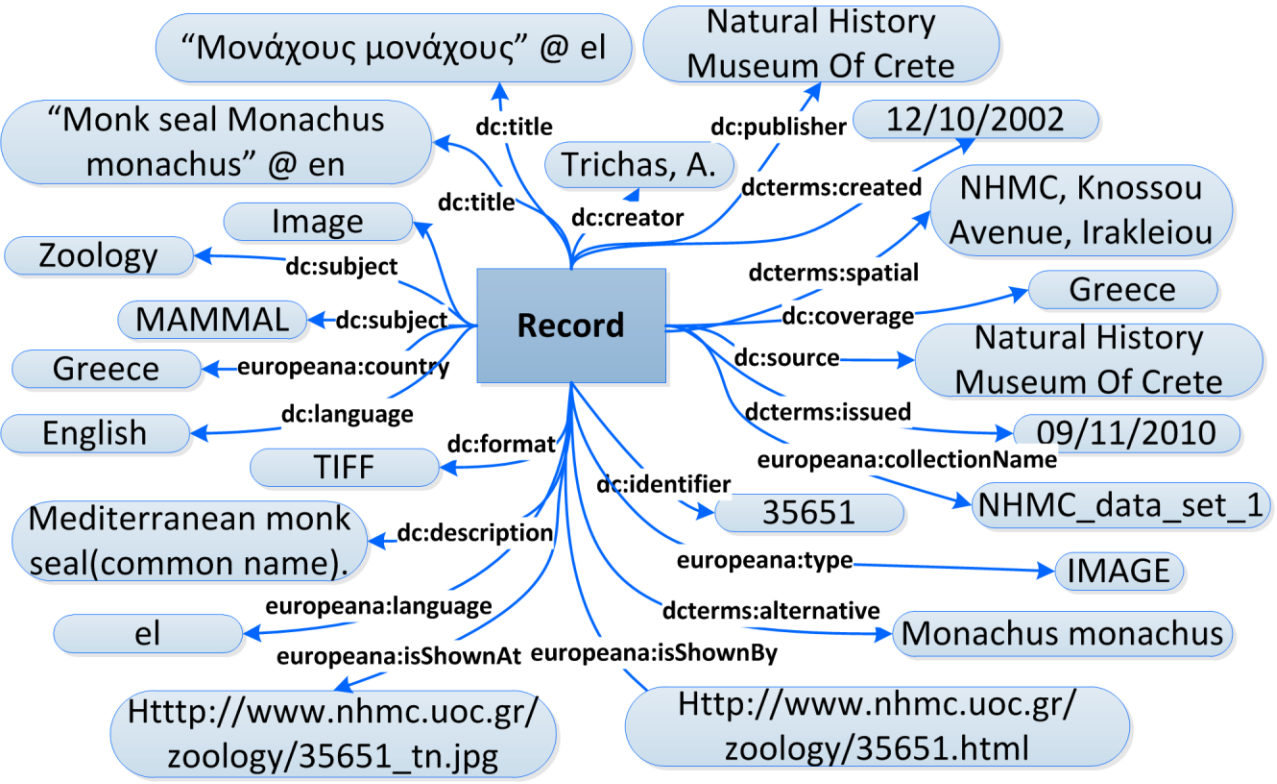
Europeana Semantic Elements (ESE)

- Dublin-Core based application profile
- Generic terms applied to heterogeneous materials
- Metadata as simple text descriptions

Mandatory elements	Recommended elements	Optional elements	Elements supplied by Europeana
dc:title	dcterms:alternative	dc:format	europeana:country
dc:description	dc:creator	dcterms:extent	europeana:language
dc:language	dc:contributor	dcterms:medium	europeana:uri
europeana:dataProvider	dc:date	dc:identifier	europeana:usertag
europeana:isShownAt	dcterms:created	dc:rights	europeana:year
europeana:isShownBy	dcterms:issued	dcterms:provenance	
europeana:provider	dcterms:temporal	dc:relation	
dc:subject	dc:publisher	dcterms:conformsTo	
dc:type	dc:source	dcterms:hasFormat/isFormatOf	
dc:coverage	dcterms:isPartOf	dcterms: hasVersion/isVersionOf	
dcterms: spatial	europeana:object	dcterms:isReferencedBy/references	
europeana:rights		dcterms:hasPart	
europeana:type		dcterms:isReplacedBy/replaces	
		dcterms:isRequiredBy/requires	
		dcterms:tableOfContents	
		europeana:unstored	

Europeana Semantic Elements (ESE)

- Example




```
<metadata>
 <record>
  <dc:coverage>Greece</>
  <dc:creator>Trichas, A.</>
  <dcterms:issued>09/11/2010</>
  <dc:description>Mediterranean monk seal</>
  <dc:format>TIFF</>
  <dc:identifier>35651</>
  <dc:language>English</>
  <dc:publisher>Natural History Museum,Crete</>
  <dc:rights>NHMC</>
  <dc:source>Natural History Museum,Crete</>
  <dc:subject>Zoology</>
  <dc:subject>MAMMAL</>
  <dc:title>Monk seal Monachus monachus</>
  <dc:type>Image</>
  <dcterms:alternative>Monachus monacus</>
  <dcterms:created>12/10/2002</>
  <dc:spatial>NHMC,Knossou Avenue,Irakleiou</>
  <dc:collectionName>NHMC data_set_1</>
  <europeana:country>Greece</>
  <europeana:dataProvider:>NHMC</>
  <europeana:isShownBy>http://nhmc.uoc.gr/
                       35651.html</>
  <europeana:language>el</>
  <europeana:object>http://nhmc.uoc.gr/
                    35651_tn.jpg</>
  <europeana:type:>IMAGE</>
 </record>
</metadata>
```

Google Web Toolkit (GWT)

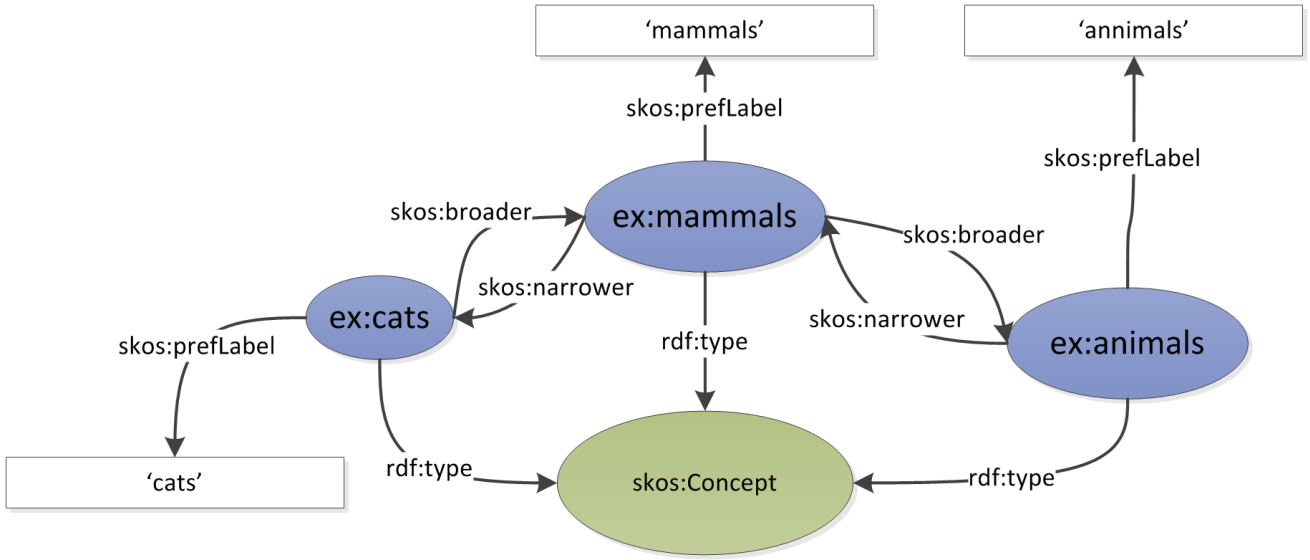
- What is GWT?
  - framework for Rich Internet Applications (RIA)
    - web application with desktop characteristics
    - extensive use of Ajax
    - enhanced interactivity and improved user experience
    - Better responsiveness and information flow
  - Provides a set of core Java APIs to write RIAs.
  - Compiles client-side Java code to highly optimized cross-browser compatible JavaScript.
  - Developed and used by Google.
  - Open source and completely free.
- Recommended by Europeana

