LINKED OPEN DATA FOR CULTURAL HERITAGE

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2D presentation: O for overview, H for help, normal continuous HTML

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1 INTRO

- A bit about me: co-founder of Sirma Group Holding, Bulgaria's largest software group and parent company of Ontotext
  - 30y in IT: 8 at university, 22 in industry
  - Did plenty of project management, business analysis and data modeling, some big projects too
  - Last 8 years focused on data modeling and integration
  - Last 6 years in paricular, focused on semantic data and semantic integration
- I love to poke in other people's data and get in-depth. So there's a lot about data in these slides
- See My publications: you can sort by type and keyword, full abstracts are available.
  - I've provided a few references below, but if a topic interests you, please search in the publications
- The shorter version has about 110 slides, so sit back, relax, and enjoy the ride. Should take us 1:20h
  - Ask questions at any time in the chat, I'll answer them all at the end
- This longer version has 130 slides, including info about Library metadata and ontologies

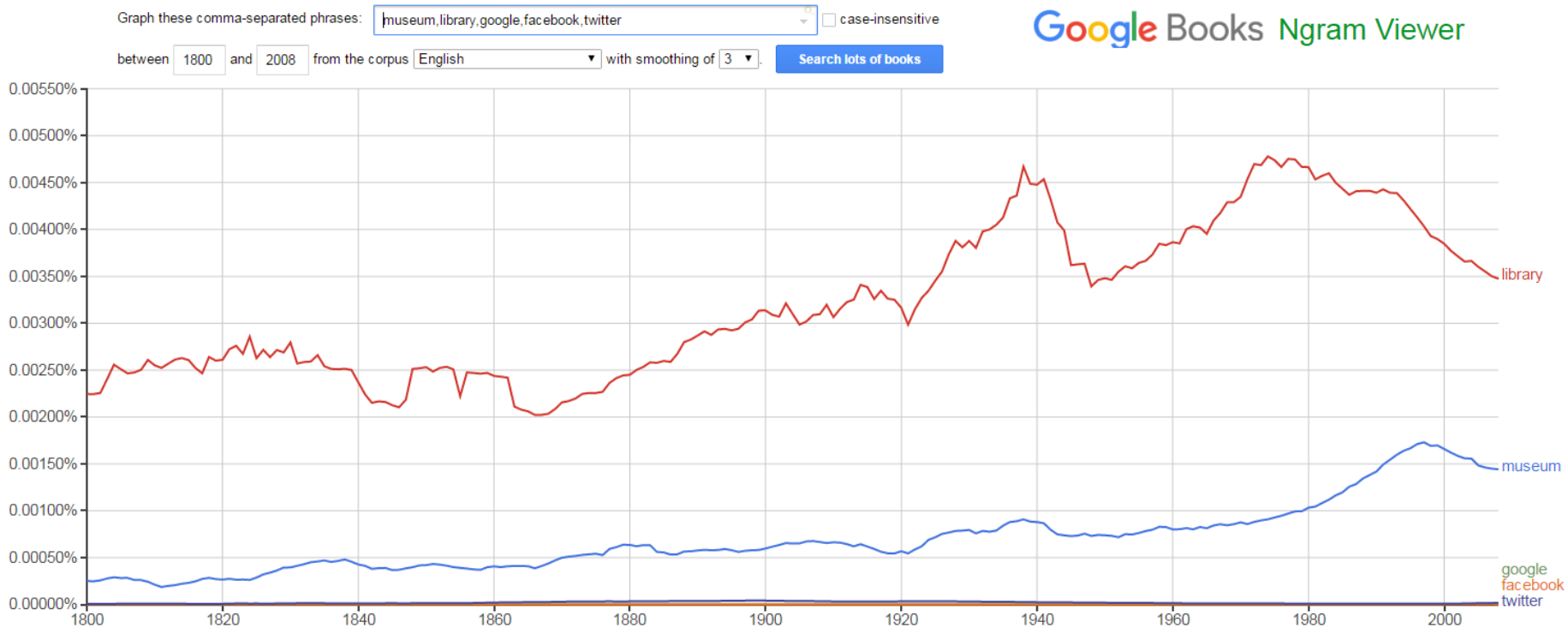
1.1 GLAM VS INTERNET

GLAM, CH, DH?

- **Cultural Heritage** (CH): the sum of our non-economic heritage
  - Obvious implications to economically significant sectors, eg tourism
  - Some say it's the source of all creativity, would you agree?
  - Includes old and new (eg digitally-born), material and immaterial, tangible and intangible, permanent and temporal (eg interactive installations)
- **Galleries, Libraries, Archives, Museums** (GLAM): sisterhood of institutions that care for our CH, each with its own perspective and priorities
- **Digital Humanities (DH)**: the use of computers in the humanities.
  - Eg some UK universities with DH programs: @KingsDH @UCLDH @DH_OU @CamDigHum

1.2 GOOGLE NGRAMS: PHRASES IN BOOKS

Search for "library, museum" vs "Google, Facebook, Twitter" in books: the web sites are negligible

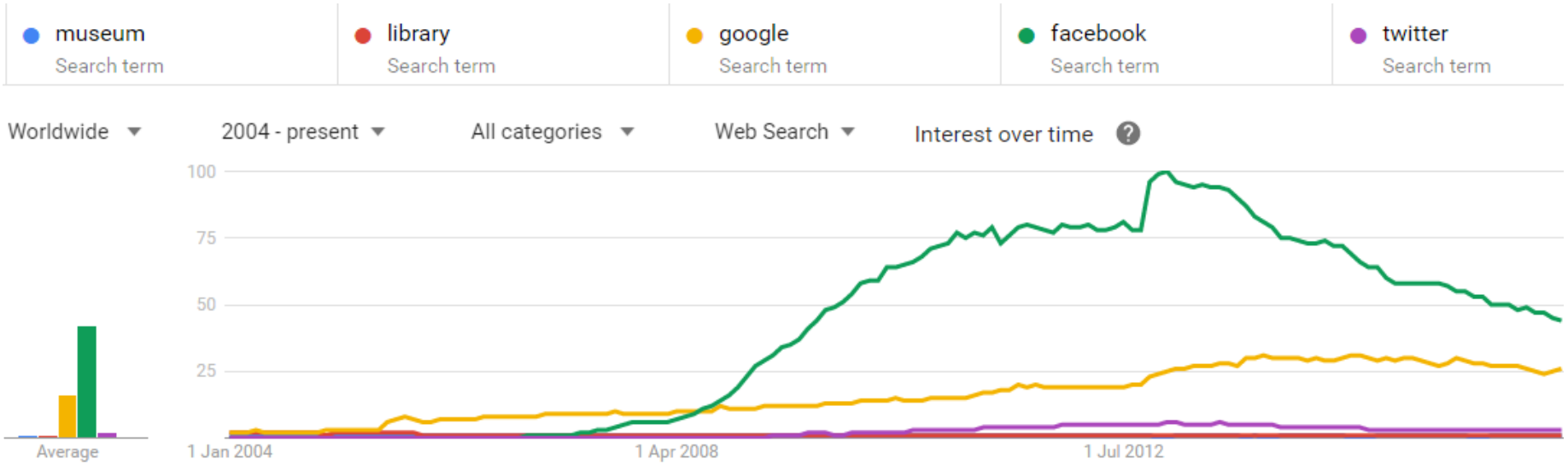


1.3 GOOGLE NGRAMS: TWO SPECIFIC ORGS

Compare two specific orgs: "Facebook" is more popular in recent books, compared to "British Museum" over time

1.4 GOOGLE TRENDS: SEARCH POPULARITY

Web searches over the last 12 years: "Facebook, Google" are much more popular than "library, museum"



1.5 HOW TO SURVIVE IN THE INTERNET AGE?

Since ancient times GLAMs have been the centers of knowledge and wisdom

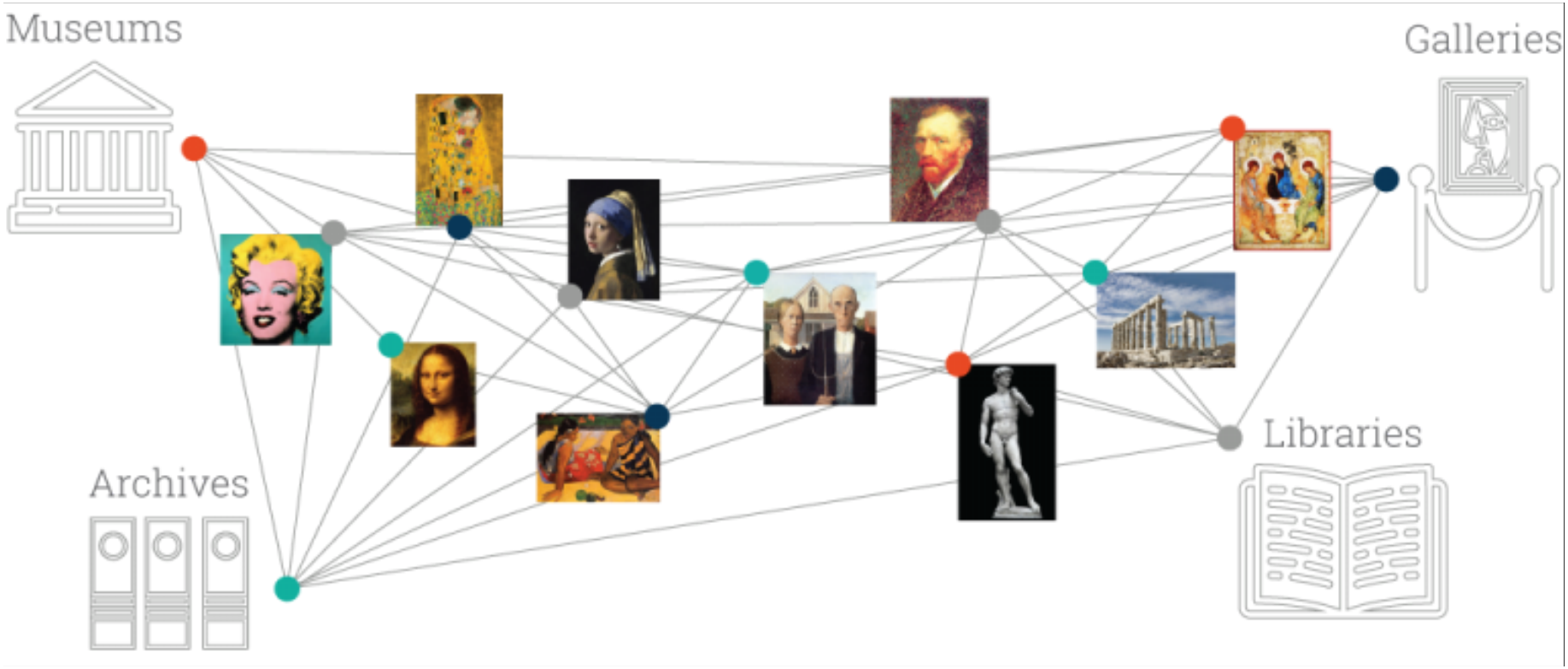
- Aren't Google, Wikipedia, Facebook, Twitter and smart-phone apps becoming the new centers of research and culture (or at least popular culture)?
- Will GLAMs fall victims to teenagers with smartphones browsing Facebook? If the library's attitude is "Come search in our OPAC" then **certainly yes**
- How to preserve the role of GLAMs into the new millennium?

To survive, GLAMs must adopt the internet as their default modus operandi

- Web 1.0: presentation
- Web 2.0: interaction
- Web 3.0 (semantic web): data linking, enriching/disambiguating text using NLP/IE approaches

1.6 WHY LINKED OPEN DATA (LOD) IS IMPORTANT

- Culture is naturally cross-institutional, cross-border, multilingual, and interlinked
- LOD allows making connections between (and making sense of) the multitude of digitized cultural artifacts available on the net
- LOD enables large-scale Digital Humanities research, collaboration and aggregation; technological renewal of CH institutions



2 GLAM CONTENT STANDARDS

GLAM data is complex and varied

- Exception is the rule
- Many metadata format variations
- Data comes from a variety of systems

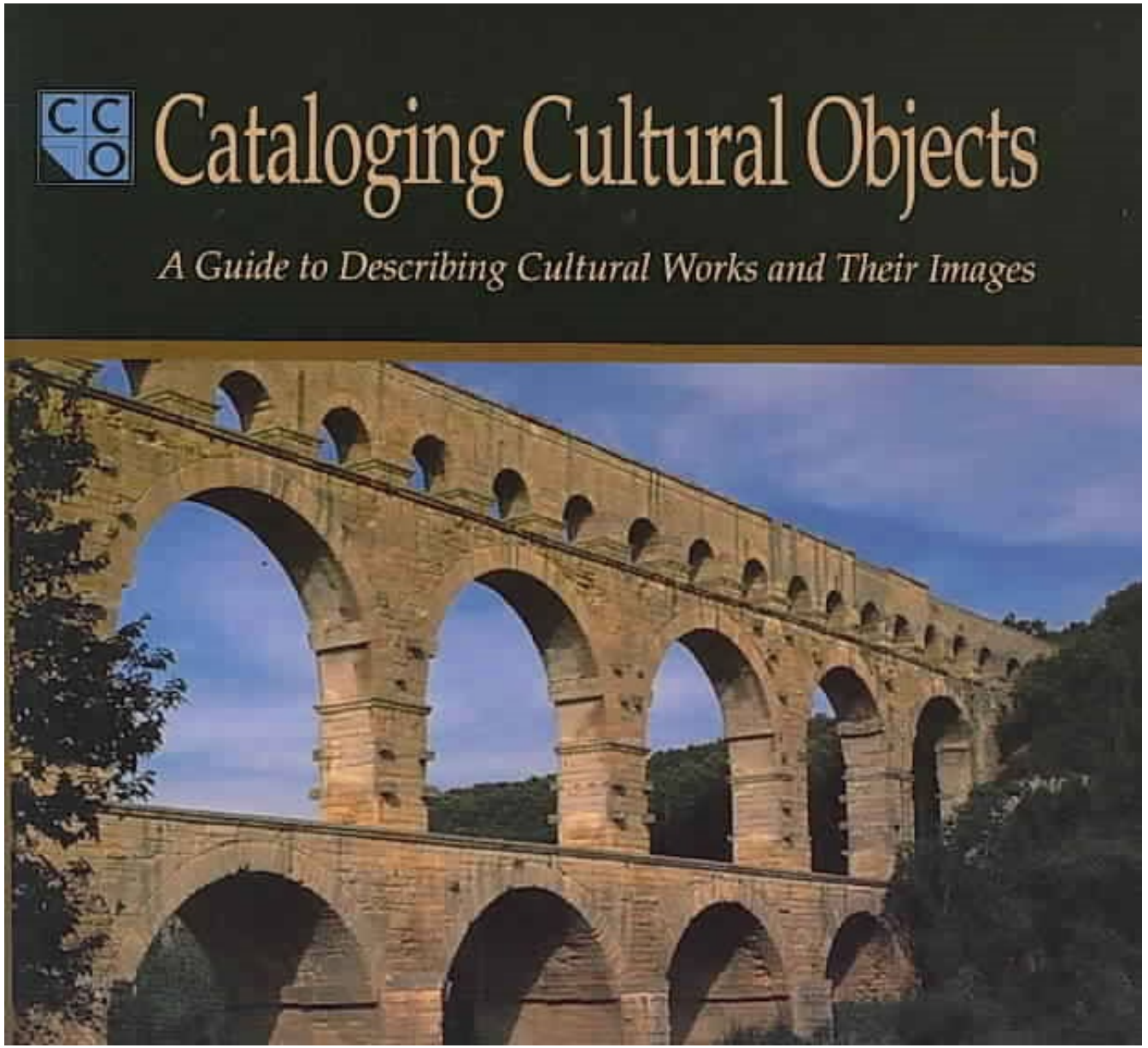
Thus professional organizations have found it useful to define **content standards**

- Describe what data to capture (and sometimes how to go about it)
- Before formalizing how to express it in machine-readable form

Examples are extremely useful for data modelers to decide how to map the data

2.1 MUSEUM CONTENT STANDARDS

Cataloging Cultural Objects: content standard for art, architecture, museums



2.1.1 CCO EXAMPLE: ARTWORK AND CREATOR RECORD

Figure 14

Work Record Linked to a Personal and Corporate Name Authority Record: Oil Painting[3]

Required and recommended elements are marked with an asterisk.

Work Record

- **Class** *[controlled]*: paintings • European art
- ***Work Type** *[link]*: painting
- ***Title**: Landscape with Classical Ruins and Figures | **Title Type**: preferred
- ***Creator display**: Marco Ricci (Italian, 1676-1730), figures by Sebastiano Ricci (Italian, 1659-1734)
  - ***Role** *[link]*: painter | **Extent** *[controlled]*: landscape architecture | *[link]*: Ricci, Marco
  - ***Role** *[link]*: painter | **Extent** *[controlled]*: figures | *[link]*: Ricci, Sebastiano
- ***Creation Date**: ca. 1725/1730
  [controlled]: **Earliest**: 1720; **Latest**: 1735
- ***Subject** *[links to authorities]*: landscape ruins • human figures • Dionysos (Greek deity) • Classical architecture
- **Culture** *[link]*: Italian
- ***Current Location** *[link]*: J. Paul Getty Museum (Los Angeles, California, United States) | **ID**: 70.PA.33

Personal and Corporate Name Authority Record

- ***Names**:
  Ricci, Marco (preferred, inverted)
  Marco Ricci (preferred, natural order)
  Richi, Marco
  Ricci, Marchetto
  Rizzi, Marco
  Rizi, Marco
- ***Display Biography**: Italian painter, 1676-1730
- ***Nationalities** *[controlled]*: Italian • Venetian
- ***Birth Date** *[controlled]*: 1676; **Death Date**: 1730
- ***Life Roles** *[controlled]*: painter • draftsman
- **Place of Birth** *[link]*: Belluno (Veneto, Italy)
- **Place of Death** *[link]*: Venice (Veneto, Italy)
- **Places of Activity** *[link]*: Veneto (Italy), England
- **Related People**:
  Relationship Type *[controlled]*: brother of
  [link to related person]: Sebastiano Ricci (Italian, 1659-1734)

2.1.2 CCO EXAMPLE: HIERARCHICAL LINK BETWEEN 2 ARTWORKS

Figure 13

Work Record Linked to Another Work Record: Medieval Cathedral and Its Portal

Required and recommended elements are marked with an asterisk. Figure shows a hierarchical link between a building and a component of that building.