Google Web Toolkit (GWT)

- Why use GWT?
  - UI development similar to Swing (desktop applications).
  - No need to write HTML / JavaScript, but can if desired.
  - Use CSS for formatting.
  - Full IDE support – easy development and debugging.
  - Send complex Java types to and from the server
    - Data gets serialized across network.
  - Documentation
- Learning Time
- Slow compilation

Simple Knowledge Organization System (SKOS)

- Model for **expressing** the basic structure and content of *thesauri*, *classification schemes*, *taxonomies*, or any other type of *structured controlled vocabulary*.
  - RDF format
  - concepts can be composed and published on the Web
  - machine readable and linked with data on the Web
- Concept
- skos:prefLabel
  skos:altLabel
  skos:broader
  skos:narrower
  etc.



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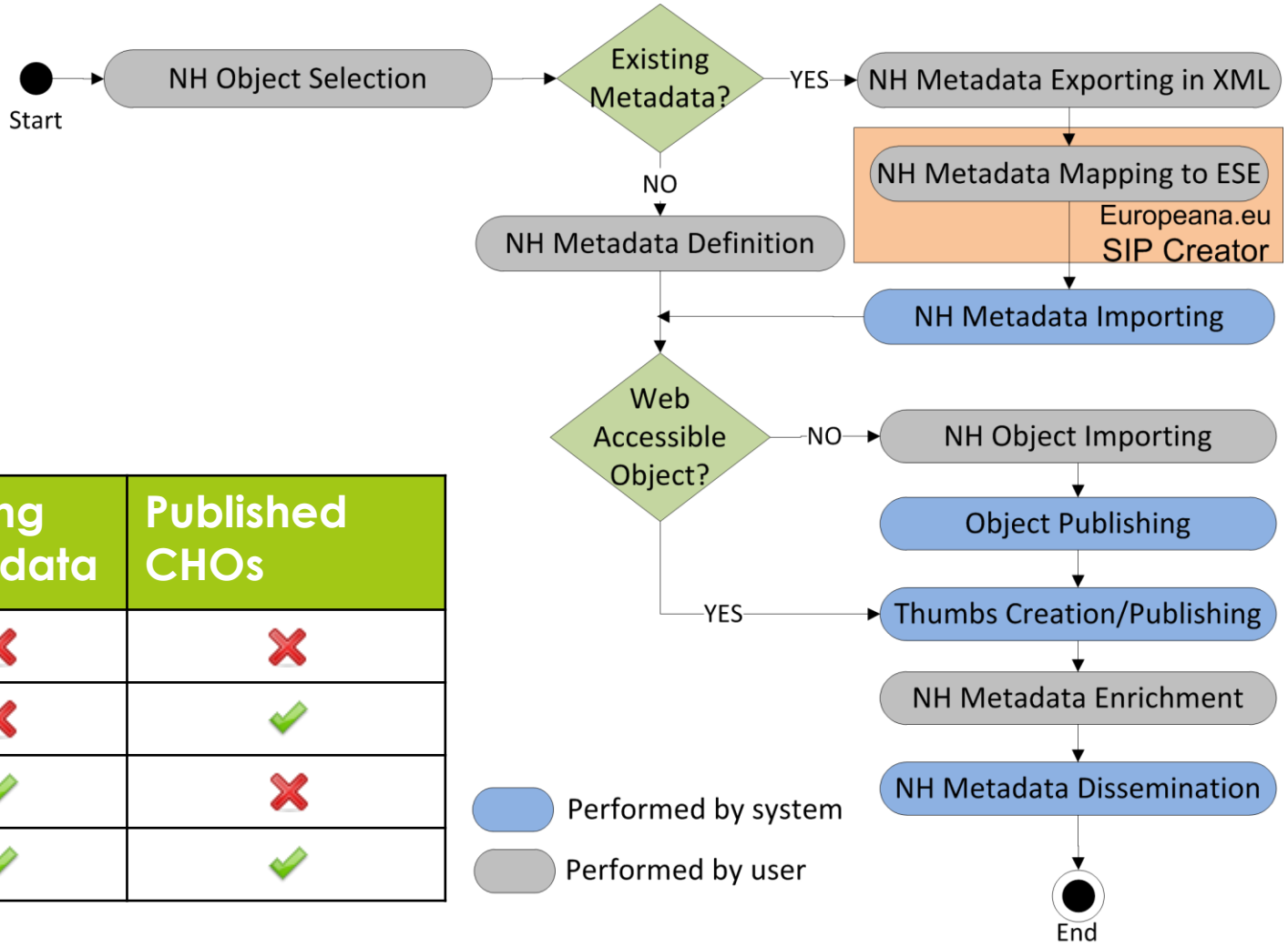
Functional requirements

- Easy to install/use
- Empower the collaboration among curators
- Metadata Unification
- CHO Publishing
- Thumbnail creation
- Multilingual tool
- Semantic linkage with well-established controlled vocabularies
- Schema-independent
- Flexibility and modularity
- Highly customizable

Functional requirements

- Create-Read-Update-Delete (CRUD)
  - CHO
  - CHO Metadata
  - CHO Collection
  - CHO Collection Metadata
- Support different user categories
  - Specific access rights
    - Guest (Review CHO collection/CHO metadata)
    - Curator (CRUD CHO collection/CHO metadata)
    - Administrator (CRUD user accounts, CHO collection/CHO metadata)

NHM Metadata Lifecycle



Scenario	Existing Metadata	Published CHOs
1	✗	✗
2	✗	✓
3	✓	✗
4	✓	✓

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ESE-CHO Application Profile

- A superset of Europeana Semantic Elements (ESE)
- The ESE-CHO Application Profile consists of the following parts:
  - *Basic information (e.g. title, creator)*
  - *Life Cycle information (e.g. date created)*
  - *Technical information (e.g. medium, extent)*
  - *Relation information (e.g. is part of)*
  - *Collection information(e.g. title, subject)*
  - *Europeana information (e.g. data provider, country)*

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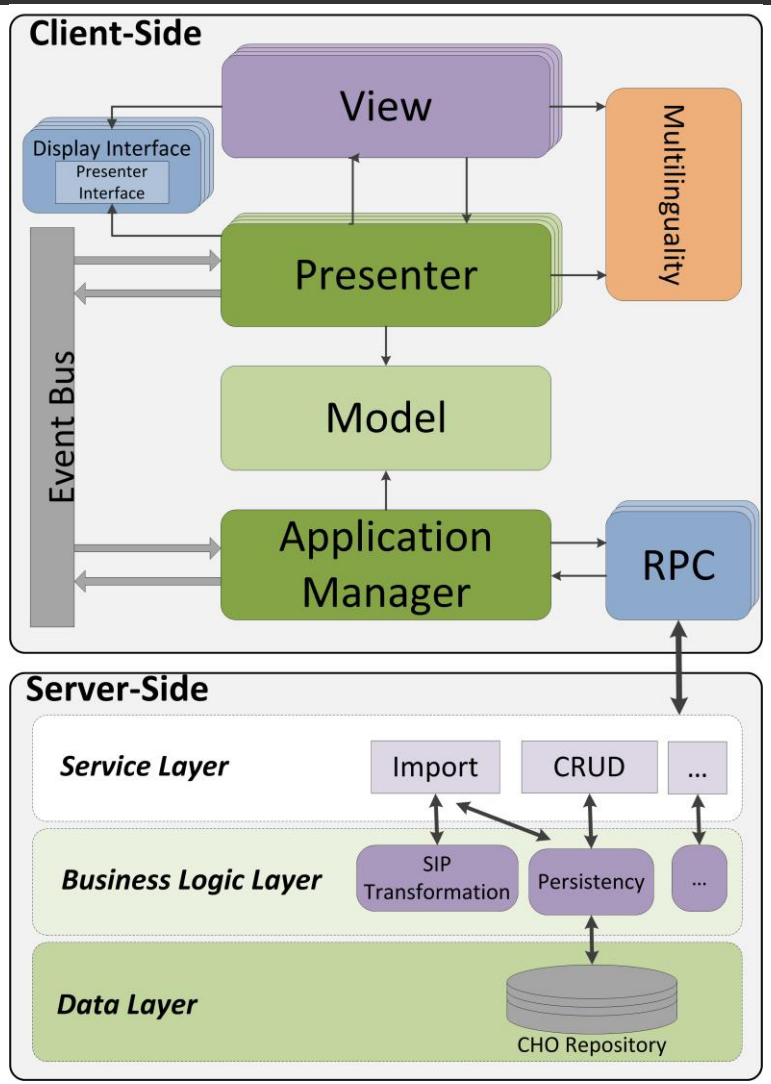
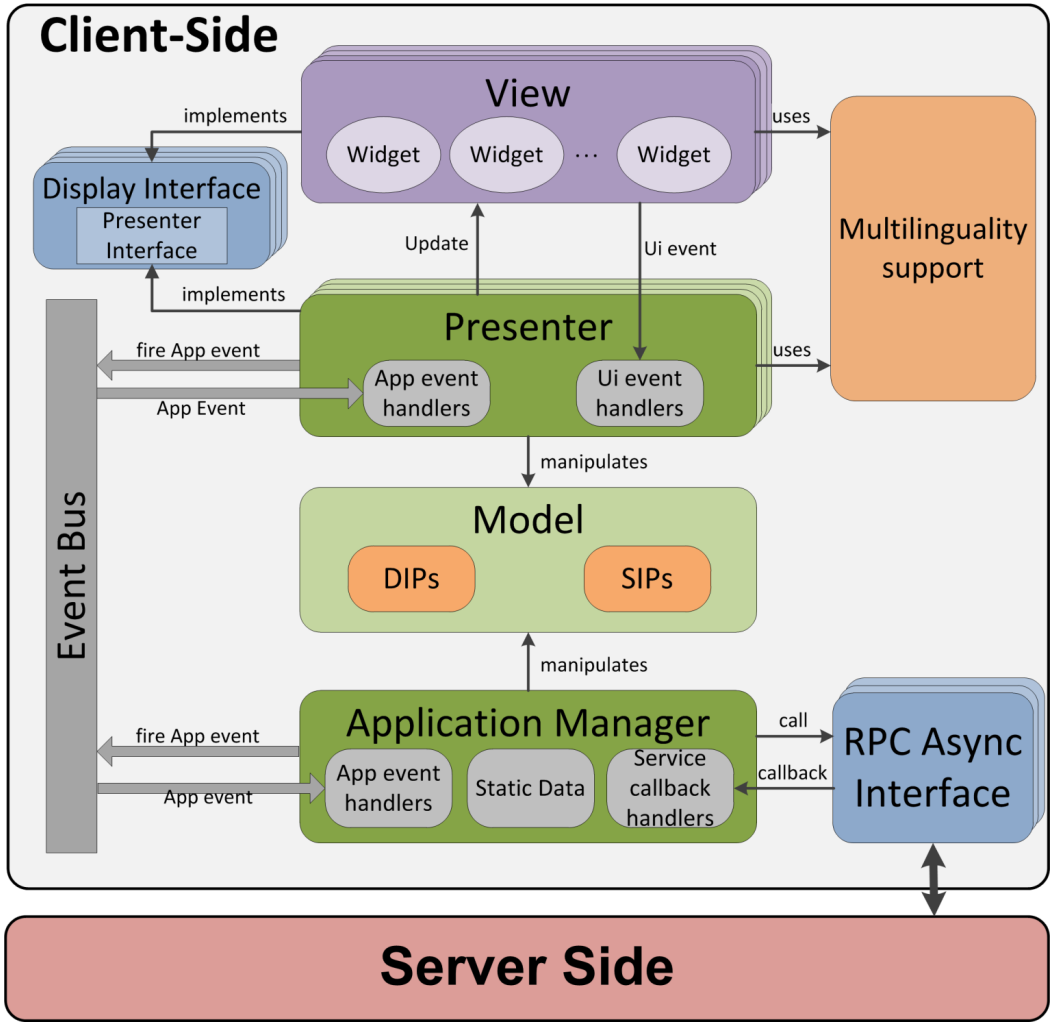
System Architecture