Work Record

- **Class** *[controlled]*: architecture
- ***Work Type** *[link to Concept Authority]*: portal
- ***Title**: Portal (South Transept) | **Title Type**: preferred
- ***Creator display**: unknown French
  ***Role** *[controlled]*: architects | *[link]*: unknown French
- ***Creation Date** ca. 1205-ca. 1240
  [controlled]: **Earliest**: 1200; **Latest**: 1245
- ***Subject** *[link to authorities]*: portal • Last Judgment • Jesus Christ • martyrs • confessors • Saint Martin • Saint Nicholas
- ***Current Location** *[link]*: South Transept, Chartres Cathedral, Chartres (Eure-et-Loir, Centre region, France)
- ***Materials and Techniques**: limestone
  Material *[link]*: limestone
- **Styles** *[link]*: Gothic
- **Description**: The central portal depicts the Last Judgment; left portal portrays the Martyrs, tympanum portrays the martyrdom of St. Stephen; right portal portrays the Confessors, tympanum portrays good deeds of St. Martin and St. Nicholas.
- **Related Work**:
  Relationship Type *[controlled]*: part of
  [link to Work Record]: *Chartres Cathedral*; cathedral; unknown French; begun 1194, consecrated 1260; Chartres (Eure-et-Loir, Centre region, France)

2.1.3 CCO EXAMPLE: CREATOR EXTENT

How to describe one aspect of the data

For Creator Extent

Record the part of a work contributed by a particular creator, if necessary for clarity. Some examples of terminology follow:

execution	with additions
design	figures
predella	embroidery
cast	printed

Examples

[for a painting]

Creator display: figures by Peter Paul Rubens (Flemish, 1577-1640), landscape and still-life objects by Jan Brueghel the Elder (Flemish, 1568-1625)
Controlled fields:
Role: painter
Extent: figures
[link to Personal and Corporate Name Authority]:
Rubens, Peter Paul

Role: painter
Extents: landscape • still life
[link to Personal and Corporate Name Authority]:
Brueghel, Jan, the Elder

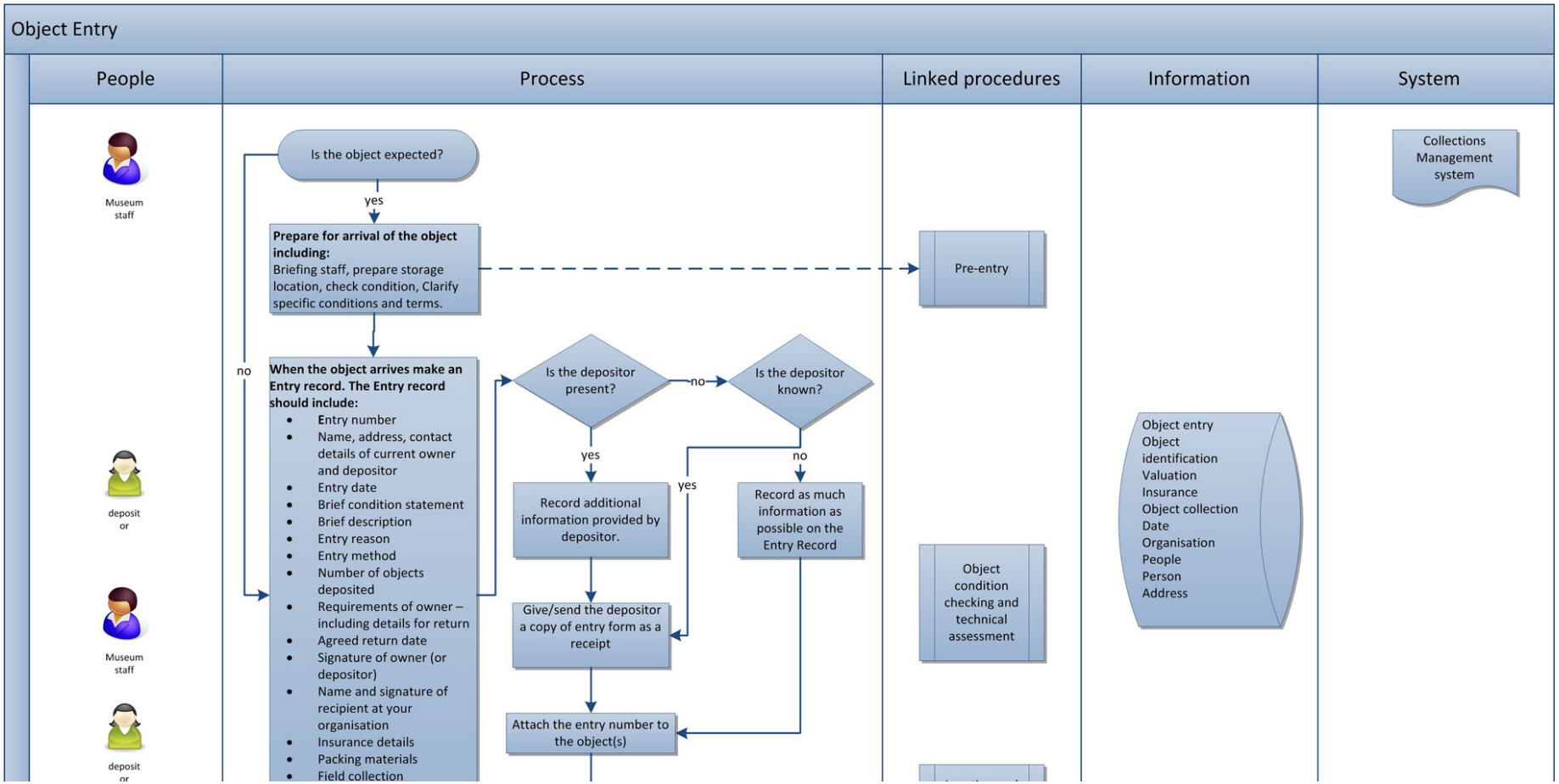
2.1.4 SPECTRUM

Spectrum

UK Museum Collections Management Standard

- Defines procedures for museums to follow, and the attendant data
- Covers 21 procedures: Pre-entry, Object entry, Loans in, Acquisition, Inventory control, Location and movement control, Transport, Cataloguing, Object condition checking and technical assessment, Conservation and collections care, Risk management, Insurance and indemnity management, Valuation control, Audit, Rights management, Use of collections, Object exit, Loans out, Loss and damage, Deaccession and disposal, Retrospective documentation
- Addresses accreditation

2.1.5 SPECTRUM EXAMPLE: OBJECT ENTRY



2.2 ARCHIVAL CONTENT STANDARDS

- ISAD(G): archival materials
- ISAAR(CPF): agents (corporations, people, families)
- ISDF: functions (eg Secretary of some society)
- ISDIAH: archival holding institutions

Image by D.Pitti, 2015

Standard	Edition	Development Dates	Publication Date
Principles		(1988) 1989-1992	1992
ISAD	1st	1990-1993	1994
ISAAR	1st	1993-1995	1996
ISAD	2nd	1996-2000	1999
ISAAR	2nd	2000-2004	2004
ISDF	1st	2005-2007	2007
ISDIAH	1st	2005-2008	2008

2.3 LIBRARY CONTENT STANDARDS

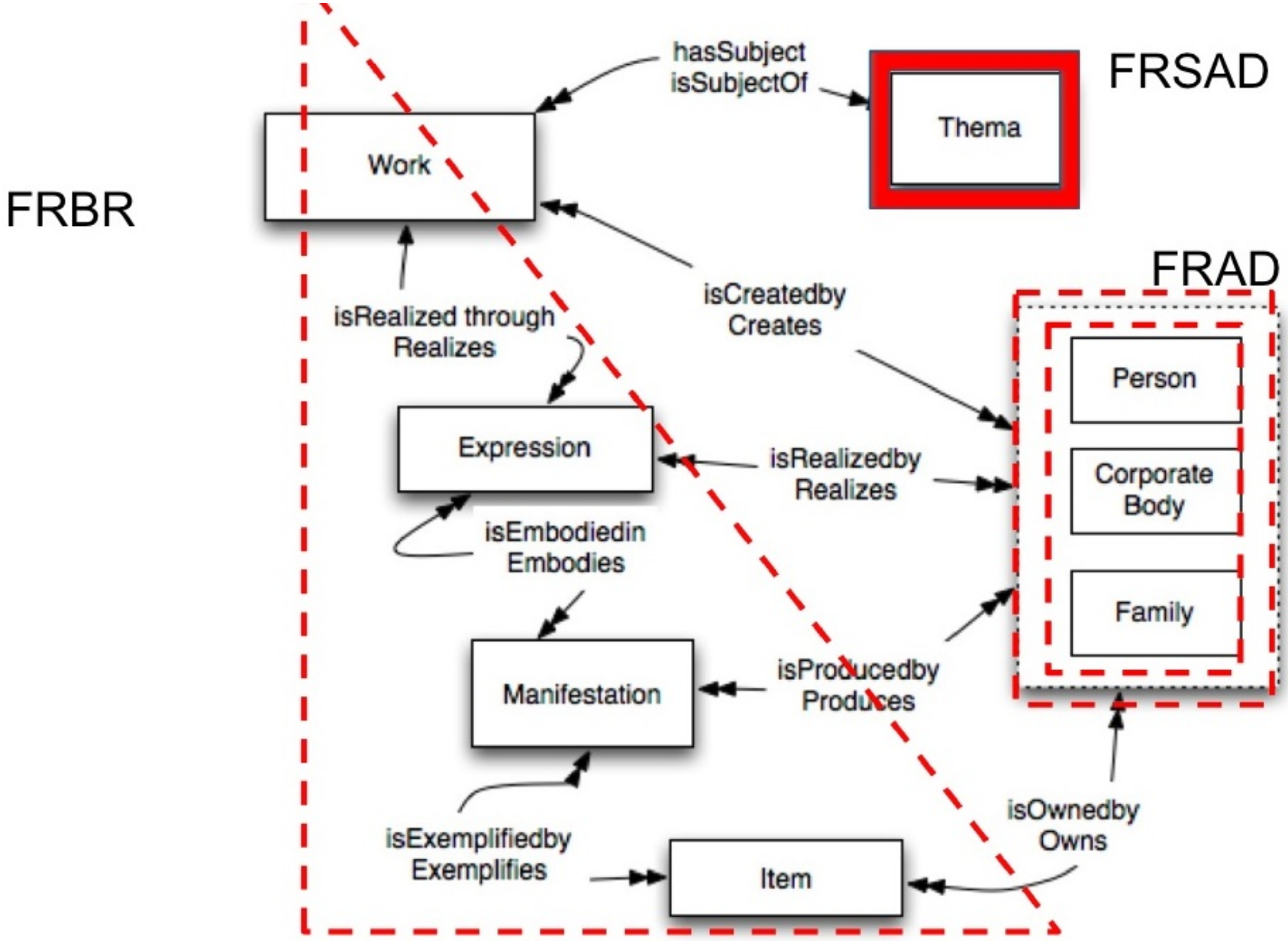
- AACR2 (Anglo-American Cataloging Rules 2)
- International Standard Bibliographic Description (ISBD)
- Resource Description and Access (RDA)

Extremely detailed and comprehensive (see RDA later). But sometimes pay more attention where to put the commas than to:

- Data sharing
- Global availability of resources
- Sharing the cataloging burden

2.3.1 FRBR, FRSAD, FRAD

Functional Requirements for Bibliographic Records (FRBR), Subject Authority Data (FRSAD), Authority Data (FRAD) (J.Mitchell, M.Zeng, M.Zumer, 2011)



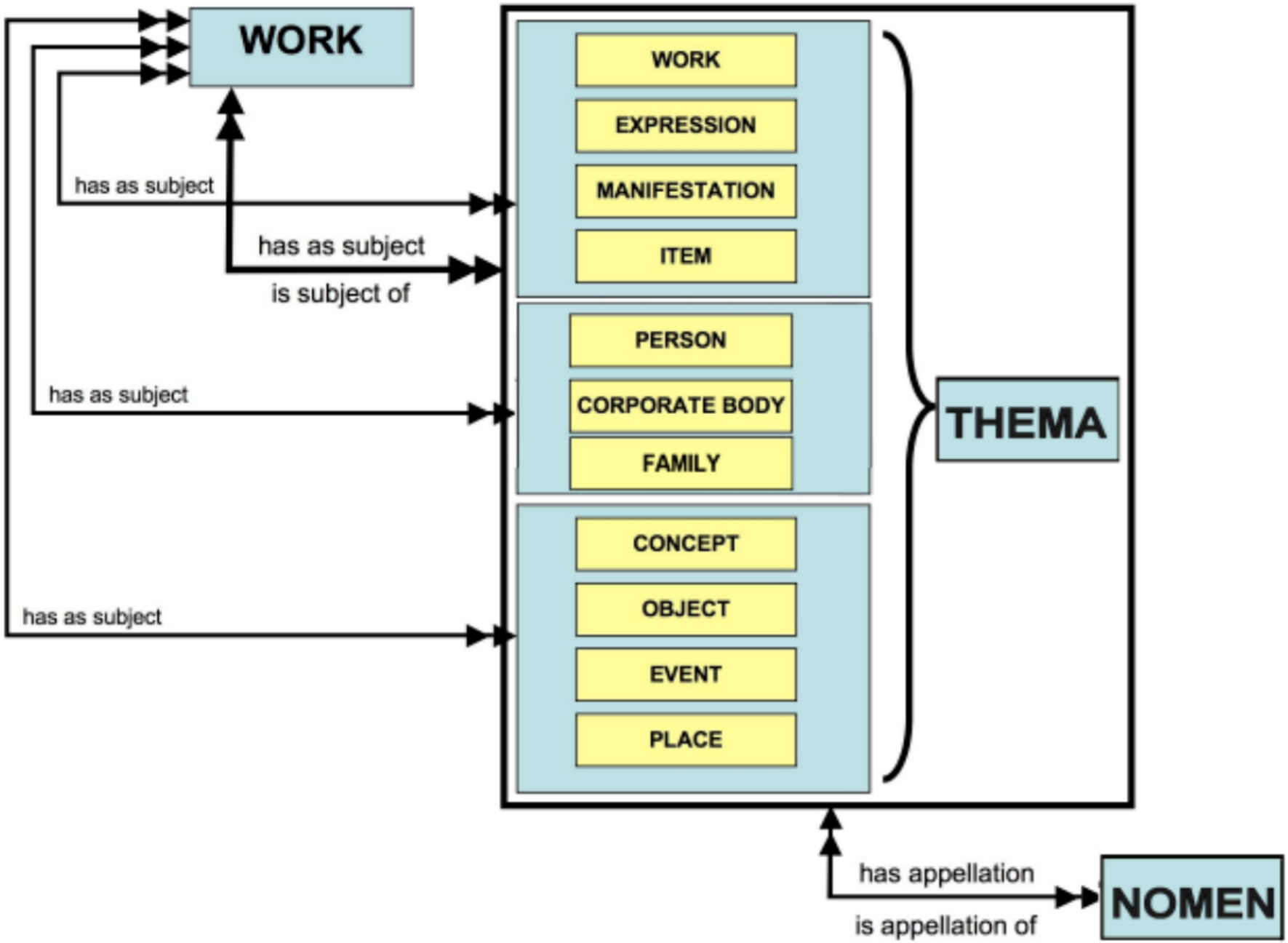
2.3.2 FRBR

Starts from user tasks (find, identify, select, obtain, explore). Introduces the important 4-level WEMI model (relates to Uniform Titles):

- Work: original or derived intellectual work (eg Don Quixote)
- Expression: translation or edition (eg Don Quixote translation to English)
- Manifestation: publisher's work (eg with illustrations, foreword by, compilation…). ISBNs are here
- Item: physical copy: libraries track loan/availability; famous copies (eg Lincoln's Bible); manuscripts are singleton items

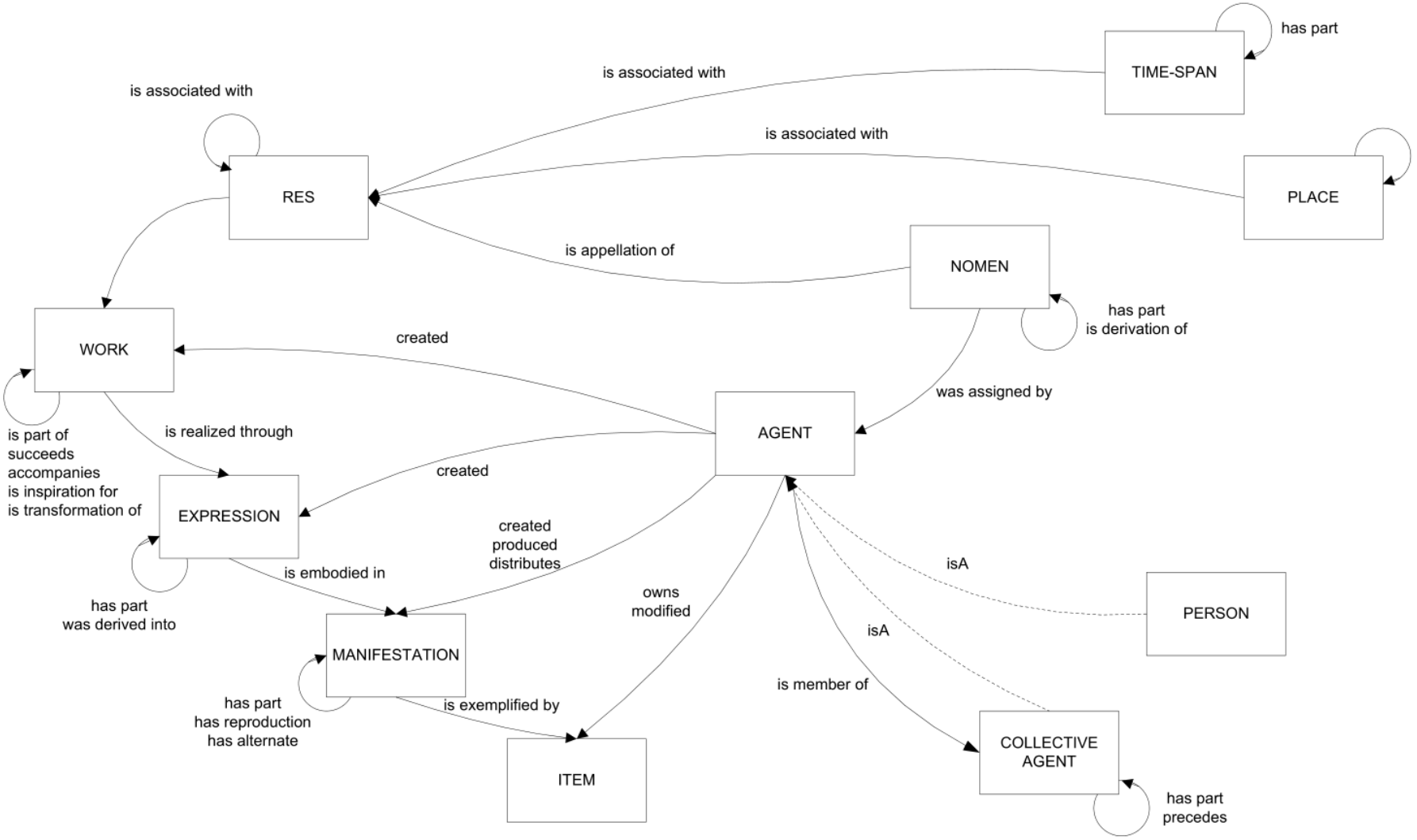
2.3.3 FRSAD

Anything can be subject (thema), referred to by various names/titles (nomen)



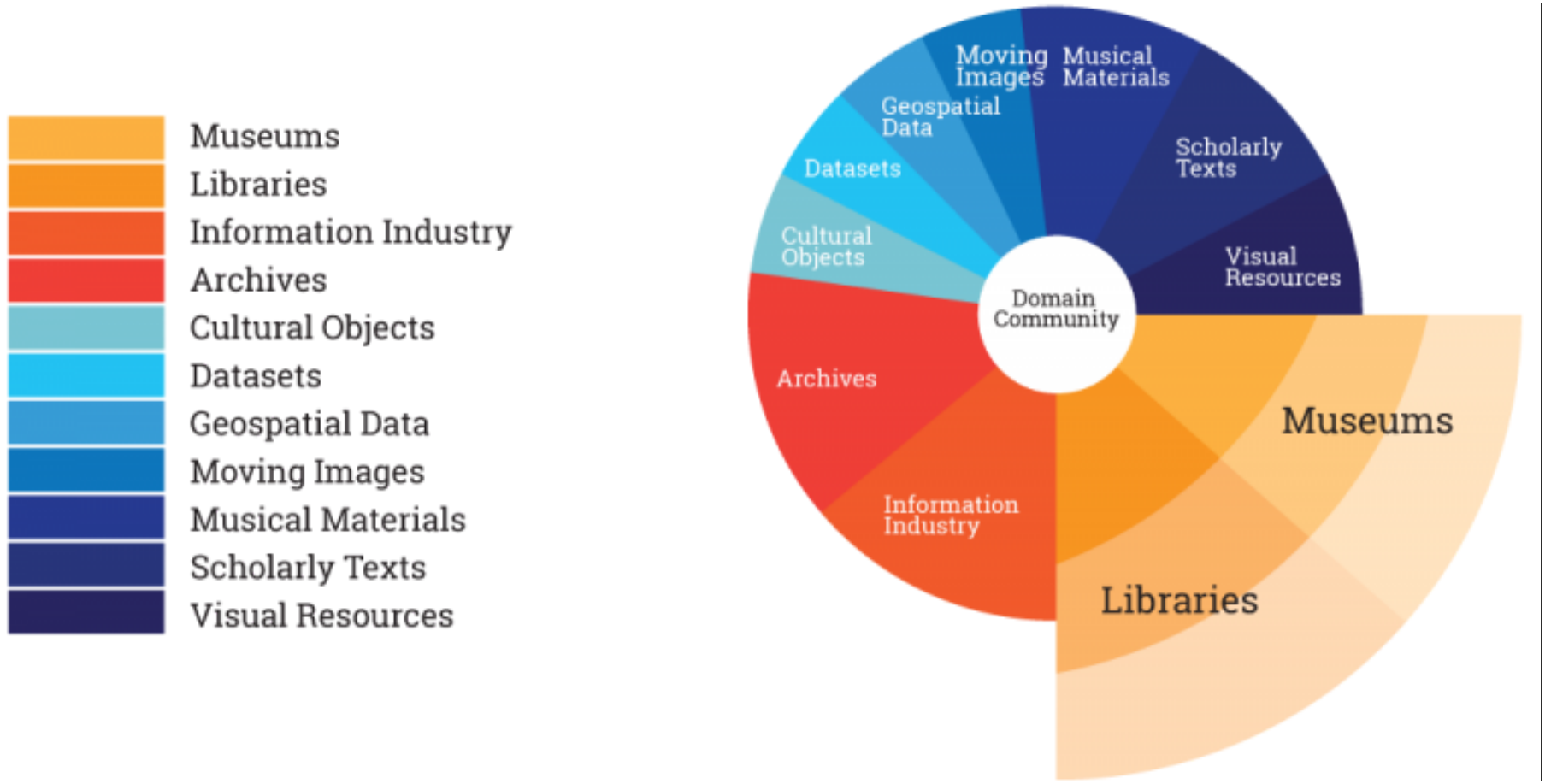
2.3.4 FRBR-LRM

FRBR-Library Reference Model (P.Riva, P.Le Bœuf, M.Žumer, Draft for World-Wide Review 2016-02). Merges the previous standards