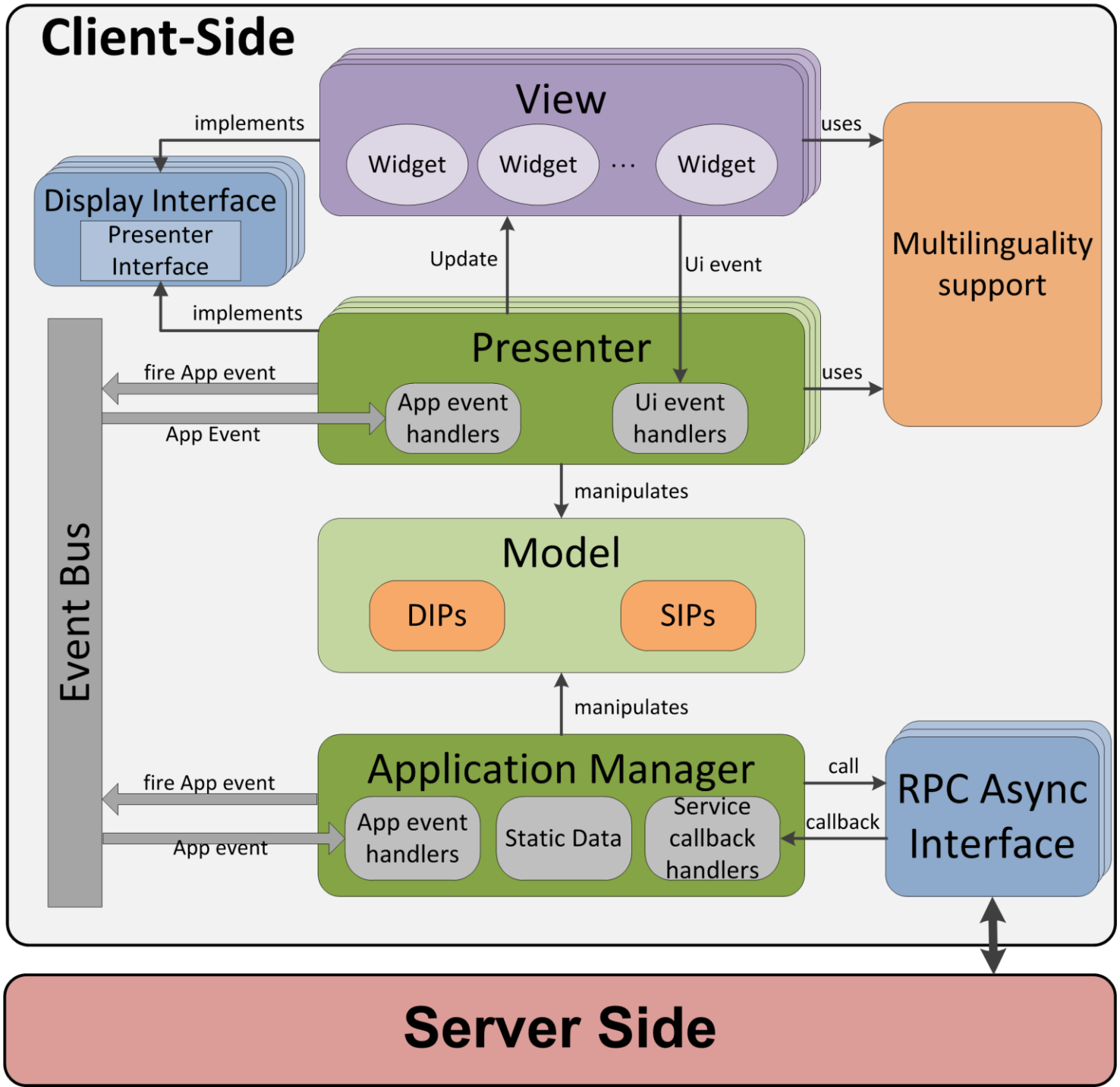
- EuroMuse has been developed as a RIA.
- RIAs require complex code on the client side to handle user interaction and other operations.



Client Side Logic

- Resides on the user's web browser
- Interaction with the users.
- Presentation of the information.
- Communication with the server.
- Design Patterns:
  - Model View Presenter
  - Observer
  - Mediator




Client-Side
View
Widget
Widget
Widget
implements
uses
Display Interface
Presenter Interface
Update
Ui event
Multilinguality support
implements
Presenter
fire App event
App Event
App event handlers
Ui event handlers
uses
Event Bus
manipulates
Model
DIPs
SIPs
manipulates
Application Manager
fire App event
App event
App event handlers
Static Data
Service callback handlers
call
callback
RPC Async Interface
Server Side

EUROMUSE

English

File Help Administration

Logged in as user admin admin

My profile | Logout

Collection Browser

- Perca fluviatilis
- Phoxinus phoxinus
- Platichthys flesus
- Platichthys flesus
- Psetta maxima
- Pungitius pungitius
- Rutilus rutilus
- Salmo salar
- Salmo trutta
- Salmo trutta trutt...
- Sander lucioperca
- Scardinius erythro...
- Scardinius erythro...
- Spinachia spinachia
- Taurulus bubalis
- Thymallus thymallus
- Tinca tinca
- Triglopsis quadric...
- Vimba vimba
- Zoarces viviparus

⊞ TNHM fossil images

⊞ TNHM mineral & rock images

⊞ TNHM text - test

⊞ TNHM video collection

Object: Salmo trutta (TNHM fish images) [VIEW MODE]

Edit

Basic Info

Technical Info

Historical Info

Related Locations

Related Resources

Title

Salmo trutta

Alternative Title

sea trout
Language English

Meriforell
Language Eesti

Description

Sea trout.
Language English

Meriforell on lõhelaste sugukonda kuuluv kalaliik. Elupaik: jõgi.
Language Eesti

Subject

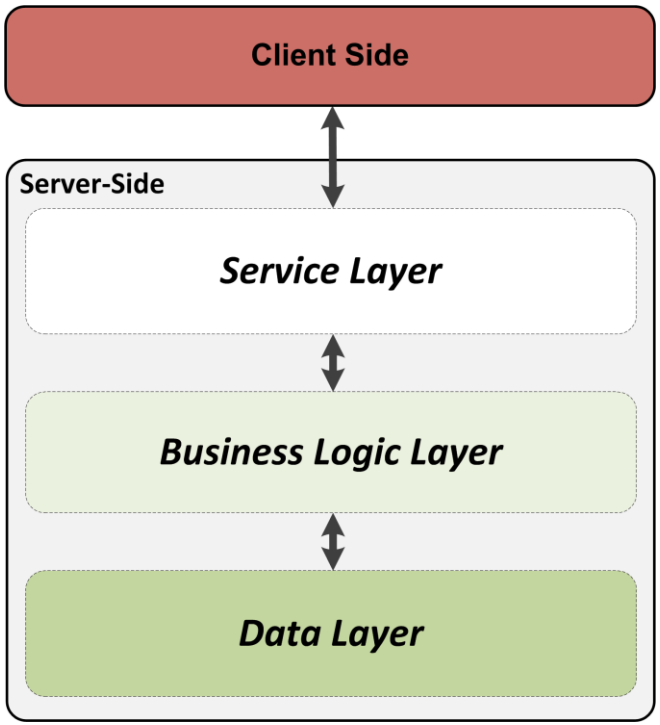
animalia

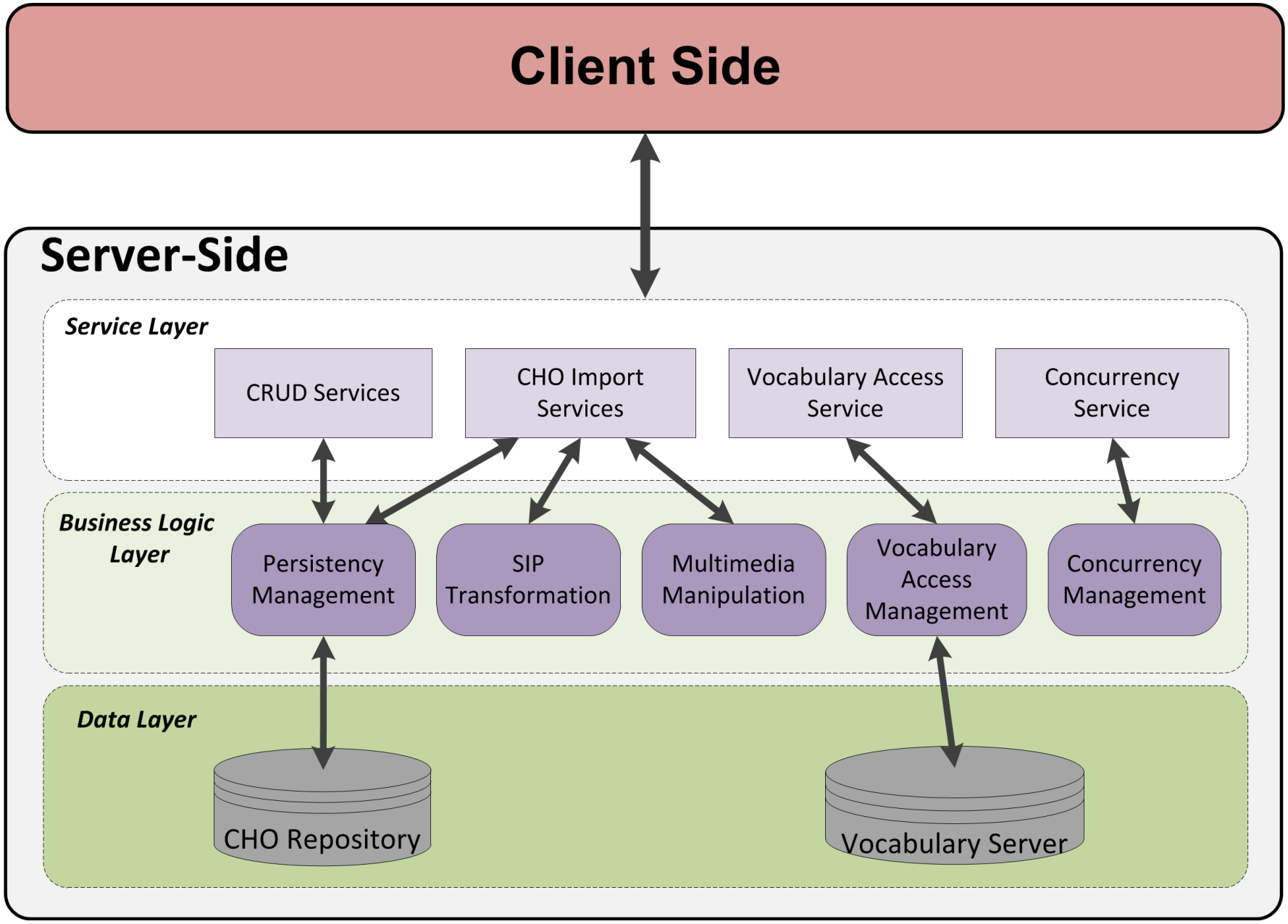
chordata

actinopterygii

Server Side Logic

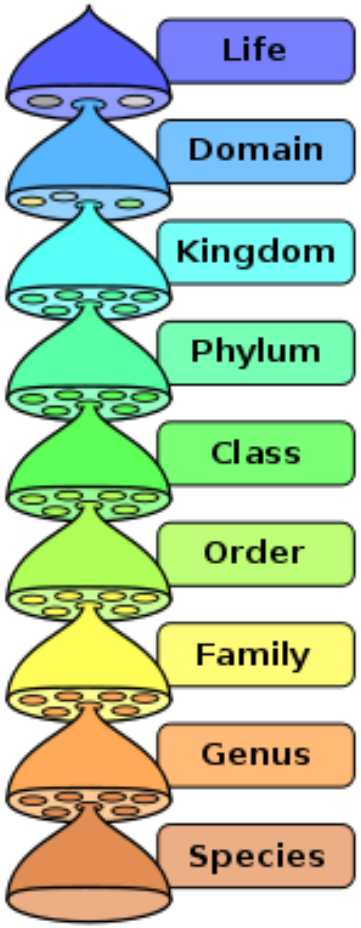
- Resides on the web server hosting the system.
- Follows a **multi-layered architectural pattern**.
  - **Strict interaction** between layers
- 3 layers
  - Service
  - Business Logic
  - Data




Client Side
Server-Side
Service Layer
CRUD Services
CHO Import Services
Vocabulary Access Service
Concurrency Service
Business Logic Layer
Persistency Management
SIP Transformation
Multimedia Manipulation
Vocabulary Access Management
Concurrency Management
Data Layer
CHO Repository
Vocabulary Server

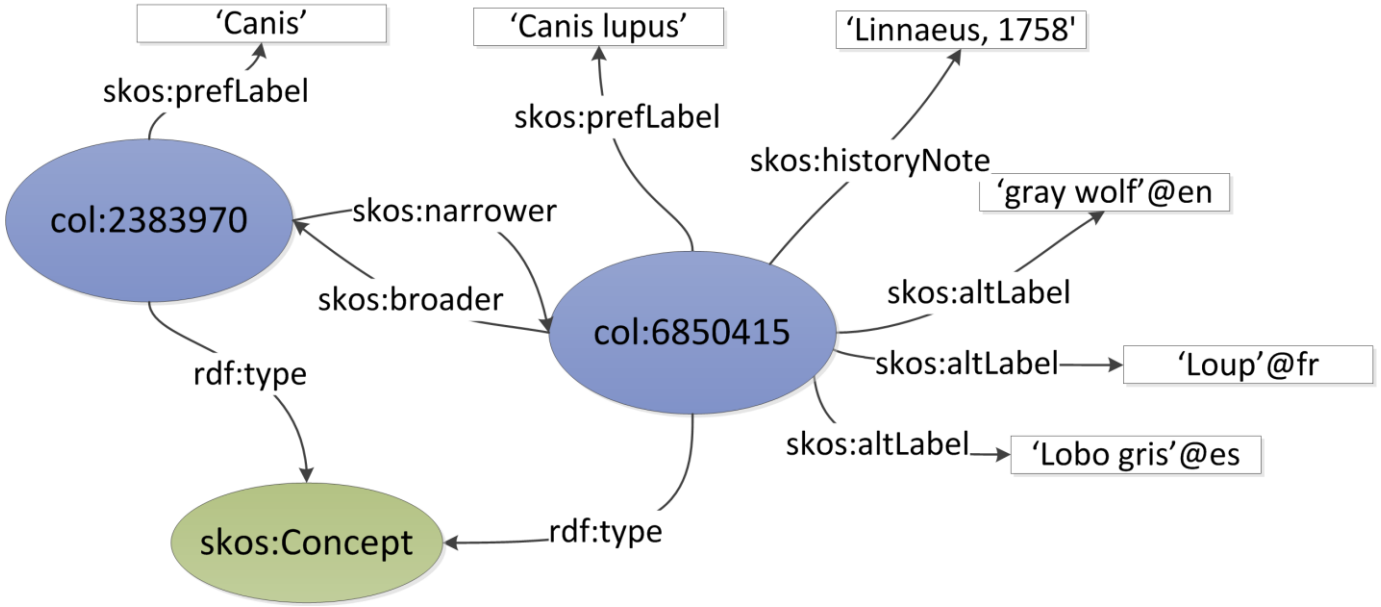
Vocabulary Access Module

- Responsible for the **indexing** and **accessing** of vocabularies and authority files
  - taxonomic classification
  - publicly sourced authority files of person/places
- DCMI-Type Vocabulary
- MARC Relators (Library of Congress)
  - Relation between a name and a bibliographic resource
- EuroMuse currently uses the taxonomic classification of **Catalogue of Life**
  - started in 2001 by Species 2000 and IT IS
  - comprehensive catalogue of all known species of organisms on Earth
  - 99 taxonomic databases, 3000 specialists, 1.4 million species