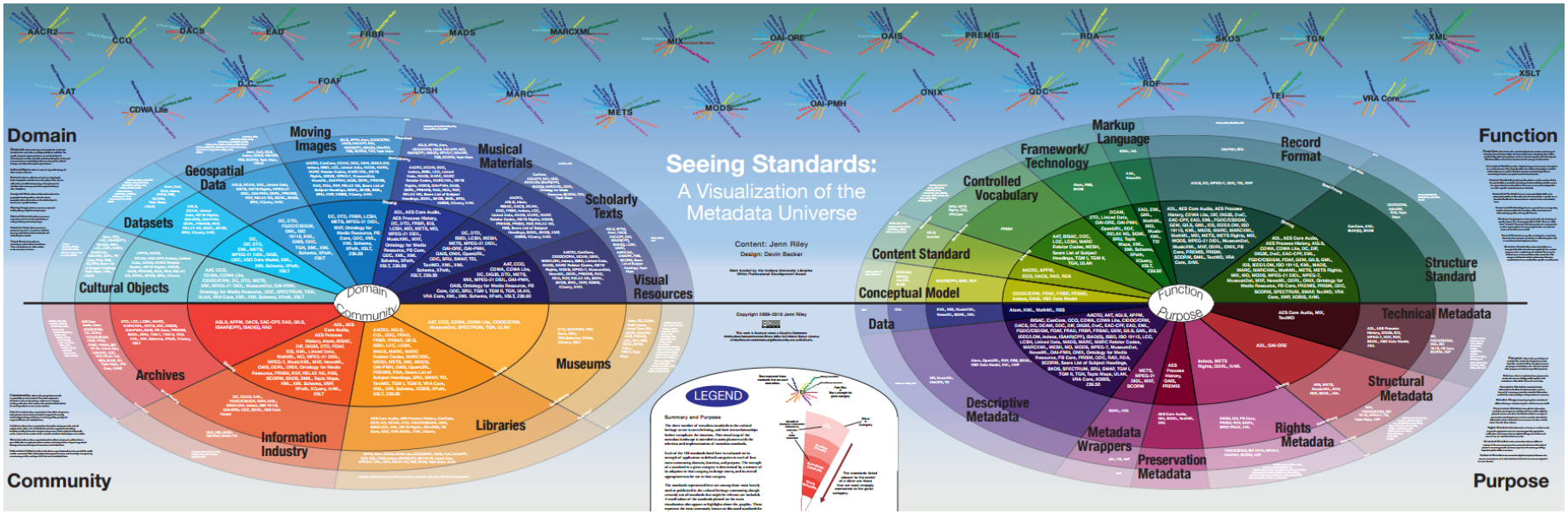


3 GLAM METADATA SCHEMAS

How many of the standards listed in Seeing Standards: A Visualization of the Metadata Universe apply to your work? (by Jenn Riley, Associate Dean for Digital Initiatives at McGill University Library)



3.1 SEEING STANDARDS (2)



3.2 XML SCHEMAS

Do you deal with XML? I bet you do

- XML Schema (XSD): most widely used, but most unwieldy
- RelaxNG (RNG): new generation schema language
- RNG Compact (RNC): non-XML notation, most readable. Eg EAD3 is mastered in RNC, then RNG and XSD produced
- Schematron: express rules in XPath that can't be captured in XSD/RNG/RNC (eg cross-field validation)

Tools:

- https://github.com/EHRI/jing-trang/tree/EHRI-176: patch the **jing** RNG validator to emit errors like Schematron (SVRL with XPath error location)
- https://github.com/VladimirAlexiev/rnc: RNC tools and CH schemas in RNC. Emacs with code highlighting and syntax checking (flycheck)

```
Vocabulary =
  element Vocabulary {
JUNK      element Subject {(
        element Ancestors {
          (element Preferred_Ancestor_Branch {
             element Ancestor {
               element Immediate {ParentType},
               element Other {ParentType}*}}
           & element Non-Preferred_Ancestor_Branches {
               element Non-Preferred_Ancestor_Branch {
                 element Ancestor {
                   element Immediate {ParentType},
                   element Other {ParentType}*}}+}?),
```

3.3 MUSEUM METADATA: CDWA

Categories for the Description of Works of Art (CDWA): realization of CCO, 532 "categories" (data elements).

1. Object/Work Type	12. Display Creation Date
2. Title	13. Indexing Dates
3. Display Creator	14. Location / Repository
4. Indexing Creator	15. Indexing Subject
5. Display Measurements	16. Classification
6. Indexing Measurements	17. Description / Descriptive Note
7. Display Materials/Techniques	18. Inscriptions
8. Indexing Materials/Technique	19. Related Works
9. Display State/Edition	20. Rights for Work
10. Style	21. Record
11. Culture	22. Resources

3.3.1 CDWA LITE

XML schema implementing part of CDWA. Moderate complexity, about 300 elements. Display vs Indexing (structured) elements, eg for Dimension.

```
administrativeMetadata = element administrativeMetadata {rightsWork*, recordWrap?, resour
descriptiveMetadata = element descriptiveMetadata {
  objectWorkTypeWrap,
  titleWrap,
  displayCreator,
  indexingCreatorWrap,
  displayMeasurements?,
  indexingMeasurementsWrap?,
  displayMaterialsTech,
  indexingMaterialsTechWrap?,
  displayStateEditionWrap?,
  styleWrap?,
  cultureWrap?,
  displayCreationDate,
  indexingDatesWrap,
  locationWrap,
  indexingSubjectWrap?,
  classWrap?,
  descriptiveNoteWrap?,
  inscriptionsWrap?,
  relatedWorksWrap?}
resourceWrap = element resourceWrap {resourceSet*}
attributionQualifierCreator = element attributionQualifierCreator {xsd:string}
classification = element classification {xsd:string, attr_termsource, attr_termsourceID}
classWrap = element classWrap {classification*}
culture = element culture {xsd:string, attr_termsource, attr_termsourceID}
cultureWrap = element cultureWrap {culture*}
dateQualifier = element dateQualifier {xsd:string}
descriptiveNote = element descriptiveNote {xsd:string}
descriptiveNoteWrap = element descriptiveNoteWrap {descriptiveNoteSet*}
descriptiveNoteSet = element descriptiveNoteSet {descriptiveNote?, sourceDescriptiveNote*
displayCreationDate = element displayCreationDate {xsd:string}
displayCreator = element displayCreator {xsd:string}
displayEdition = element displayEdition {xsd:string}
displayMaterialsTech = element displayMaterialsTech {xsd:string}
displayMeasurements = element displayMeasurements {xsd:string}
displayState = element displayState {xsd:string}
displayStateEditionWrap = element displayStateEditionWrap {displayState*, displayEdition*
earliestDate = element earliestDate {xsd:string, attr_termsource}
extentMeasurements = element extentMeasurements {xsd:string}
resourceID = element resourceID {xsd:string, attr_type}
resourceRelType = element resourceRelType {xsd:string, attr_type}
resourceType = element resourceType {xsd:string, attr_termsource, attr_termsourceID}
rightsResource = element rightsResource {xsd:string, attr_type}
resourceViewDescription = element resourceViewDescription {xsd:string, attr_type}
resourceViewSubjectTerm = element resourceViewSubjectTerm {xsd:string, attr_termsource, a
resourceViewType = element resourceViewType {xsd:string, attr_termsource, attr_termsource
resourceViewDate = element resourceViewDate {
  xsd:string,
  attr_type,
  attribute earliestdate {xsd:string}?,
  attribute latestdate {xsd:string}?}
resourceSource = element resourceSource {
  xsd:string,
  attr_type,
  attribute earliestdate {xsd:string}?,
  attribute latestdate {xsd:string}?}
linkRelatedResource = element linkRelatedResource {relatedResourceRelType?, labelRelatedR
relatedResourceRelType = element relatedResourceRelType {xsd:string}
labelRelatedResource = element labelRelatedResource {xsd:string}
resourceMetadataLoc = element resourceMetadataLoc {xsd:string, attr_type}
indexingCreatorSet = element indexingCreatorSet {
  nameCreatorSet+,
  nationalityCreator*,
  vitalDatesCreator*,
```

3.3.2 CONA SCHEMA

Cultural Objects Name Authority (CONA): Getty museum data aggregation. Moderate complexity, about 280 elements:

```
element Subject {
  (element Ancestors {
     (element Preferred_Ancestor_Branch {
        element Ancestor {
          element Immediate {ParentType},
          element Other {ParentType}*}}
      & element Non-Preferred_Ancestor_Branches {
          element Non-Preferred_Ancestor_Branch {
            element Ancestor {
              element Immediate {ParentType},
              element Other {ParentType}*}}+}?),
    [a:defaultValue = "300000000"]
    attribute Broad_Parent_ID {VP_Subject_ID}?}
  & element Associative_Relationships {
      element Associative_Relationship {
        element Description {xsd:string}?
        & element AR_Date {
            element Display_Date {xsd:string}
            & element Start_Date {Geog_Date}
            & element End_Date {Geog_Date}}?
        & element Historic_Flag {associative_rels_hist
        & element Relationship_Type {ar_code}
        & element Related_Subject_ID {
            element VP_Subject_ID {VP_Subject_ID}
            | element Contrib_Subject_ID {xsd:string}}
  & element Descriptive_Notes {
      element Descriptive_Note {
        element Note_Text {xsd:string}
        & element Note_Language {language_code}
        & element Note_Sources {
            element Note_Source {
              element Source {SourceType}
              & element Page {xsd:string}?}+}}*}?
  & element Record_Type {sub_record_type}?
  & element Sort_Order {xsd:int}
  & element Special_Project {xsd:string}?
  & element Subject_Contributor {
      element Contributor_id {contrib_code}
      & element Contrib_subject_id {xsd:string}?
      & element Contrib_Note {xsd:string}?
      & element Editor_name {xsd:string}
      & element Editor_email {xsd:string}}
  & element Subject_Sources {
      element Subject_Source {
        element Source {SourceType}
        & element Page {xsd:string}?}+}?
  & element Terms {
      element Preferred_Term {TermType},
      element Non-Preferred_Term {TermType}*}
  & element Work_Types {
      element Preferred_Work_Type {Work_TypeType},
      element Non-Preferred_Work_Type {Work_TypeType}*
  & element Other_Displays {OtherDisplaysType}
  & element Person_Corp_Rels {
      element Person_Corp_Rel {PersonCorpType}+}
  & element Depicted_Subjects {
      element Depicted_Subject {DepictedSubjectType}+}
  & element Creation_Display_Dates {
      element Creation_Display_Date {
        element Date_Qualifier {creation_dates_qualifi
        element Start_Date {Historical_Date},
        element End_Date {Historical_Date}}*}?
  & element General_Depicted_Subjects {
      element General_Depicted_Subject {GenDepictedSub
  & element Location_Repositories {
      element Location_Repository {LocationRepositoryT
  & element Classifications {
      element Classification {ClassificationType}+}
  & element Materials {
      element Material {MaterialsIndexingType}+}?
  & element Dimensions {
      element Dimension {DimensionsIndexingType}+}?
  & element Creator_Displays {
      element Creator_Display {
        element Creator_Display_Text {xsd:string},
        element Preferred_Flag {creator_display_prefer
  & element Cultures {
      element Culture {CultureType}+}?
  & element Events {
      element Preferred_Event {EventType},
      element Non-Preferred_Event {EventType}*}?
  & element Styles {
      element Style {StyleType}+}?
  & element Outside_Iconography_Records {
      element Outside_Iconography {
        element Iconogrpahy_Term {xsd:string},
        element Iconography_Code {xsd:string},
        element Outside_Iconography_Sources {
          element Outside_Iconography_Source {
            element Source {SourceType}
            & element Page {xsd:string}?}+}?}+}?),
    attribute Subject_ID {VP_Subject_ID}?}+,
  attribute Title {xsd:string},
  attribute Part {xsd:string}?,
  attribute Date {xsd:date}}

VP_Subject_ID = xsd:long {minInclusive = "1000000" maxInclu

ClassificationType =
  element Class_ID {class_code}
  & element Preferred {class_rels_preferred}

CultureType =
  element Nationality_Code {nationality_code}
  & element Display_Order {xsd:unsignedShort}
  & element Preferred {depicted_sub_rels_preferred}

DepictedSubjectType =
  element Place_Number {VP_Subject_ID}?
  & element Person_Corp_Number {VP_Subject_ID}?
  & element AAT_Number {VP_Subject_ID}?
  & element CONA_Number {VP_Subject_ID}?
  & element Iconography_ID {VP_Subject_ID}?
  & element Preferred {depicted_sub_rels_preferred}
  & element Display_Order {xsd:unsignedShort}
  & element Indexing_Type {depicted_sub_rels_idx_type}?
  & element Subject_Extent {depicted_sub_rels_sub_extent}?
  & element Depicted_Term_ID {empty}?

DimensionsIndexingType =
  element Value {xsd:decimal}
  & element Unit {dimensions_idx_unit}
  & element Dimensions_Type {dimensions_idx_dim_type}
  & element Dimensions_Extent {dimensions_idx_dim_ext}?
  & element Dimensions_Qualifier {dimensions_idx_dim_qual}?
  & element Scale_Type {dimensions_idx_scale_type}?
  & element Format {dimensions_idx_format}?
  & element Shape {dimensions_idx_shape}?

EventType =
  element Event_ID {event_code}
  & element Display_Order {xsd:unsignedShort}
  & element Place {xsd:string}?
  & element Event_Date {
      element Display_Date {xsd:string}
      & element Start_Date {Historical_Date}
      & element End_Date {Historical_Date}}?

GenDepictedSubjectType =
  element Preferred {depicted_sub_rels_preferred}
  & element Display_Order {xsd:unsignedShort}
  & element General_Depicted {general_depicted_subject_gend
  & element Indexing_Type {depicted_sub_rels_idx_type}?
  & element Subject_Extent {depicted_sub_rels_sub_extent}?

Geog_Date = xsd:integer {maxInclusive = "9999"}

Historical_Date = xsd:integer {maxInclusive = "9999"}
```

3.3.3 SPECTRUM XML

SPECTRUM Schema 4.0b has 10 entities and 592 fields, of which 490 are Object (artwork) fields. I am not aware of any systems producing this.

```
Object
  AccessCategory 0
    Date (ExactDate 0)
    Name (string)
    Note (string 0)
  Acquisition 0
    AccessionDate (ExactDate 0)
    Authorisation 0*
      Authoriser (string)
      Date (ExactDate 0)
    Date (Date 0)
    Funding 0*
      Provisos (string 0)
      Source (string 0)
      Value (string 0)
    GroupPrice (string 0)
    Method (string 0)
    Note (string 0*)
    OfferedPrice (string 0*)
    OfferPrice (string 0*)
    Owner (Person 0*)
    Price 0
      LocalValue (string)
      OriginalCurrency (string 0)
      OriginalValue (string 0)
    Provisos (string 0*)
    Reason (string 0*)
    Reference (string 0*)
    Source 0*
    TitleTransfer 0
      Number (string)
  Associations 0*
    GeneralAssociations 0*
      Concept (string 0)
      CulturalAffinity (string 0)
      HistoryNote (string 0)
    SpecificAssociations 0*
      Association
        AssociatedActivity 0*
          Activity (string 0)
          AssociatedActivityNote (string 0)
        AssociatedObject 0*
          AssociatedObject (Object 0)
          AssociatedObjectType (string 0)
        AssociationNote (string 0)
        Date (Date 0)
        Organisation (Organisation 0)
        People (People 0)
        Person (Person 0)
        Place (Place 0)
        RelatedEvent 0
          AssociatedEventName
            Name (string 0)
            Type (string 0)
          AssociatedEventPeople (People 0)
          AssociatedEventPerson (Person 0)
          AssociatedEventPlace (Place 0)
          Date (Date 0)
          Organisation (Organisation 0)
        RelatedObject 0
          Number (string)
          RelatedObjectAssociation (string 0
          RelatedObjectNote (string 0)
      AssociationType (string 0)
  Audit 0*
    Auditor
    Category (string 0)
    Date (ExactDate 0)
    Method (string 0)
    Note (string 0)
    ObjectAuditType (string 0)
    Reference (string 0)
    Results (string 0)
    Type (string 0)
  Condition 0
    Check 0*
      Assessor 0
      ConditionCheckAssessmentReason (string
      ConditionDate (ExactDate 0)
      Date (ExactDate 0)
      Method (string 0)
      NextDate (ExactDate 0)
      Note (string 0*)
      Reference (string 0)
      TechnicalAttributes 0*
        TechnicalAssesment (string 0*)
        TechnicalAssessmentDate (ExactDate 0
    Completeness 0
      CompletenessDate (ExactDate 0)
      Keyword (string)
      Note (string 0*)
    DamageLoss 0*
      Date (Date 0)
      Method (string 0)
      Note (string 0*)
      Reference (string 0)
      Reporter (Person 0*)
    Keyword (string 0)
    Note (string 0*)
  Conservation 0*
    Material (string 0*)
    Method (string 0*)
    Note (string 0*)
    RecallDate (ExactDate 0*)
    Reference (string 0)
    Treatment 0*
      Conservator (Person 0*)
      Date (ExactDate 0)
      Description (string 0*)
      Priority (string 0)
  Deaccession 0
    Date (ExactDate 0)
    Disposal 0
      Date (ExactDate 0)
      Method (string 0)
      NewNumber (string 0)
      Note (string 0*)
      Price 0
      ProposedRecipient (string 0*)
      Provisos (string 0*)
      Reason (string 0*)
      Recipient 0
      Reference (string 0)
    GroupPrice (string 0)
  Description 0*
    Age 0*
      Phase (string 0)
      Qualifier (string 0)
      Unit (string 0)
      Value (integer 0)
    Colour (string 0*)
    Component 0*
      Information (string 0)
      Name (string 0)
    Content 0*
      Activity (string 0*)
      Concept (string 0*)
      ContentLanguage (string 0)
      ContentOther 0*
        ContentOther (string 0)
        ContentOtherType (string 0)
      ContentScript (string 0)
      Date (Date 0*)
      Description (string 0*)
      Event 0*
        Name (string 0)
        Type (string 0)
      Keyword (string 0*)
      Name (string 0)
      Organisation (Organisation 0*)
      People (People 0*)
      Person (Person 0*)
      Place (Place 0*)
      Position (string 0)
    Dimension 0*
      Date (ExactDate 0)
      Dimension (string)
      Part (string 0)
      Qualifier (string 0)
      Unit (string)
      Value (string)
    Form (string 0)
    Gender (string 0*)
    Inscription 0*
      Content (string 0)
      Date (Date 0)
      Description (string 0*)
      Inscriber 0*
      Interpretation (string 0*)
      Language (string 0*)
      Method (string 0*)
      Position (string 0)
      Script (string 0*)
      Translation (string 0*)
      Transliteration (string 0*)
      Type (string 0)
    Material 0*
      Material (string 0)
      MaterialComponent 0
        Keyword (string 0)
        Note (string 0*)
      Name (string 0*)
      Source (Place 0)
    PhysicalDescription (string 0*)
    TechnicalAttributes 0*
      Attribute (string 0)
      Unit (string 0)
      Value (string 0)
    Technique 0*
      Technique (string 0)
      Type (string 0)
  Despatch 0*
    DeliveryDate (ExactDate 0)
  Entry 0
    Date (ExactDate 0)
    Depositor 0
    DepositorRequirements (string 0*)
```