Vocabulary Access Module

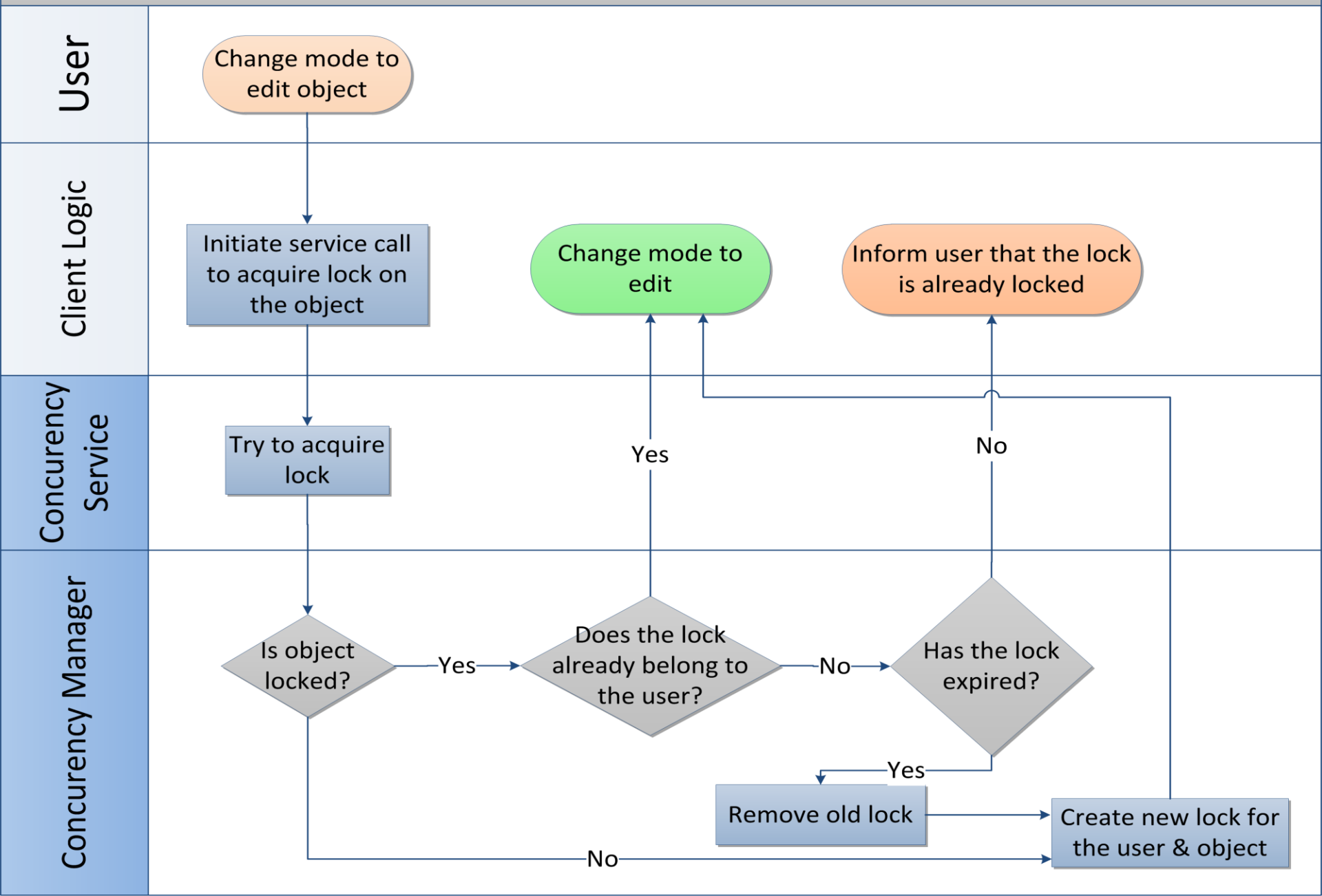
- Published the full database in **RDF** format (D2R Server)
  - compliant to SKOS
  - allows the semantic linkage of the CHOs to the taxonomic classification nodes

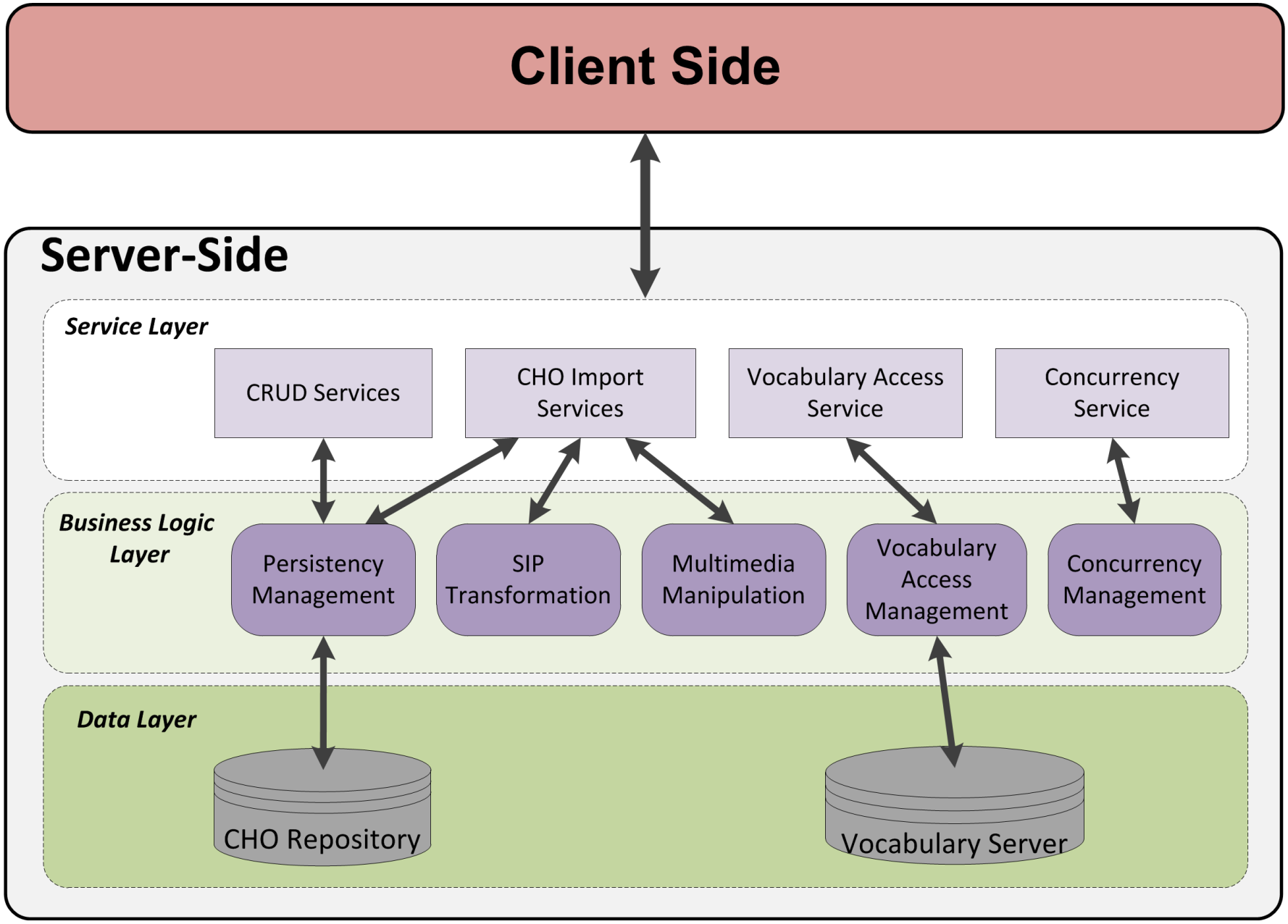


Concurrency Control Module

- Responsible for the concurrency of the application
- Why do we need concurrency?
  - EuroMuse allows multiple users to interact with the system at the same time.
  - Avoid issues when multiple users try to update the same data.
- The **Concurrency Control** mechanism is based on pessimistic.
- Introduced view/edit mode.
  - In view mode data is not locked and no changes can be made
  - In edit mode data must be locked
- Automatic lock expiration and lock refreshing