3.3.4 LIDO

Lightweight Information Describing Objects (LIDO). Evolved from CDWA, museumdat, with inspiration from CIDOC CRM. (Images by R.Stein and A.Vitzthum, ATHENA workshop, 2010)

Descriptive and administrative elements of a LIDO record

- Object Classifications –

Object / Work Type (*mandatory*)

Classification

-Object Identifications –

Title / Name (*mandatory*)

Inscriptions

Repository / Location

State / Edition

Object Description

Measurements

-Events –

Event Set

-Relations –

Subject Set

Related Works

-Administrative Metadata –

Rights

Record (*mandatory*)

Resource

3.3.5 LIDO SCHEMA

- Complex schema, eg when referring to a related object, you can provide almost as much detail as for the main object. Could leverage opportunities for linking more.
- Display vs Indexing (structured) elements: inherited from CDWA

Object Identification

objectWorkType: **Gemälde**

title: **„Hohe Wogen“**
pref: preferred

objectDescriptionSet
type: **Object history**
descriptiveNote: **„Wie alle reinen Meeresbilder ...“**

objectMeasurementsSet
displayObjectMeasurements: **H: 67 cm, B: 87 cm**
objectMeasurements
measurementsSet
unit: **cm**
type: **height**
value: **67**
measurementsSet
unit: **cm**
type: **width**
value: **87**

3.4 ARCHIVE METADATA

- EAD: Encoded Archival Description. Describes archival materials (documentary units)
- EAC/CPF: Encoded Archival Context: Corporations, Persons, Families
- EAG: Encoded Archival Guide. Describes institutions

3.4.1 ARCHIVE METADATA PROBLEMS

Pay a lot of attention to presentation, not enough to linking (difficult to "semanticize"). Emphasis on documents, not historic agents and events

- EAG: So-called "controlled access points" are text, and typically not controlled at all
- EAC: Many institutions don't consider EAC very valuable, and instead put person info in EAD's bioghist element (example below from EADiva)
- EAC: Related persons are names ("strings"), not links ("things")
- EAC: Events include lots of info but only Date is separate field (person names could be tagged but often are not)
- EAC: Family tree modeled as Outline, that's also used for other purposes (just presentation)

```
<bioghist>
  <head>Chronological Events</head>
  <chronlist>
    <chronitem>
      <date normal="19781028">October 28, 1978</date>
      <event>
        <persname normal="Wossname, Samuel">Sam Wossname</persname> succeeds
        <persname normal="Othername, John">John Othername</persname> as department head.
      </event>
    </chronitem>
    <chronitem>
      <date normal="19790315">March 15, 1979</date>
      <event>Departmental reorganization.</event>
    </chronitem>
  </chronlist>
</bioghist>
```

3.5 LIBRARY METADATA: MARC

MARC is 50 years old, unreadable, and doesn't accommodate new FRBR principles.
MARC-XML is not much better

LDR			01671cam a2200385 a 4500
001			12901170
005			20041228203623.0
008			020820s2003 nyub 000 1 eng
010			‡a 2002030595
020			‡a 0743233034 (alk. paper)
040			‡a DLC ‡c DLC ‡d DLC
043			‡a n-usp--
050	0	0	‡a PS3563.A319 ‡b W36 2003
082	0	0	‡a 813/.54 ‡2 21
100	1		‡a McMurtry, Larry.
245	1	4	‡a The wandering hill : ‡b a novel / ‡c Larry McMurtry.
260			‡a New York : ‡b Simon & Schuster, ‡c c2003.
300			‡a xiii, 302 p. : ‡b maps ; ‡c 25 cm.
490	1		‡a Berrybender narratives ; ‡v bk. 2
500			‡a Maps on endpapers.
650		0	‡a British ‡z West (U.S.) ‡v Fiction.
650		0	‡a Eccentrics and eccentricities ‡v Fiction.
651		0	‡a Yellowstone River ‡v Fiction.
650		0	‡a Women immigrants ‡v Fiction.
650		0	‡a Young women ‡v Fiction.
650		0	‡a Berrybender family (Fictitious characters) ‡v Fiction.
800	1		‡a McMurtry, Larry. ‡t Berrybender narratives ; ‡v bk. 2.

3.5.1 MARC MUST DIE

A whole emotional subculture, based on a slogan by Roy Fielding, 2002.

- marc-must-die.info: "MARC is dead" (is it really?)
- FutureLib: in-depth discussion wiki
- Facebook group

Presentation by Sally Chambers, ELAG 2011

4 GLAM ONTOLOGIES

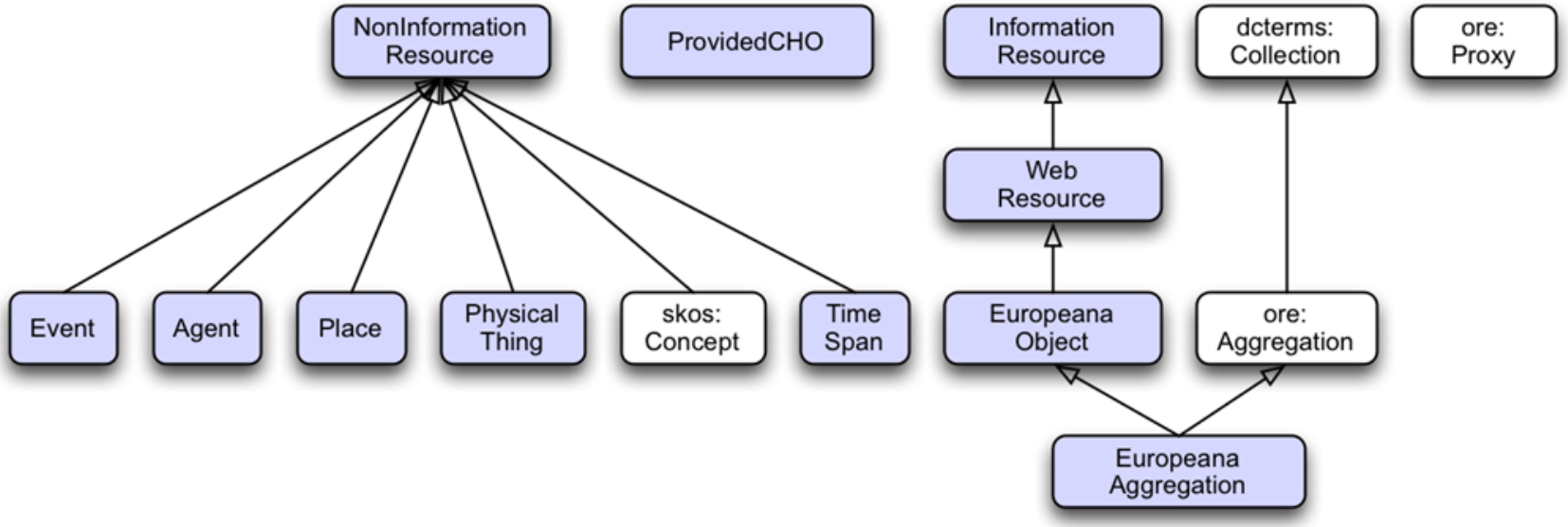
Why do they call conversion to RDF "lifting" and back to some other format "lowering"?

- RDF is a simple abstracted data model
- Doesn't have nesting biases like XML: whether a sub-element is nested or referenced by ID. Has less syntactic idiosyncrasies
- (RDF/XML is awful, but there is Turtle for readability, or JSONLD for programmer convenience)
- The model is self-describing in a distributed way: if a class/property is looked up, should return description and info

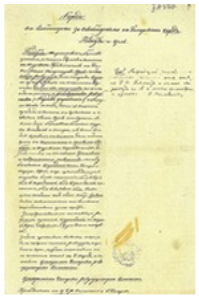
4.1 EUROPEANA DATA MODEL

Model used by the Europeana aggregator (53M objects), and adopted by Digital Public Library of America (DPLA) Based on:

- OAI ORE (Open Archives Initiative Object Reuse & Exchange): organizing object metadata and digital representations (WebResources)
- Dublin Core: descriptive metadata
- SKOS (Simple Knowledge Organization System): conceptual objects (concepts, agents, etc)
- CIDOC-CRM inspired: events, some relations between objects



4.1.1 EDM SEMANTIC GRAPH

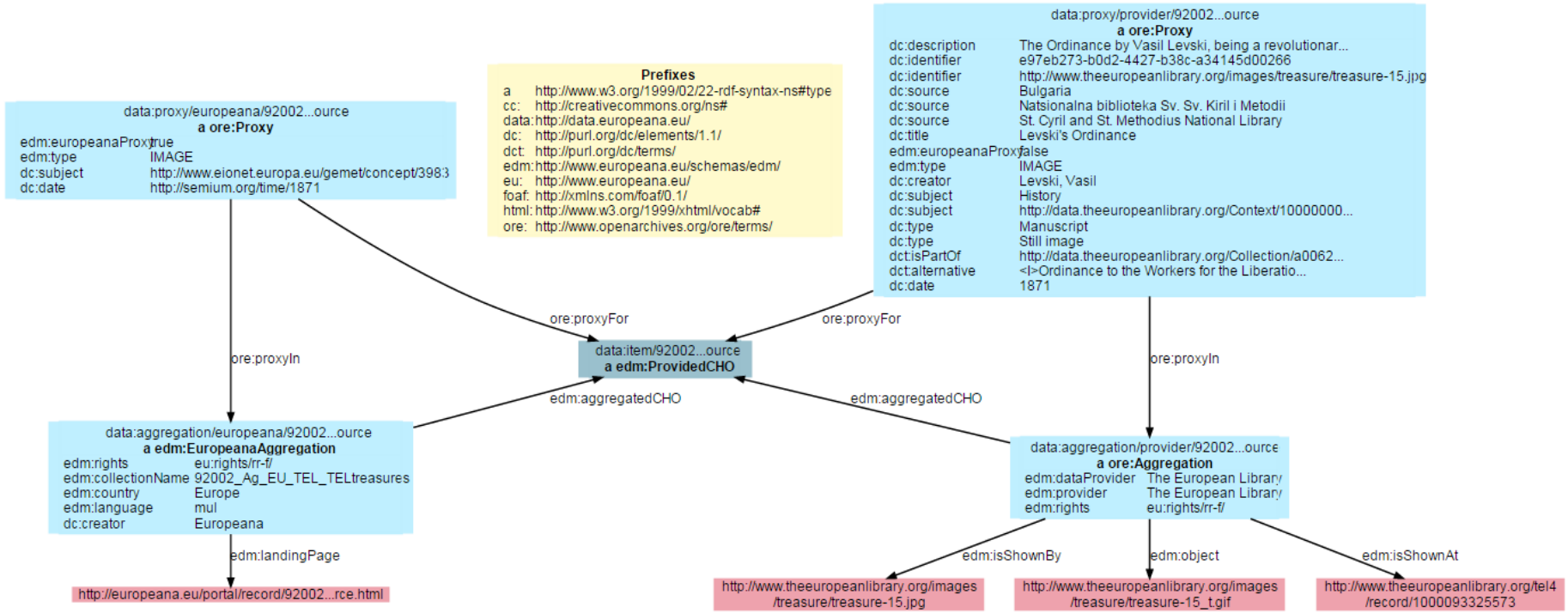


Levski's Ordinance

Download as ▾

Source: http://data.europeana.eu/item/92002/BibliographicResource_1000093325573_source

Description: The Ordinance by Vasil Levski, being a revolutionary code in its essence, is a great achievement of the democratic thought that constitutes not only the ideology of the Bulgarian liberation movement but the era of the liberating revolutions as a whole. Though it bears specific Bulgarian characteristics and circumstances, this document is unique by itself in the history of the liberating struggles in the XIX c. with its logistic and systematic construction, the consistent democracy not opposed to the opportunity for the people's revolutionary will to be imposed with good organization and violence, even. In the Ordinance Levski draws the outlines of the future free democratic society, of the "sacred and fair republic", of the "people's government" based on the Renaissance and the enlighted political thought. On the first page of the document the political philosophy of the author is stated determining the motives and aims of the new revolutionary organization with the main slogan been that tyranny and lack of humanity should be replaced by democratic republic. The basic principles governing the future state will be: the equality of all citizens; the equality of all nationalities; civil and political rights; the rule of law; independence of all authorities.



4.1.2 EDM ISSUES/CONSIDERATIONS

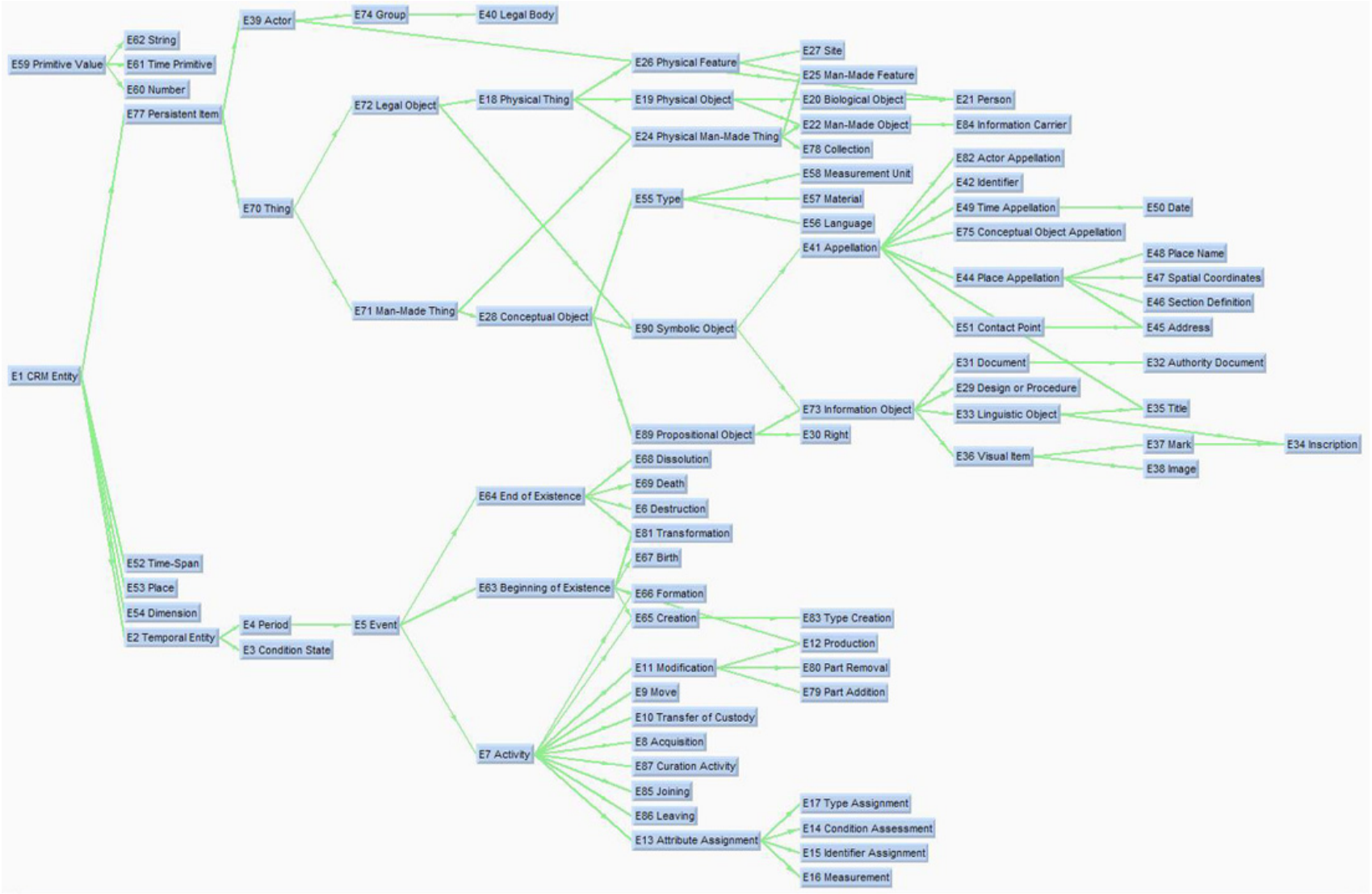
- Criticized that it's not expressive enough. Eg can't capture the specific contribution of an artist to artwork
- Complication: splits info about an object:
  - EDM External (form provider): edm:ProvidedCHO and ore:Aggregation
  - EDM Internal (at Europeana): edm:ProvidedCHO and 2 <ore:Aggregation, ore:Proxy> pairs
- Many providers use the minimal features and make mistakes; Europeana didn't do a lot of validation
  - Old objects retro-converted from ESE are poor (only text), though some enrichments added by Europeana
  - Europeana Data Quality Committee formed, to push this strategic point (2015-2020)

Evolving specification (since 2009)

- Currently considering actual implementation of Events
- Extensions for manuscripts, music, fashion, etc

4.2 CIDOC CRM

CIDOC CRM: comprehensive reference model used for history, historic events, archaeology, museum data, etc by CIDOC (ICOM documentation committee). Standardized as ISO 21127:2014, still evolving. About 85 classes, fundamental branches: Persistent (endurant) vs Temporal (perdurant), Physical vs Conceptual



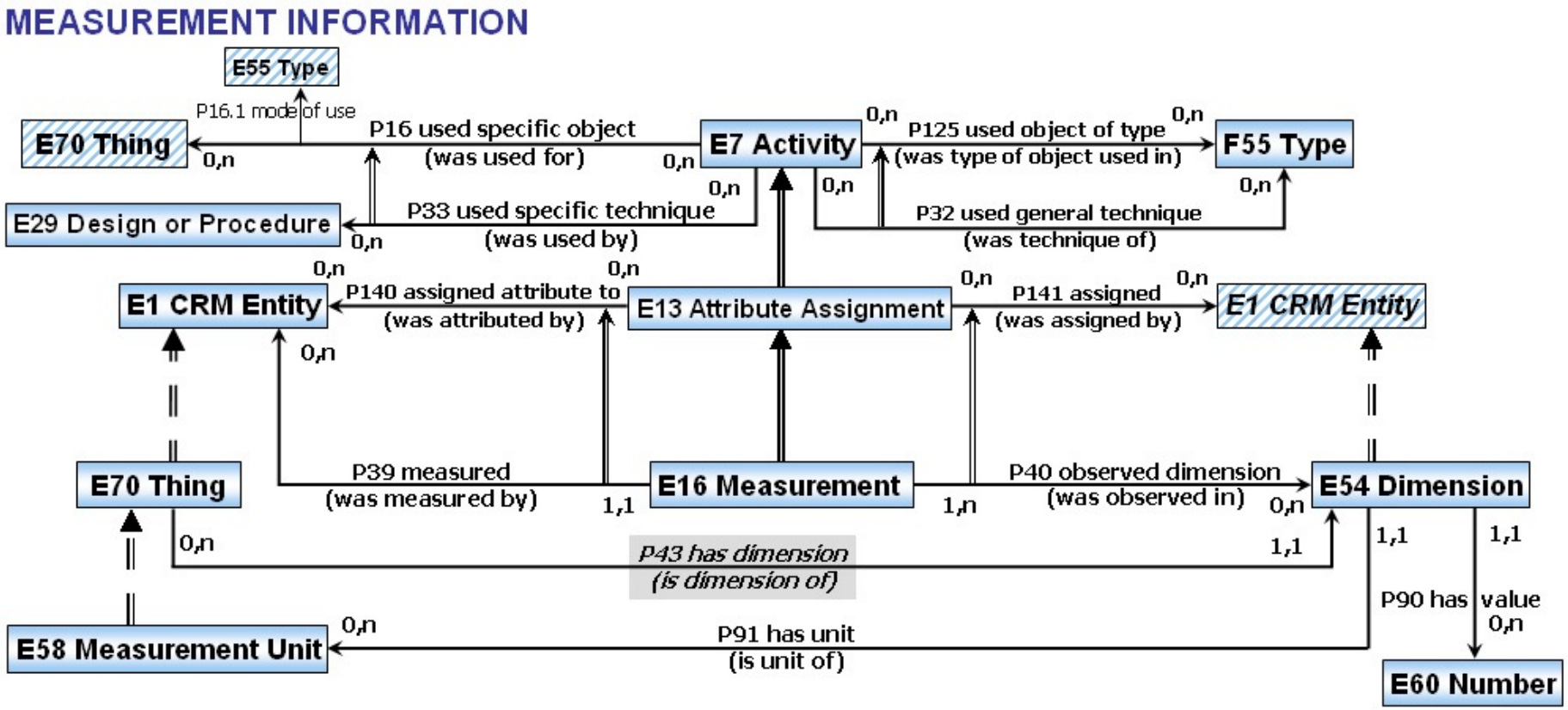
4.2.1 CIDOC CRM PROPERTIES

Classes represent abstract things (eg crm:E24_Physical_Man-Made_Thing), specific things (eg Paintings, Coins) are accommodated with crm:P2_has_type. 135 props (plus their inverses); prop hierarchy (see "- - -" at bottom):