Concurency Control Activity Diagram

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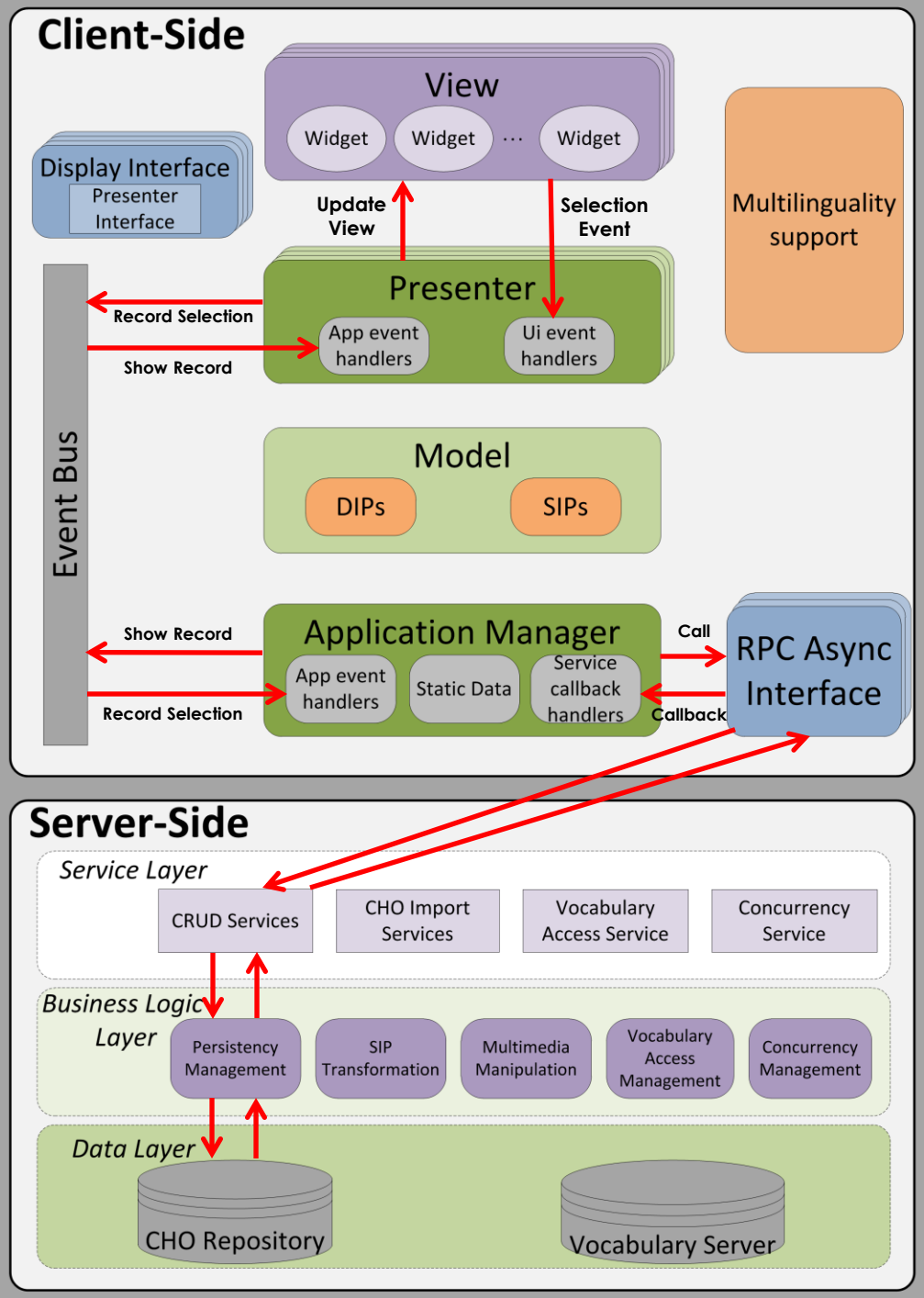
Client-Side
View
Widget
Widget
Widget
Display Interface
Presenter Interface
Update View
Selection Event
Multilinguality support
Presenter
App event handlers
Ui event handlers
Record Selection
Show Record
Event Bus
Model
DIPs
SIPs
Application Manager
App event handlers
Static Data
Service callback handlers
Show Record
Record Selection
Call
Callback
RPC Async Interface
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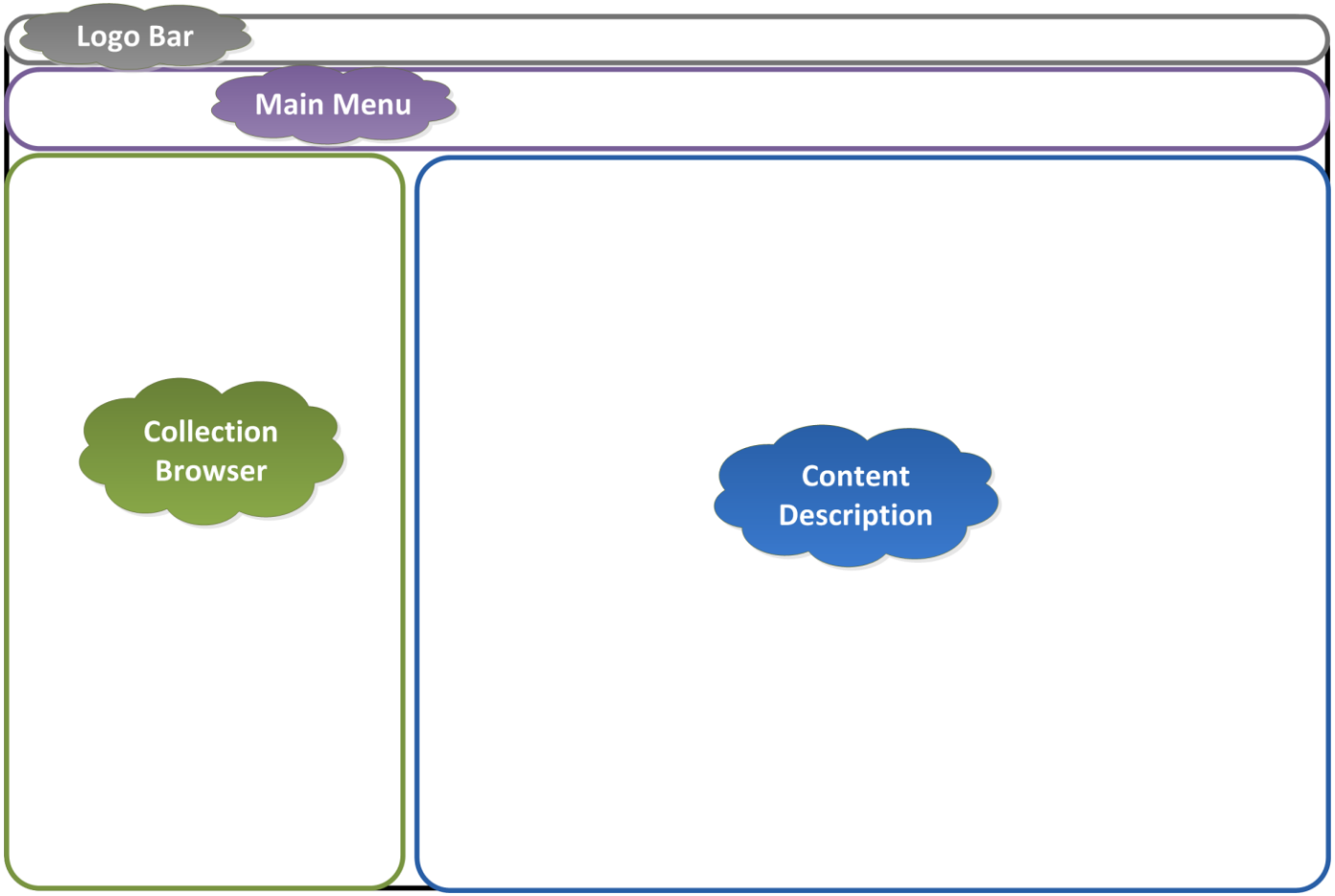
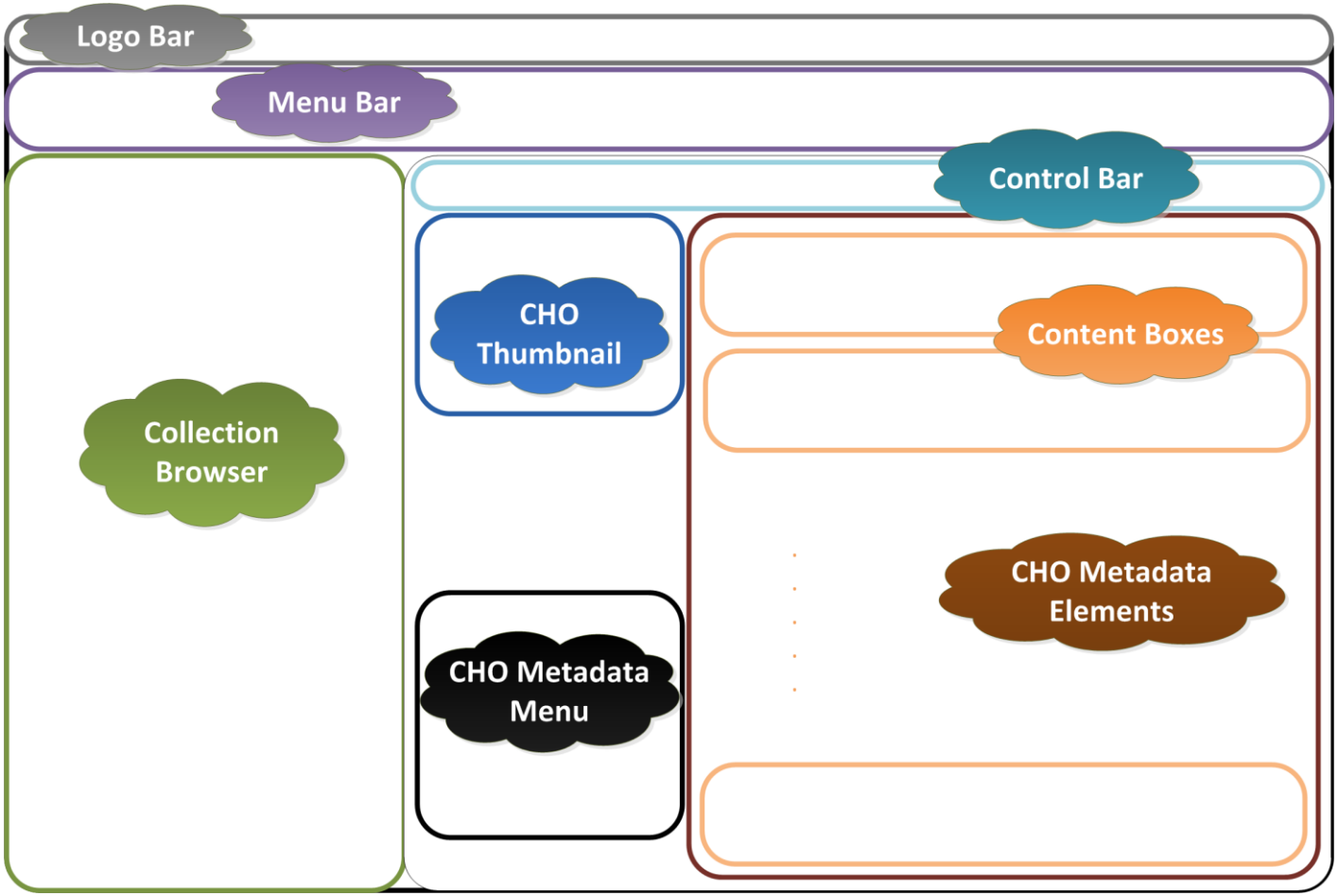
GUI Design Specification