Id	Property Name	Entity - Domain	Entity - Range
P1	is identified by (identifies)	E1 CRM Entity	E41 Appellation
P48	- has preferred identifier (is preferred identifier of)	E1 CRM Entity	E42 Identifier
P78	- is identified by (identifies)	E52 Time-Span	E49 Time Appellation
P87	- is identified by (identifies)	E53 Place	E44 Place Appellation
P102	- has title (is title of)	E71 Man-Made Thing	E35 Title
P131	- is identified by (identifies)	E39 Actor	E82 Actor Appellation
P2	has type (is type of)	E1 CRM Entity	E55 Type
P137	- exemplifies (is exemplified by)	E1 CRM Entity	E55 Type
P3	has note	E1 CRM Entity	E62 String
P79	- beginning is qualified by	E52 Time-Span	E62 String
P80	- end is qualified by	E52 Time-Span	E62 String
P4	has time-span (is time-span of)	E2 Temporal Entity	E52 Time-Span
P5	consists of (forms part of)	E3 Condition State	E3 Condition State
P7	took place at (witnessed)	E4 Period	E53 Place
P26	- moved to (was destination of)	E9 Move	E53 Place
P27	- moved from (was origin of)	E9 Move	E53 Place
P8	took place on or within (witnessed)	E4 Period	E19 Physical Object
P9	consists of (forms part of)	E4 Period	E4 Period
P10	falls within (contains)	E4 Period	E4 Period
P148	has component (is component of)	E89 Propositional Object	E89 Propositional Object
P12	occurred in the presence of (was present at)	E5 Event	E77 Persistent Item
P11	- had participant (participated in)	E5 Event	E39 Actor
P14	- - carried out by (performed)	E7 Activity	E39 Actor
P22	- - - transferred title to (acquired title through)	E8 Acquisition	E39 Actor
P23	- - - transferred title from (surrendered title through)	E8 Acquisition	E39 Actor

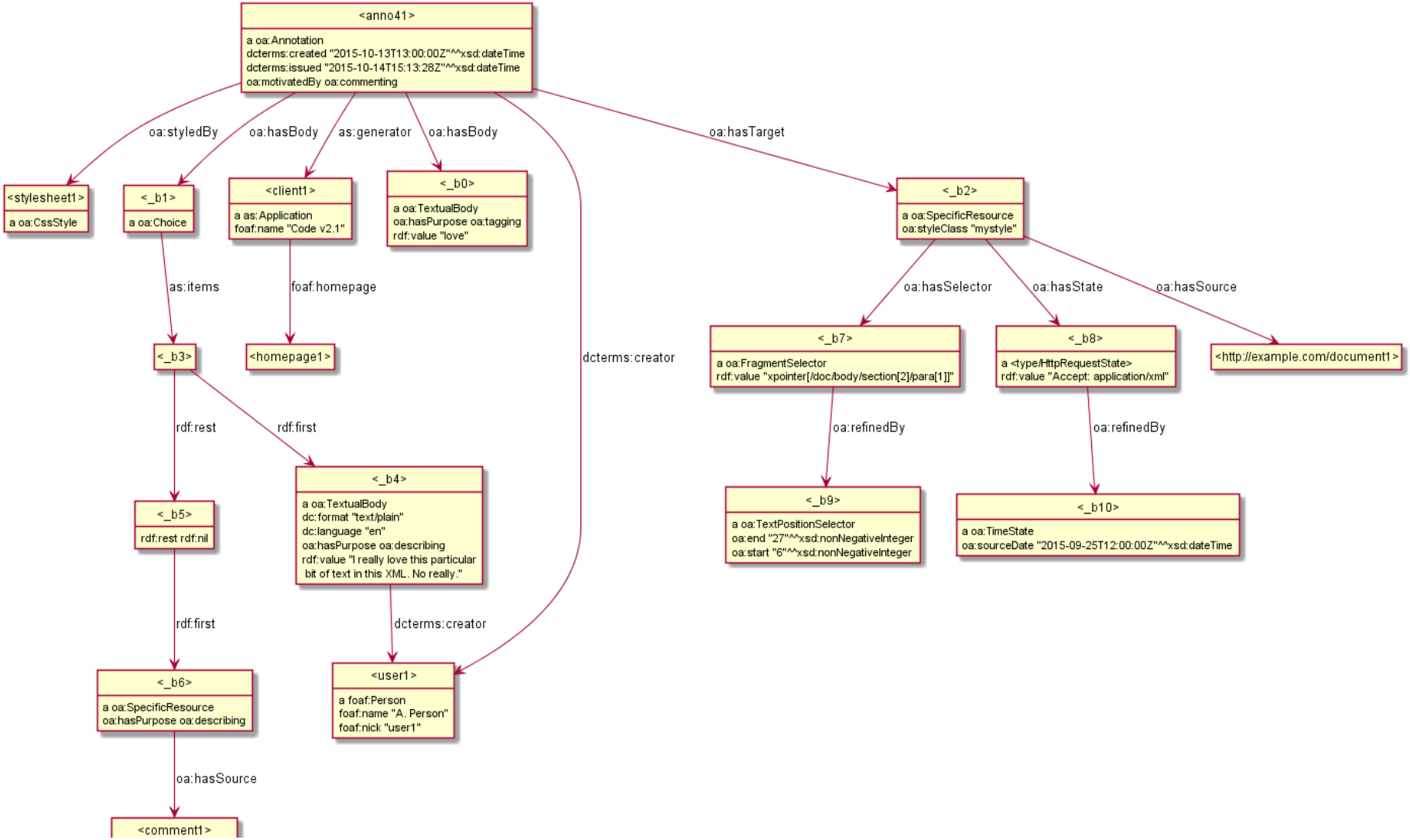
4.2.2 CIDOC GRAPHICAL EXAMPLES

- Video Tutorial (or HTML version including Kindle)
- Graphical Representation (or continuous HTML version including Kindle): essential to understand how to apply CRM in various situations
- Typical modeling construct **short-cut** (crm:P43_has_dimension) vs **long-path** (eg crm:P39i_was_measured_by/crm:P40_observed_dimension), which allows more details



4.3 WEB ANNOTATION (OPEN ANNOTATION, OA)

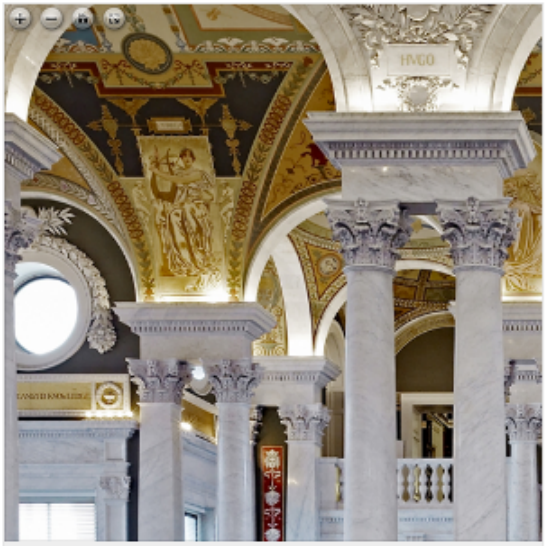
W3C TR: mark, annotate, relate any web resources, eg: Webpage and bookmark, Image and region over it, Document and translation, Paragraph and commentary. Diagram of Complete Example from spec (using my **rdfpuml**)



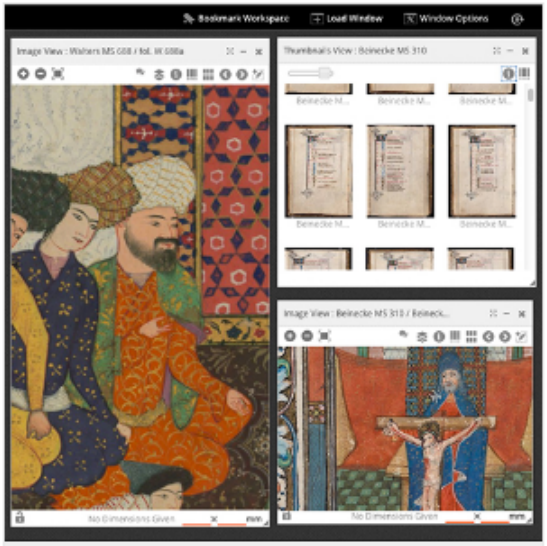
4.4 INTERNATIONAL IMAGE INTEROP FRAMEWORK (IIIF)

Standard API for DeepZoom (hi-res) images. Supported by many servers and viewers.
http://iiif.io

IIIF Showcase

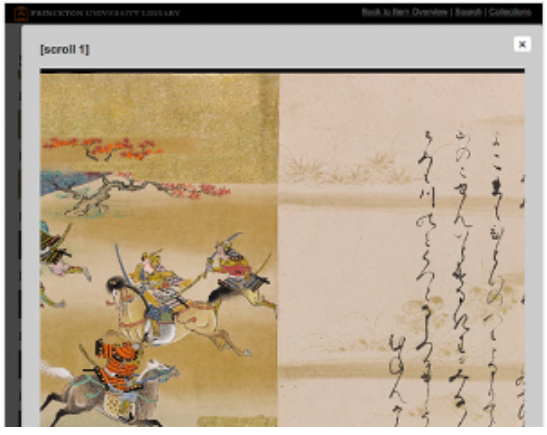


OpenSeadragon



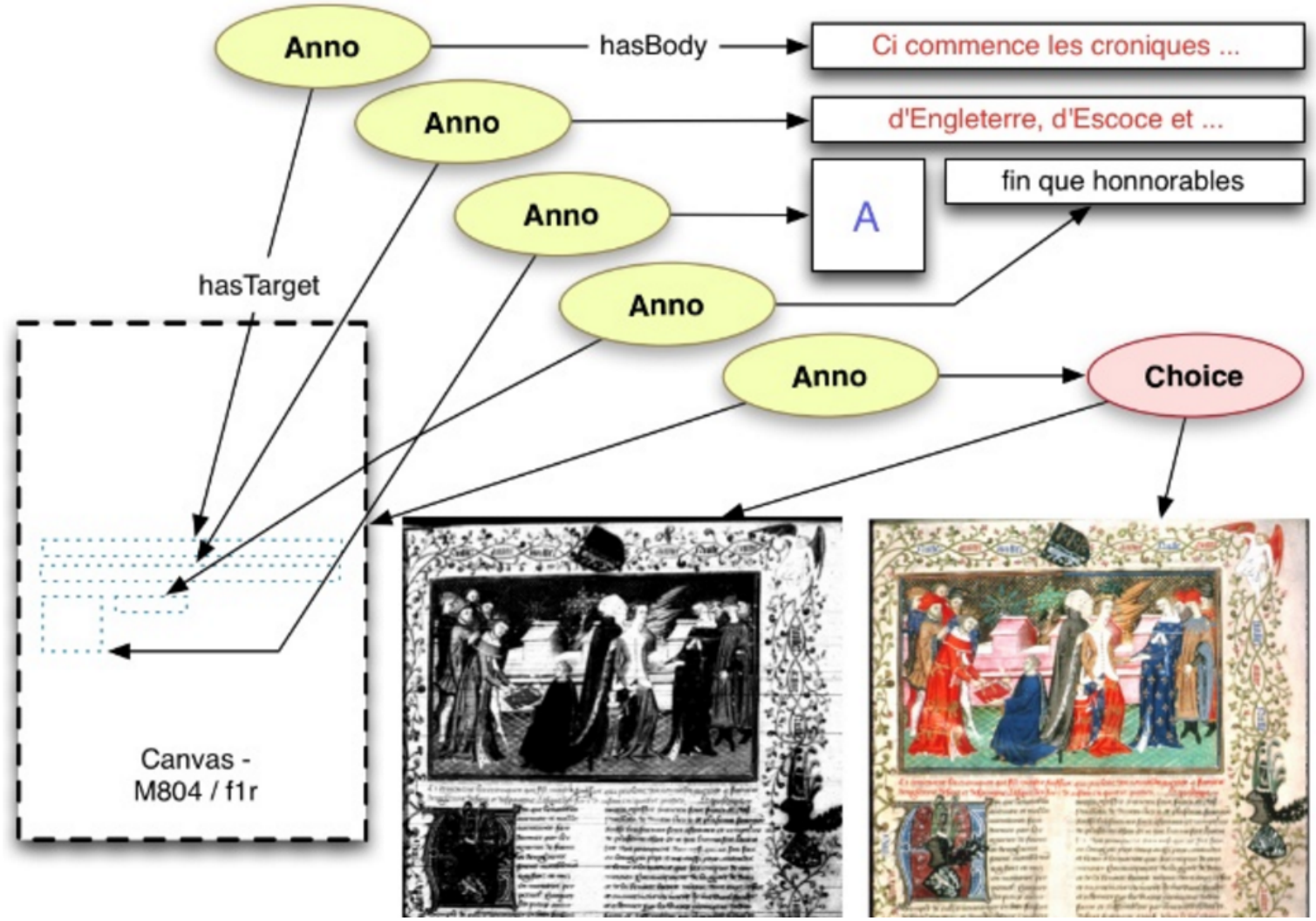
Mirador Viewer

Universal Viewer



4.4.1 IIIF PRESENTATION API

Based on OA and SharedCanvas. Strong attention to JSONLD representation (convenient for developers). Allows to assemble manuscripts from pieces, present folios, etc etc. See Rob Sanderson presentations, eg IIIF and JSONLD:



4.5 LIBRARY ONTOLOGIES

War of the Bibliographic Ontologies?

- **BIBO**: used for a long time, pragmaic
- **FRBRer**: pragmatic realization of FRBR, but little uptake (not rich enough?)
- **FRBRoo**: based on CIDOC CRM, perhaps too complex
- **Fabio, Cito, Doco** and friends: modern, includes new features (eg citation intent)
- **BibFrame**: sponsored by LoC, but soundly criticized for modeling mistakes
- **RDAregistry.info**: basic FRBR classes, numerous properties for all kinds of things. Used for 100M records at TEL
- **SchemaBibEx** (http://bib.schema.org): steps on a clean model sponsored by the big 4 search engines (Google, MS Bing, Yahoo, Yandex.ru). Developed by OCLC. May end up being used for 300M records at WorldCat.

4.5.1 RDAREGISTRY

Resource Description and Access (RDA). Registry info is well organized

RDA Registry | Elements | Values | Data | Tools | About | FAQ | Guide | Blog | Project | RDA Toolkit

RDA Registry

- RDA Registry (Home)
- Elements (RDA element sets)
  - Classes
  - Work properties
  - Expression properties
  - Manifestation properties
  - Item properties
  - Agent properties
  - Place properties
  - Unconstrained properties
  - Meta-element properties
  - RDA/ONIX Framework elements
- Values (value vocabularies)
  - RDA values
  - RDA/ONIX Framework values
- Data (Linked data using RDA vocabularies)
  - Examples (Single resource)
  - R-Balls (Multiple resources)
  - Datasets (Multiple resources)
- Tools
  - Maps (RDF maps between RDA vocabularies and other namespaces)
  - Alignments (Alignment tables for RDA vocabularies and other namespaces)
  - Profiles (Application profiles using RDA vocabularies)
  - RIMMF (RDA data editor)
- About (More about the RDA vocabularies)
  - RDA Reference data (Data maintenance and flow)
  - Issues (Raise issues and make comments)
  - Versions (Version control)
  - Deprecation (Removal of vocabulary entries)
  - RDA/ONIX Framework (Basis of carrier and content categories)
- FAQ (Answers to frequently asked questions)
- Guide (Guide to RDA vocabularies for technical communities)
- Blog (News and views from the RDA Development Team)
- Project (RDA-Vocabularies project on GitHub)
- RDA Toolkit (Full text of RDA - subscription required)

Welcome to the RDA Registry!

The RDA Registry contains linked data and Semantic Web representations of the elements and relationship designators approved by the RDA Steering Committee (RSC).

For details of the latest release see Release 2.5.2.

Downloads

- v2.5.2 (zip)
- v2.5.2 (tar.gz)

The RDA Registry is based on the Open Metadata Registry. It is maintained by the RSC and Metadata Management Associates in association with ALA Digital Reference.

Please use the contacts below for more information. Remember that questions or comments about individual RDA elements or concepts can be easily made by using the OMR feedback button on the far right center of the page describing the individual property (it is orange, with white lettering).

Contacts:

- RSC: Gordon Dunsire
- MMA: Diane Hillmann
- OMR technical issues: Jon Phipps
- ALA Digital Reference: James Hennelly

If you discover a problem with the representations of the RDA vocabularies, or have a question, or even wish to engage in a philosophical or practical discussion, please raise an issue!

View the project on GitHub.

RDA Vocabularies and **RDA Registry** are licensed under a Creative Commons Attribution 4.0 International License. Based on a work at http://rdaregistry.info.

RESOURCE DESCRIPTION & ACCESS

4.5.2 RDAREGISTRY PROPERTIES

Many props (306 for Work alone), for specific purposes (eg "apellee" for court decisions, "granting institution" for academic theses). Numeric prop names, but lexical (natural language) also supported. Serves many semantic formats.

Work properties

The Work properties element set consists of properties representing the attributes and relationships of the RDA Work entity. Each property in the element set has a domain of the class representing this entity.

Number of elements:	297
Namespace:	http://rdaregistry.info/Elements/w/
Suggested prefix:	rdaw
Example curie (canonical)*:	rdaw:P10001
Example curie (lexical)*:	rdaw:respondent
Changelog feed:	Atom | RDF

*All RDA URIs have both an immutable canonical form and a "readable", lexical form, which is subject to change (changes will be redirected).

Downloads

- HTML (Open Metadata Registry)
- Turtle (text/turtle)
- Notation 3 (text/rdf+n3)
- N-Triples (text/rdf+nt)
- RDF/XML (application/rdf+xml)
- RDFa
- Microdata (text/microdata+html)
- JSON-LD (application/json | application/json+ld) (see the Readme)
- RDF/JSON (application/rdf+json)

Languages

English French Spanish

Properties Index

Show 25 entries

Search:

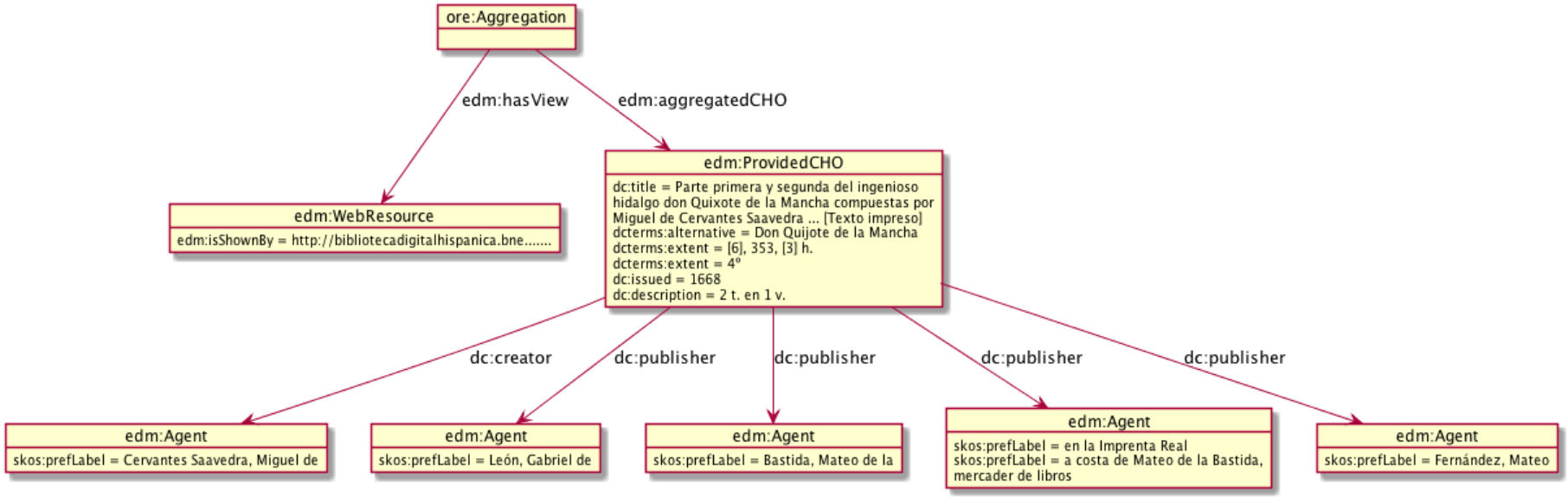
#	CURIE	Label	Definition	SubpropertyOf	Unconstrained
#	rdaw:P10001	"has respondent"	"Relates a work to a candidate for a degree who defends or opposes a thesis provided by the praeses in an academic disputation."	rdaw:P10065 "has creator"	rdau:P60045 "has respondent"
#	rdaw:P10002	"has identifier for the work"	"Relates a work to a character string uniquely associated with a work, or with a surrogate such as an authority record for a work."		rdau:P60052 "has identifier for the resource"
#	rdaw:P10003	"has other distinguishing characteristic of the work"	"Relates a work to a characteristic other than form of work, date of work, or place of origin of the work serving to differentiate a work from another work with the same title or from the name of a person, family, or corporate body."		rdau:P60054 "has other distinguishing characteristic of the resource"
#	rdaw:P10004	"has form of work"	"Relates a work to a class or genre to which a work belongs."		rdau:P60058 "has form of resource"

4.5.3 A TASTE OF FRBROO

EDM–FRBRoo Application Profile Task Force: asked what to add to EDM to better fit FRBRoo.

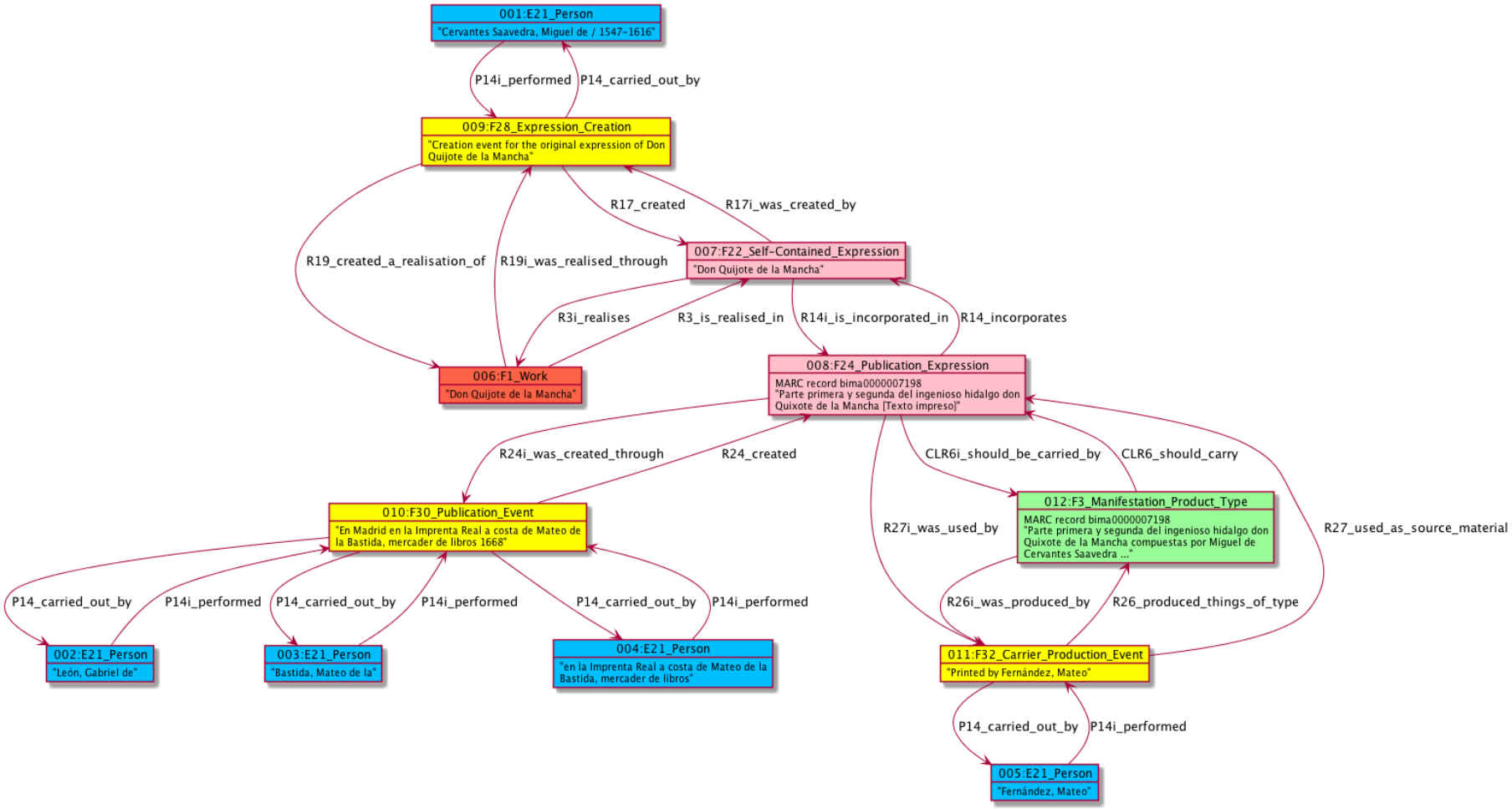
- TF members developed a number of examples, eg on publications of "Don Quixote" (T.Aalberg, V.Alexiev, J.Walkowska).

EDM variant:



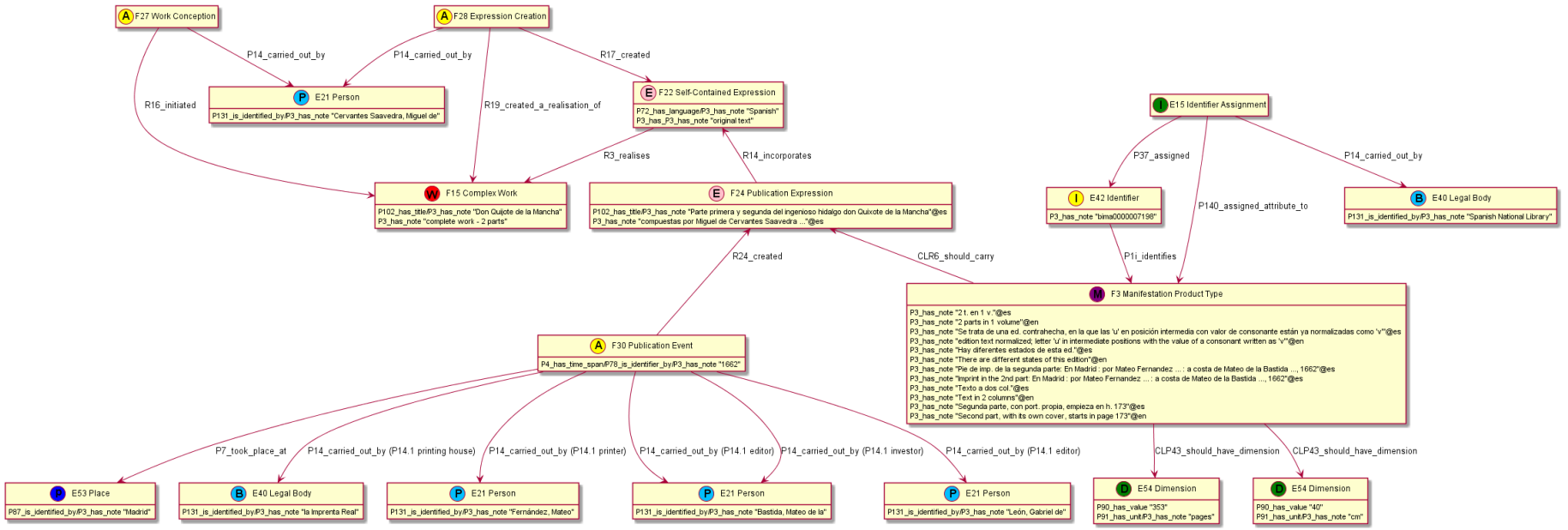
4.5.3.1 A TASTE OF FRBROO

Simpler FRBRoo variant:



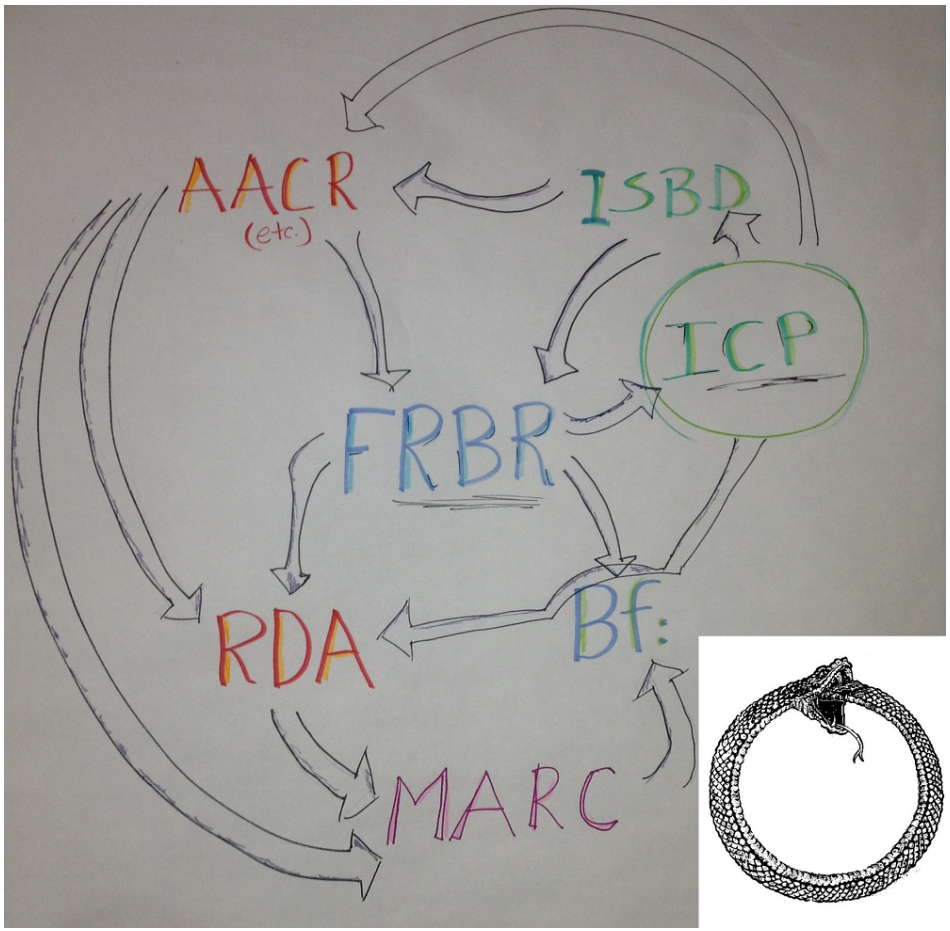
4.5.3.2 A TASTE OF FRBROO

More complex FRBRoo variant:



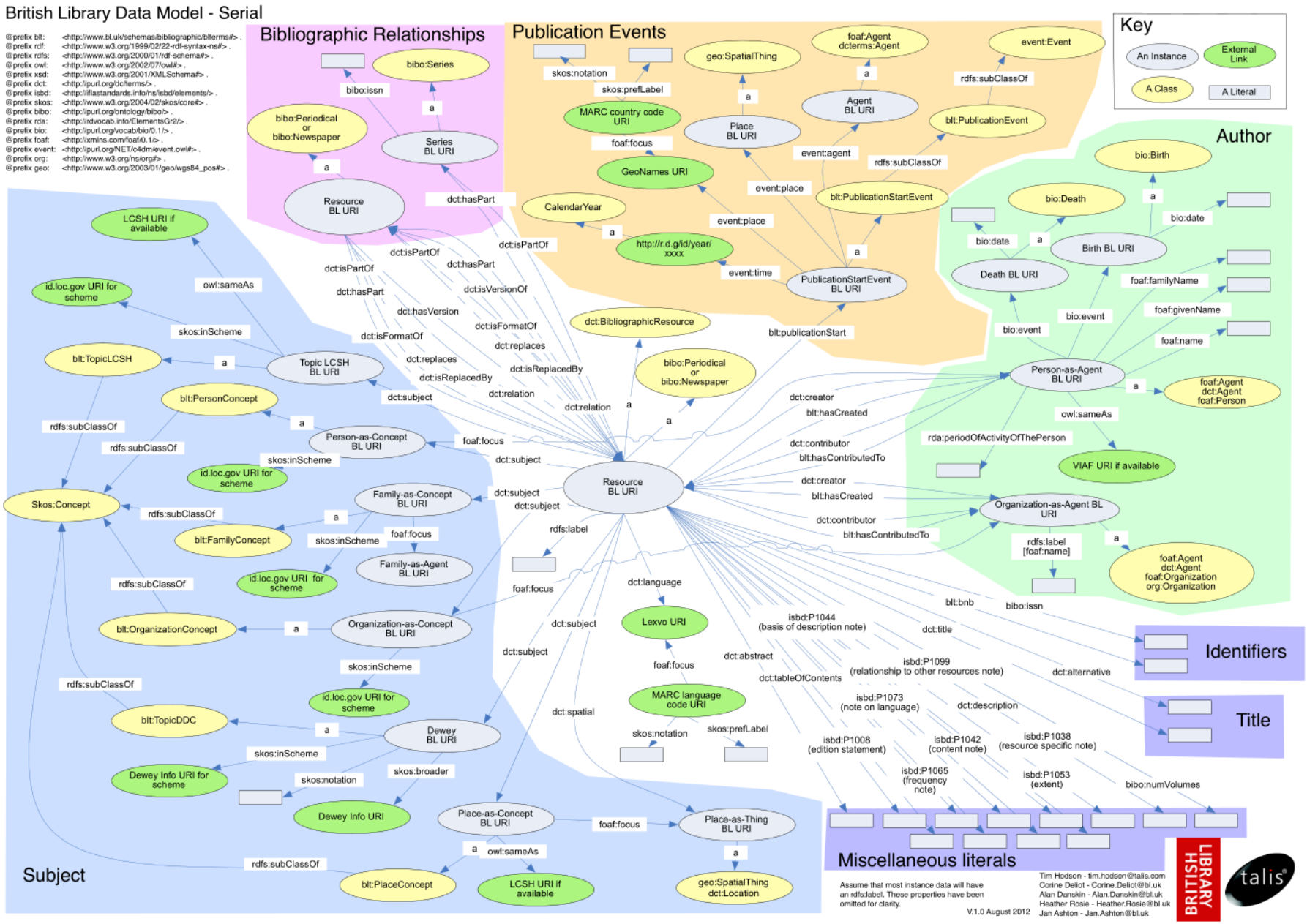
4.5.4 FRBR-INSPIRED

- "FRBR, Before and After" by K.Coyle (ALA 2016) is an in-depth look at FRBR-inspired models/realizations.
- Chapter 10 describes the following ontologies: FRBRer, FRBRcore, FaBiO, <indecs>, BIBFRAME, RDA in RDF, webFRBRer, FRBRoo
- "Mistakes have been made", K.Coyle, SWIB 2015



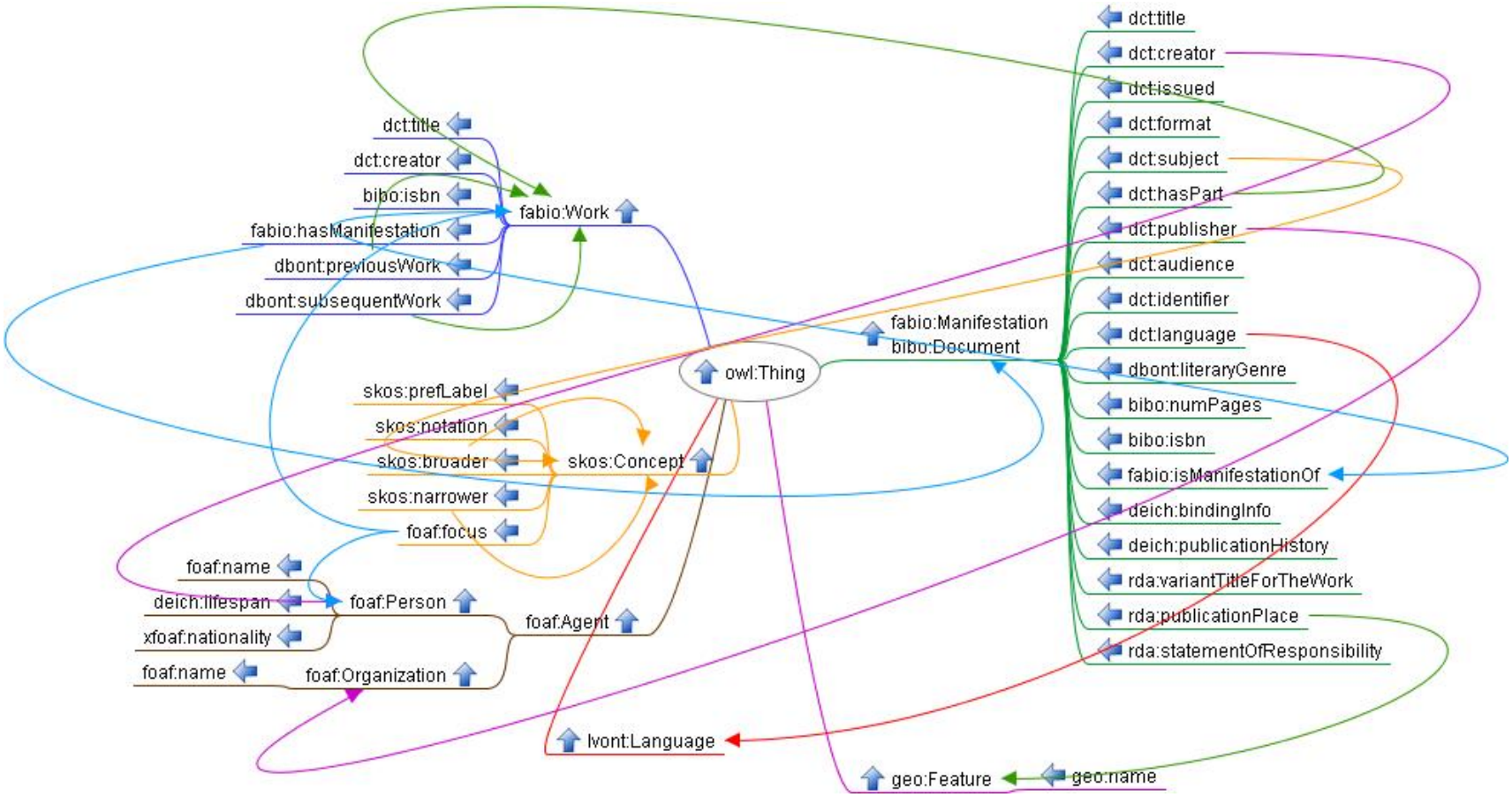
4.5.5 BRITISH LIBRARY DATA MODEL

Pragmatic data model that reuses several ontologies, and adds own props



4.5.6 FIRST LIBRARY THAT RUNS ON RDF

Oslo Public Library (http://data.deichman.no, since 2014) uses Koha open source software, RDF in the core, and marc2rdf/rdf2marc conversions. Pragmatic data model that reuses several ontologies, and adds own props. Enables a number of agile apps, eg search related books on Kiosk