- Main GUI Specification



GUI Design Specification

- GUI Specification of CHO Metadata



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EUROMUSE

English

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My profile | Logout

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- Scardinius erythro...
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⊞ TNHM mineral & rock images
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Language Eesti

Subject

animalia

chordata

actinopterygii

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Collection Browser

- *Osmerus eperlanus*
- *Perca fluviatilis*
- *Phoxinus phoxinus*
- *Platichthys flesus*
- *Platichthys flesus*
- *Psetta maxima*
- *Pungitius pungitius*
- *Rutilus rutilus*
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- *Triglopsis quadric...*
- *Vimba vimba*
- *Zoarces viviparus*

⊞ TNHM fossil images

⊞ TNHM mineral & rock images

⊞ TNHM text - test

⊞ TNHM video collection

Object: Salmo trutta (TNHM fish images) [EDIT MODE]

Change media object

View

Delete

Save

Basic Info

Technical Info

Historical Info

Related Locations

Related Resources

Title

Salmo trutta

Language (not set)

⊞ add title

Alternative Title

sea trout

Language English

Meriforell

Language Eesti

⊞ add alternative title

Description

Sea trout.

Language English

Meriforell on lõhelaste sugukonda kuuluv kalaliik. Elupaik: jõgi.

Language Eesti

⊞ add description

Implementation

- http://147.27.41.103/music/mmat

- System requirements
  - Servlet Container (Tomcat, etc.)
  - Imagemagick for image processing
  - Xuggle for video processing

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Evaluation

- TUC-MUSIC (2011,March)
  - think aloud evaluation
- Athens (2011,March)
  - think aloud evaluation
- Natural Europe curators summer school, Chania (2011, June)
  - hands-on evaluation
- Lisbon (2011, September)
  - hands-on evaluation
- Constant testing from curators who already use EuroMuse for their CHOs.

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Future Work

- Europeana Data Model (EDM)
  - Semantic expansion of the existing metadata
- Describing a museum object with multiple media objects
- User access rights per collection/museum department
- Client/Server side caching for optimization

Publication

- Makris K., **Skevakis G.**, **Kalokyri V.**, Gioldasis N., Kazasis F., Christodoulakis S.: *"Bringing Environmental Cultural Content into the Europeana.eu portal: The Natural Europe Digital Libraries Federation Infrastructure",* presented in the proceedings of the 5th Metadata and Semantics Research Conference (MTSR '11)
- Makris K., **Skevakis G.**, **Kalokyri V.**: "Deliverable D.4.2.A – The Natural Europe Cultural Environment"

Conclusion

DEMO