4.5.6.1 OSLO PUBLIC LIBRARY DATA

```
d_res:tnr_749919  rdf:type  bibo:Document , fabio:Manifestation ;
  dc:title  "About time" ;
  d:titleURLized  "about_time" ;
  fabio:hasSubtitle  "Einstein's unfinished revolution" ;
  ctag:tagged  d_keyword:imaginary , d_keyword:dilation , d_keyword:time ,
    d_keyword:tidsreiser , d_keyword:tidsdilatasjon ;
  foaf:depiction  <http://covers.openlibrary.org/b/id/96714-M.jpg> ,
    <http://covers.openlibrary.org/b/id/96715-M.jpg> ,
    <http://www.bokkilden.no/SamboWeb/servlet/VisBildeServlet?produktId=81081> ;
  owl:sameAs  <http://purl.org/NET/book/isbn/0140174613#book> ,
    <http://www4.wiwiss.fu-berlin.de/bookmashup/books/0140174613> ;
  dc:language  lexvo:eng ;
  d:bibliofilID  "931138" ;
  dc:format  <http://data.deichman.no/format/Book> ;
  d:location_signature  "Dav" ;
  dc:publisher  d_org:penguin ;
  bibo:numPages  "316" ;
  d:physicalDescription  "fig." ;
  d:bibsubject  d_subject:einstein_albert , d_subject:tid_metafysikk ;
  fabio:isManifestationOf  d_work:x24918900_about_time ;
  d:signatureNote  "07x0619gq" ;
  d:bindingInfo  <http://data.deichman.no/bindingInfo/h> ;
  d:bsID  "0181541" ;
  dc:description  "Bibliografi: s. 293-294"@no ;
  d:priceInfo  "Nkr 170.00" ;
  foaf:isPrimaryTopicOf  <http://www.goodreads.com/book/show/286461> ,
    <http://www.librarything.com/work/23493> ;
  dc:identifier  "749919" ;
  d:dewey  "115" , "530.11" ;
  d:location_dewey  "530.11" ;
  bibo:isbn  "9780140174618" , "0140174613" ;
```

4.6 ARCHIVAL ONTOLOGIES

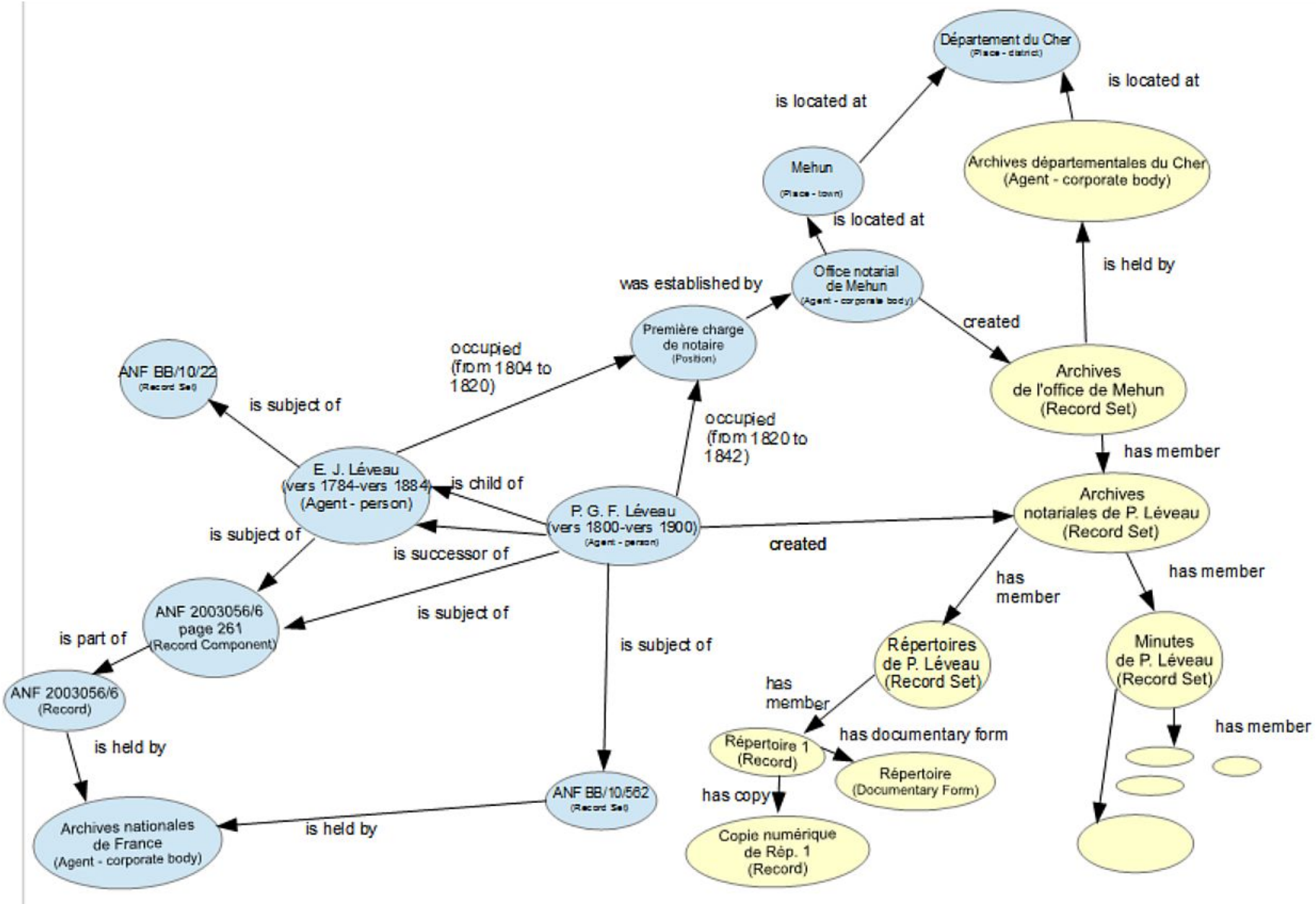
3 attempts to represent EAD as RDF, but IMHO neither is very good.

- Eg "The Semantic Mapping of Archival Metadata to the CIDOC CRM Ontology" (Journal of Archival Organization, 9:174–207, 2011) proposes to represent the EAD levels hierarchy (from Fonds down to Items) as **five** parallel CRM hierarchies

Records in Context (RiC): new upcoming semantic standard by ICA

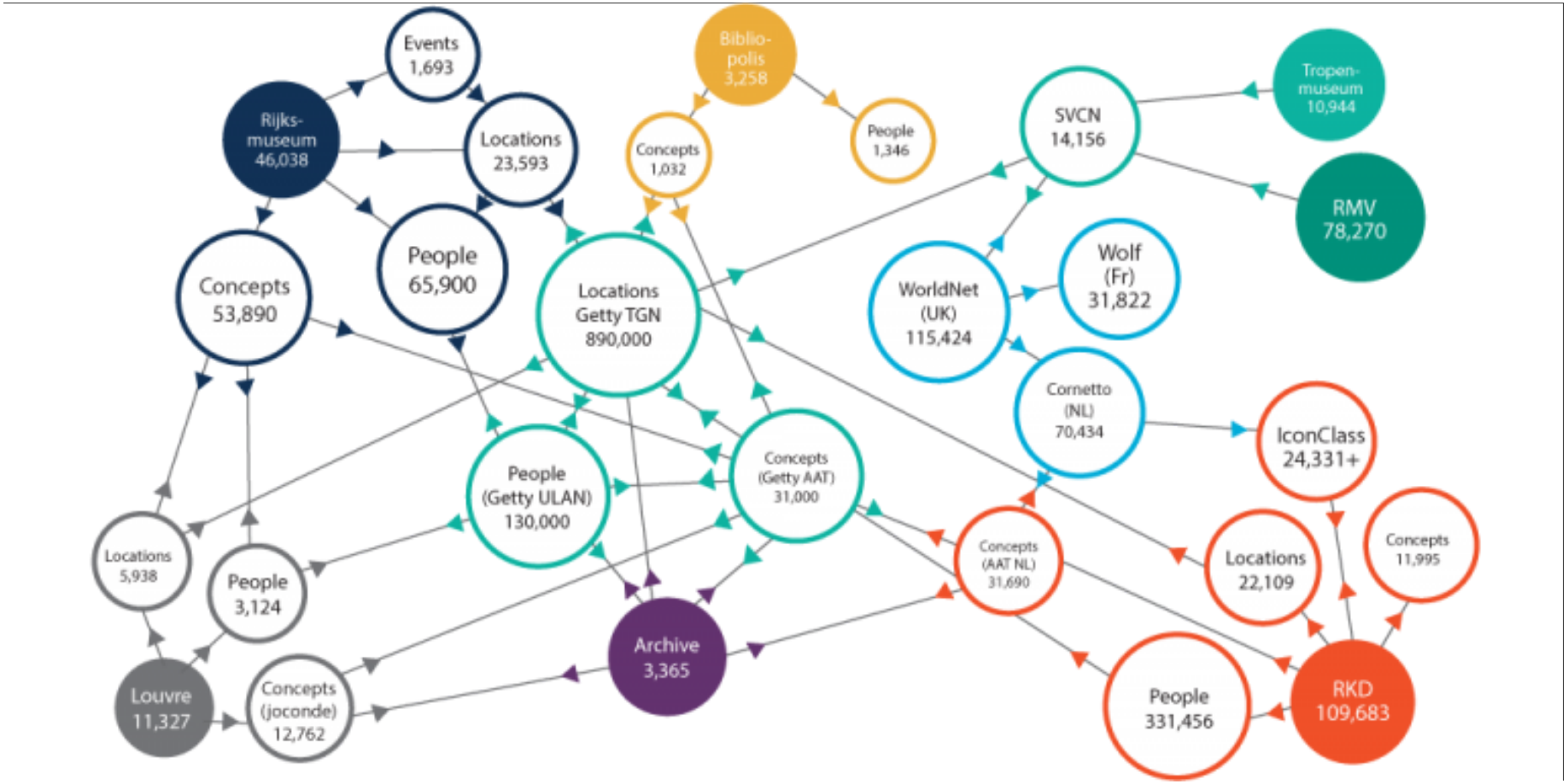
- Addresses the scope of EAD, EAC, EAG in one framework. Inspired by national standards, FRBR (FRBR-LRM), CIDOC CRM
- Progress report (2015), Mlist for comments
- Conceptual Model 1.0 (Sep 2016): Document key components of archival description, properties of each, relations between them
- Ontology: after finalizing the Conceptual Model, Expressed in OWL, will include semantic mapping to similar concepts developed by related communities

4.6.1 RIC SAMPLE NETWORK



5 GLAM LOD DATASETS (LODLAM)

- Some established thesauri and gazetteers as LOD, some are interconnected: DBPedia; Wikidata, VIAF, FAST, ULAN; GeoNames, Pleiades, TGN; LCSH, AAT, IconClass, Joconde, SVCN, Wordnet, etc.
- Not shown: large collection LODs like: Europeana (EDM), British Museum (CIDOC CRM), YCBA (CIDOC CRM), Rijksmuseum (EDM)
- (Diagram based on work by M.Hildebrand)



5.1 WIKIDATA

Tons of info on everything, including GLAMs, artists, artworks, etc. Eg Frans Hals on Reasonator

Frans Hals (Q167654)

佛兰斯·哈尔斯 | 弗兰茨·哈尔斯 | Hals | Frans Hals d.ä. | Frans (I) Hals | Franz hals | Франц Хальс | Халс Ф. | Гальс Франс | Франц Халс | Халс Франс | Франс Хальс | Франс Халс | Франс Гальс | Гальс, Франс | Хальс | Franz Hals | Галс Франс | פרנס האלס | פראנס האלס | פראנס הלס | פראנס, האלס, | Halss | Frans hals | ჰალსი | Halsi Fransi | Fransas Halsas | Frans Halls | Franc Walls | Frankhalls | Frank Hals | Frans Hal | Frank Halls | Franks Hals | Frank Hall | Frans Khal's | Franc Hals | T. Hals | Francesco Half | Franck Halls | Frans Hall | Frans I Hals | Frans, I Hals | Franc Halls | Frans Halst | Fr. Hale | Franck Hals |

Painter from the Northern Netherlands

Frans Hals was a Dutch-Belgian painter.
He was born in 1582 in Antwerp to Franchois Fransz. Hals van Mechelen and Adriaentje van Geertenryck.
His field of work included portrait and portrait painting. He was a member of Haarlem schutterij and Haarlem Guild of St. Luke.
He married Anneke Hermansz and Lysbeth Reyniers. His children include Adriaentje Hals, Harmen Hals, Frans Hals Junior, Jan Hals, Reynier Hals, and Nicolaes Hals.
He died on August 26, 1666 in Haarlem. He was buried at Grote Kerk.

Relatives

Parents

father ♂ Franchois Fransz. Hals van Mechelen
mother ♀ Adriaentje van Geertenryck

Siblings

brother ♂ Dirck Hals

Children

child ♂ Harmen Hals
♂ Frans Hals Junior
♂ Jan Hals
♂ Reynier Hals
♂ Nicolaes Hals
♀ Adriaentje Hals

Other

spouse ♀ Anneke Hermansz
♀ Lysbeth Reyniers

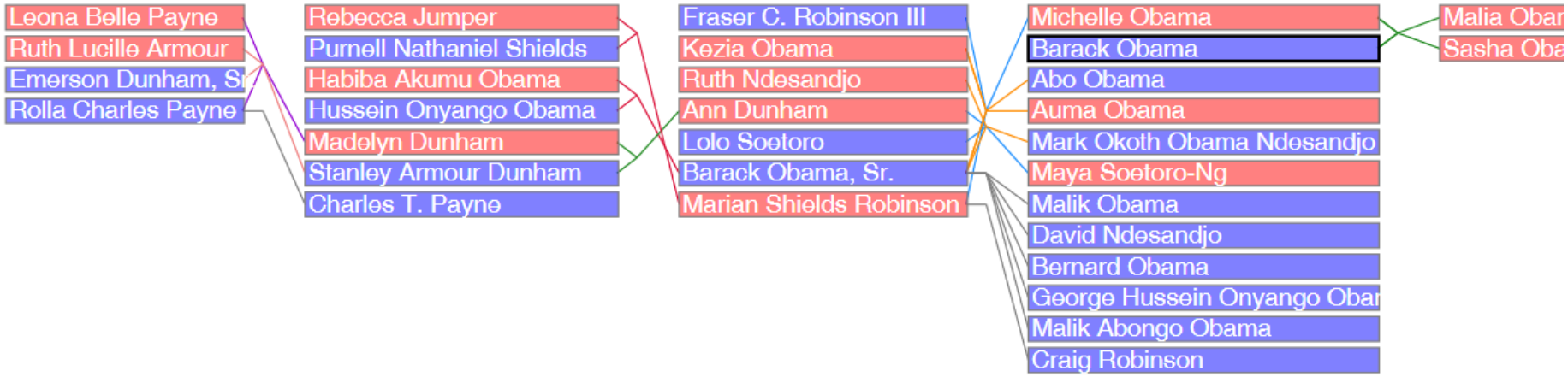
See the full family tree: inline/new page

External sources

Art UK artist	hals-frans-c-158115851666
Biografisch Portaal	12491083
BnF	14959052q
British Museum person-institution	30424
CANTIC-ID	a10984884
CERL	cnp00551574
Commons Creator page	Frans Hals
DBNL author	hals001
ECARTICO person	3474
FAST-ID	28684
Find a Grave grave	9789652
Freebase	/m/0ch5l
GND	118545221
ISNI	0000 0001 1453 225X
J. Paul Getty	3035

5.1.1 WIKIDATA GENEALOGY

Family tree of Barack Obama



5.1.2 SUM OF ALL PAINTINGS

Wikidata Project Sum of All Paintings. Data used for:

- Works by painter across collections (catalogue raisonné). Eg Frans Hals

Wikidata Skim

Do another query

Get this query as JSON

Next page »

Malle Babbe

Painting of a Haarlem woman by Frans Hals

The Merry Drinker

painting by Frans Hals

Willem van Heythuysen posing with a sword

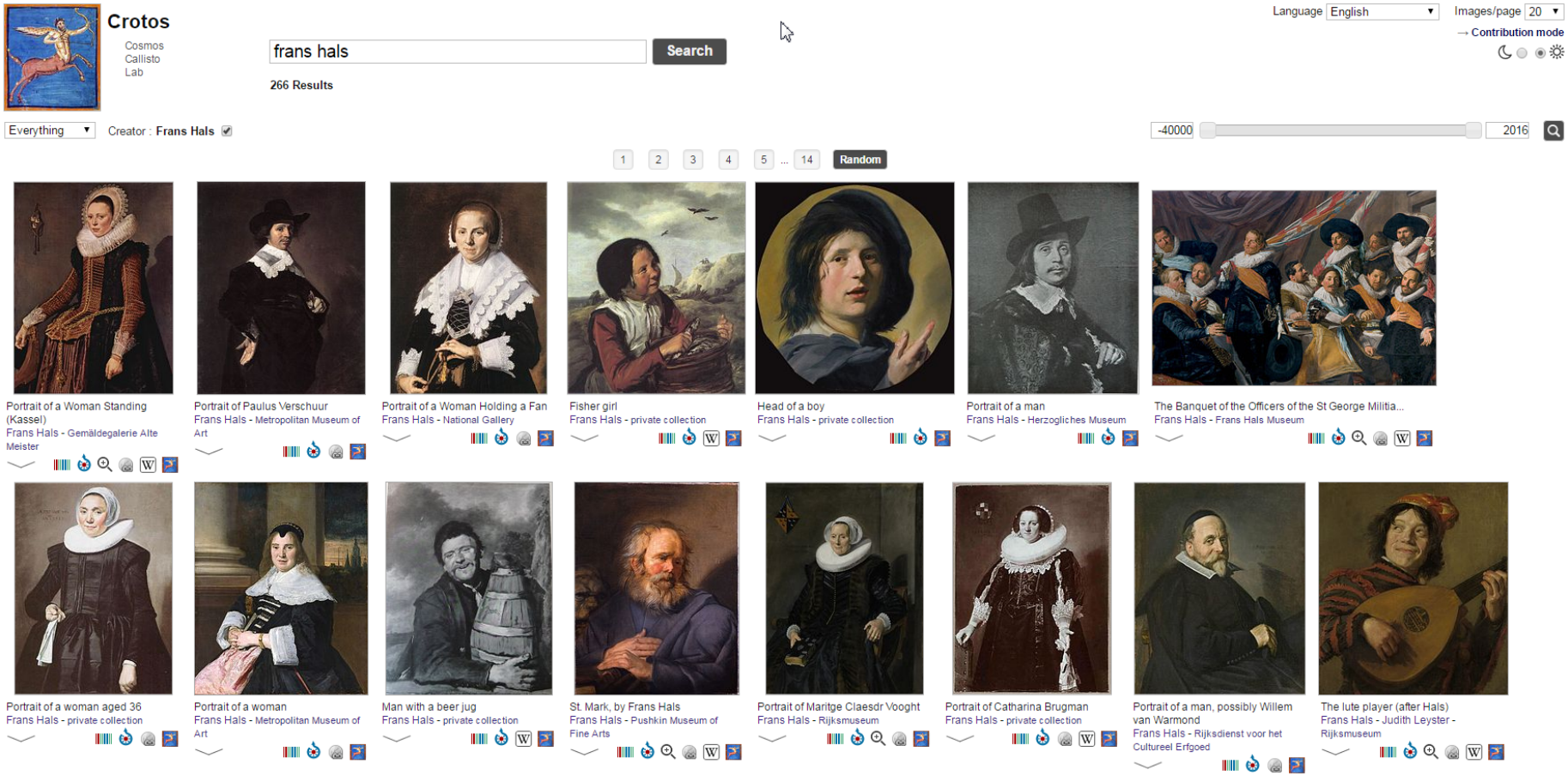
painting by Frans Hals

Laughing Cavalier

Painting of a gentleman by Frans Hals, probably Tieleman Roosterman

5.1.3 CROTOS

Excellent image search. Shows links to WD, Wikimedia Commons, original website. Eg Frans Hals on Crotos



5.1.4 YOU CAN HELP TOO!

Hunting for missing inventory numbers (9.9k of 140k). Important because <collection, inventory number> is used to identify the painting. Eg US (1k), Getty Museum (2)

label	description	image	creator	inventory number	collection	described at URL
An Italianate Landscape with Travelers on a Path	painting by Jan Both		Jan Both		J. Paul Getty Museum	
Porträt des Julien de La Rochenoire			Édouard Manet		J. Paul Getty Museum	

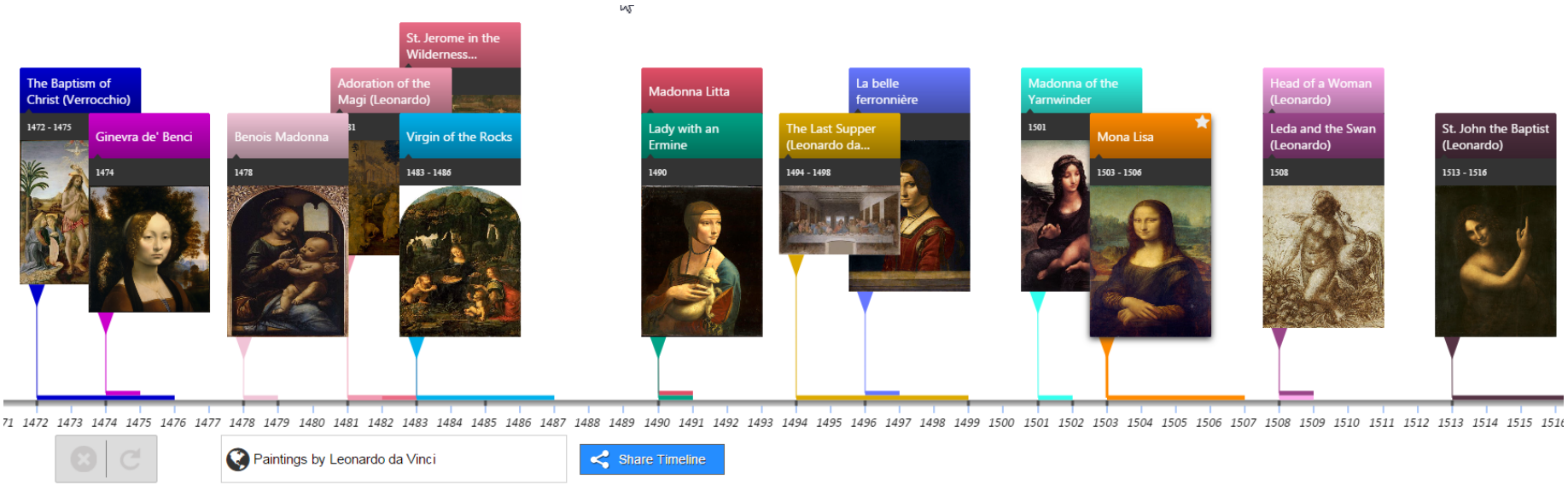
5.1.5 LET'S FIX THE SECOND ONE

Find it on Getty's site, add the info like this:

collection	J. Paul Getty Museum 0 references + add reference	edit + add
described at URL	http://www.getty.edu/art/collection/objects/265936/edouard-manet-portrait-of-julien-de-la-rochenoire-french-1882/ 0 references + add reference	edit + add
inventory number	2014.20 0 references + add reference	edit

5.1.6 HISTROPEDIA

Timelines of everyting. Eg paintings by Leonardo

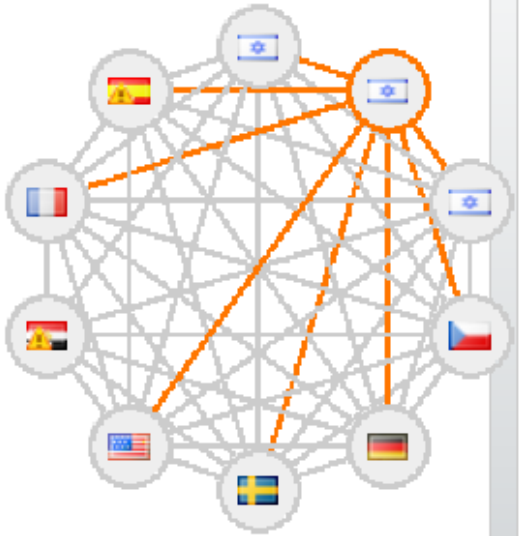


5.2 VIAF

Virtual International Authority File: 20 national libraries, 10 other contributors including Getty ULAN and Wikidata. Eg coreferencing cluster of Spinoza:

Preferred Forms

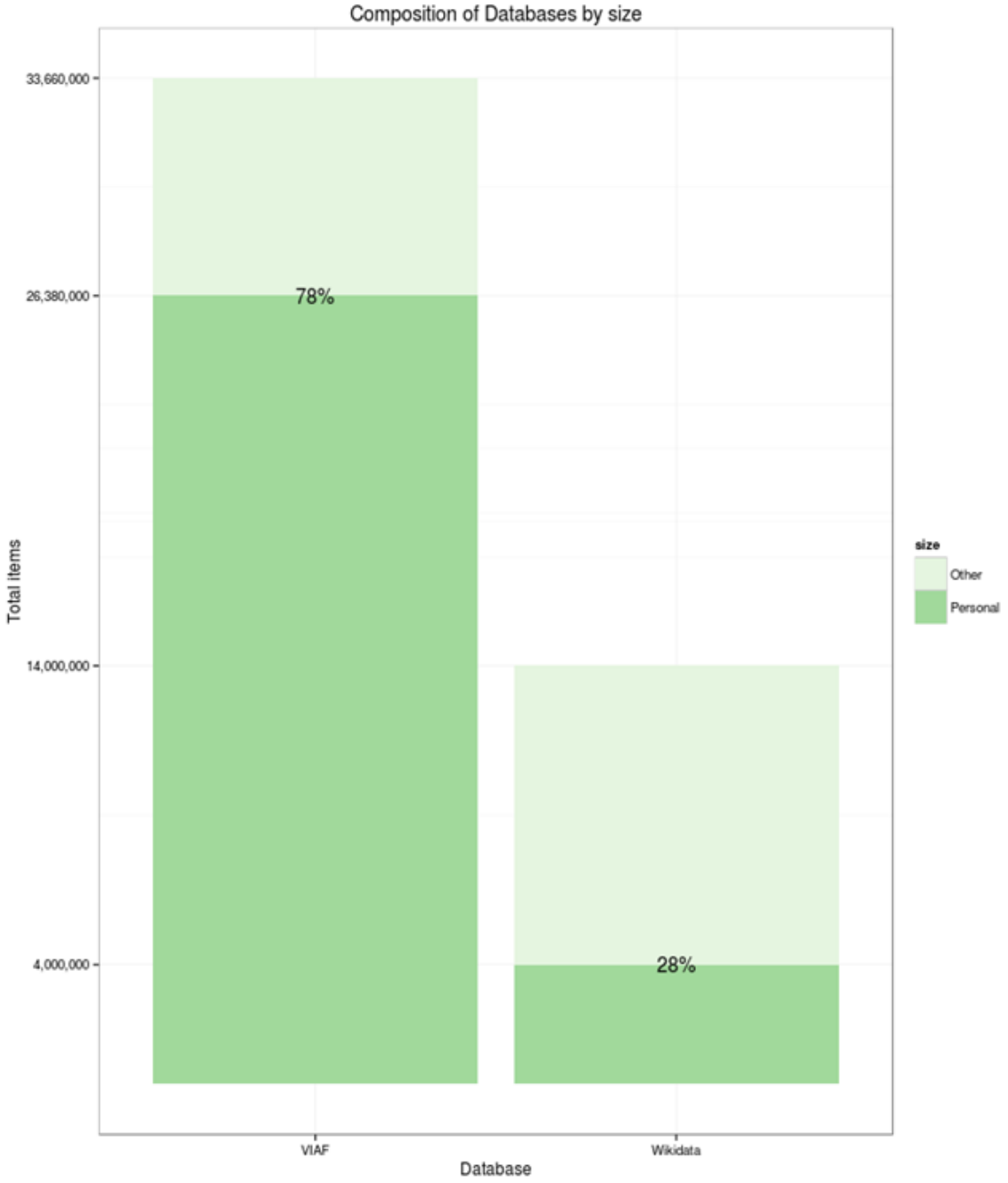
- 100 ‡a Spinoza, Baruch, ‡d 1632-1677
- 100 ‡a Spinoza, Benedictus de ‡d 1632-1677
- 100 ‡a Spinoza, Benedictus de, ‡d 1632-1677
- 100 ‡a СПИНОЗА, БАРУХ, ‡d 1632-1677
- 100 ‡a שפינוזה, ברוך בן מיכאל, ‡d 1632-1677
- 100 ‡a Spinoza, Baruch, ‡d 1632-1677
- 100 ‡a Spinoza, Benedictus de
- 200 ‡a Spinoza ‡b Baruch ‡f 1632-1677
- 100 ‡a سبينوزا، بنيديكت دو، ‡d 1632-1677 م
- 100 ‡a Spinoza, Benedictus de, ‡d 1632-1677



National Library of Israel (Hebrew)

J9Uheb|000187093

5.2.1 VIAF VS WIKIDATA (2015)

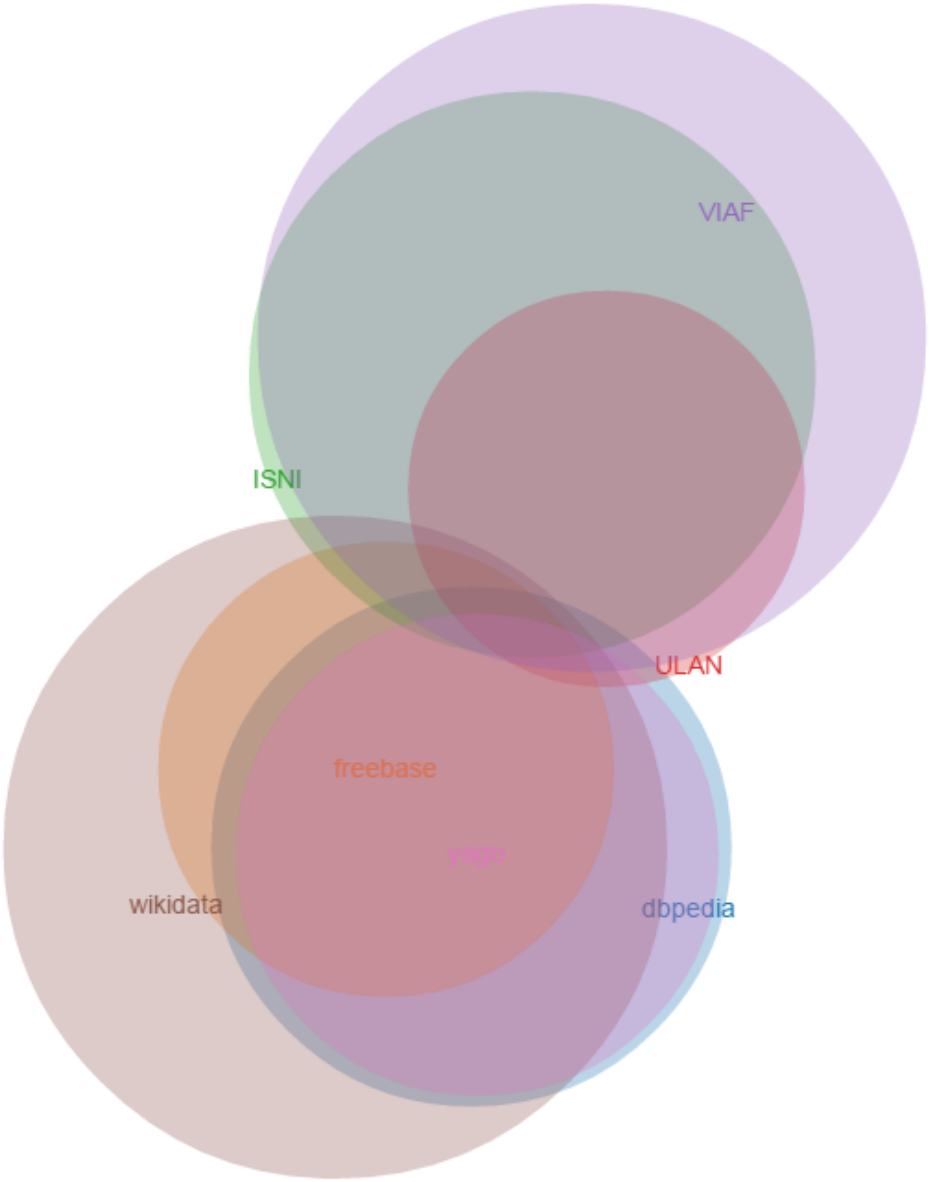


5.3 GLOBAL AUTHORITY CONTROL

- 201307 Authority Addicts: The New Frontier of Authority Control on Wikidata, Wikimania 2013
- 201501 Wikidata Project Authority Control (initiated by Ontotext)
- 201503 Name Data Sources for Semantic Enrichment study for Europeana of datasets including Person/Organization names. Conclusions:
  - The best datasets to use for name enrichment are VIAF and Wikidata
  - There are few name forms in common between the "library-tradition" datasets (dominated by VIAF) and the "LOD-tradition datasets" (dominated by Wikidata)
  - VIAF has more name variations and permutations, Wikidata has more multilingual names (translations)
  - VIAF is much bigger: 35M persons/orgs. Wikidata has 2.7M persons and maybe 1M orgs
  - Only 0.5M of Wikidata persons/orgs are coreferenced to VIAF, with maybe another 0.5M coreferenced to other datasets, either VIAF-constituent (eg GND) or non-constituent (eg RKDartists)
  - A lot can be gained by leveraging coreferencing across VIAF and Wikidata
  - Wikidata has great tools for crowd-sourced coreferencing

5.3.1 NAMES OF LUCAS CRANACH

Analyzed records of Lucas Cranach in 7 LOD datasets (Wikidata: Freebase, DBpedia, Yago; VIAF: ISNI, ULAN).



5.3.2 WIKIDATA COREFERENCING CAN ENLARGE VIAF

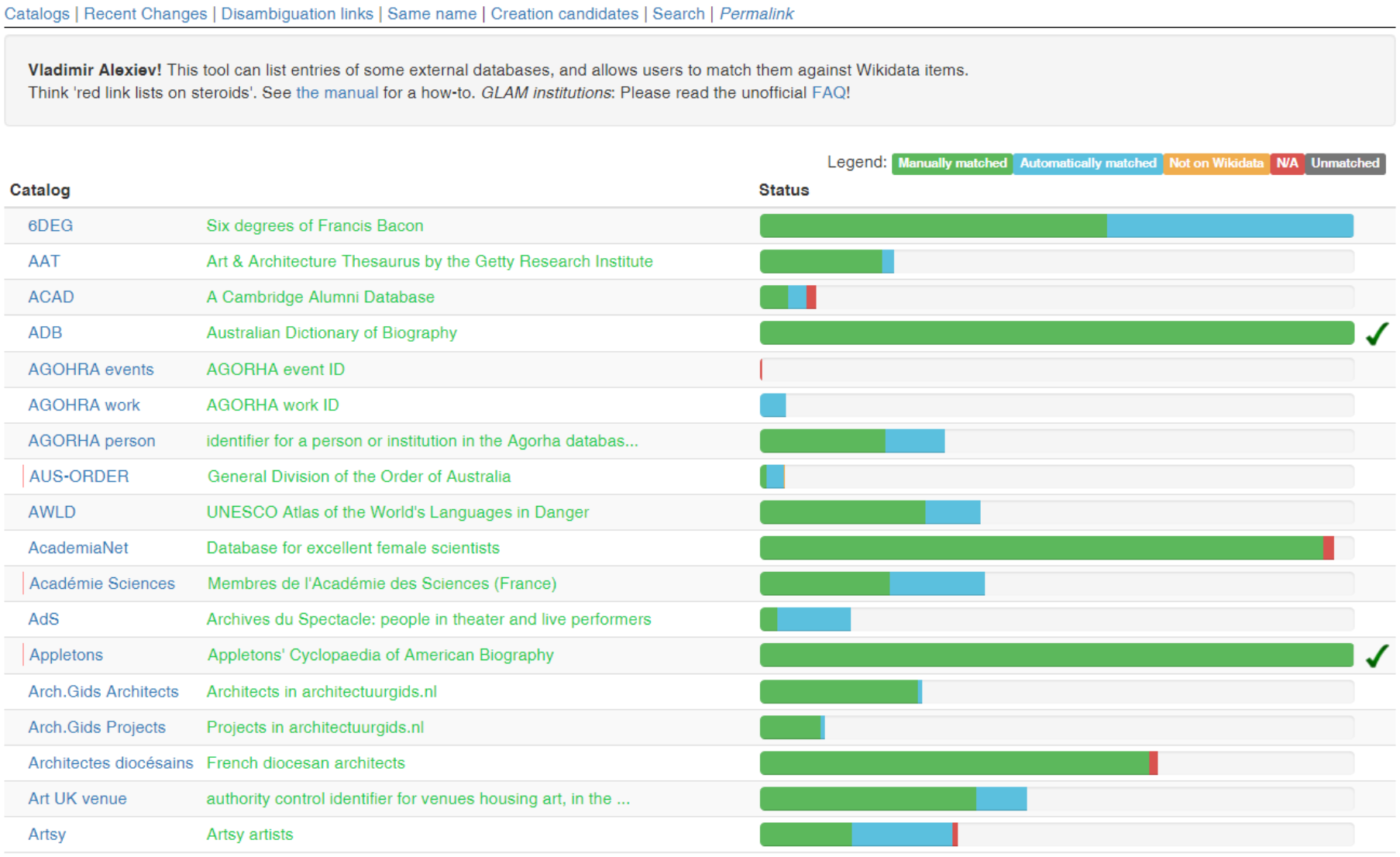
VIAF-Wikidata Coreferences for Lucas Cranach

VIAF	Id in VIAF	Wikidata	Id in Wikidata
viafID	49268177	VIAF	49268177
BAV	ADV10197613		
BNC	.a10853637		
BNE	XX907273		
BNF	cb12176451h	BNF	12176451h
DNB	118522582	GND	118522582
ISNI	0000000121319721	ISNI	0000 0001 2131 9721
JPG	500115364	ULAN	500115364
LC	n50020861	LCCN	n50020861
LNB	LNC10-000002573		
NDL	00436834		
NKC	jn20000700335		
NLA	000035031951		
NLI	000035532,001445575,001448179		
NLP	a16828161		
NTA	068435312	NTA PPN	068435312
NUKAT	vtls000190728		
SELIBR	182422		
SUDOC	028710010		
WKP	Lucas_Cranach_the_Elder	Many Wikipedias	
IMAGINE	T7238,T267474	Cantic	a10853637
		Commons Creator	Lucas Cranach (I)
		Commons category	Lucas Cranach d. Ä.
		Freebase	/m/0kqp0
		RKDartists	18978
		SIMBAD	CRANACH, Lucas the Elder
		Your Paintings	lucas-the-elder-cranach

→ Can be leveraged to **fill the gaps**, e.g. bring RKDartists into VIAF

5.3.3 MIX-N-MATCH

A global Authority on everything: librarian's dream come true! Mix-n-Match is a collaborative tool to create coreferences. 234 authorities, including Getty AAT, TGN, ULAN; RKD artists, works; LoC Authorities; VIAF (not in M-n-M but on WD); BM persons; BBC YourPaintings; Artsy, etc etc



5.3.3.1 YOU CAN HELP WITH AUTHORITIES TOO!

Eg checking matches to Getty AAT. Single sign-on, a click per item. Easy!

1-50 | 51-100 | ☐ **Show unmatched** | ☑ **Show auto-matched** | ☐ **Show user-matched** | ☐ **Show NoWD** | ☐ **Show N/A** | Site stats

Title/Q	Description	Actions
pyrolusite	mineral, inorganic material, <materials by composition>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
pyrolusite Q413293	Rutile mineral group, named after fire and washing; oxide mineral	Remove
sodium chlorite	sodium compounds, sodium, inorganic material, <materials by composition>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
sodium chlorite Q411294	Chemical compound; chemical compound	Remove
silanol	compounds (materials), <materials by chemical form>, <materials by form>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
Silanol Q420482	Chemical substance	Remove
gellan gum	gel, colloid (particulate material), <materials by physical form>, <materials by form>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
Gellan gum Q416694	Chemical compound, thickening agent, and polysaccharide; chemical compound	Remove
stonemasonry	<processes and techniques by material>, <processes and techniques by specific type>, <processes and techniques (processes and techniques)>, Processes and Techniques (Hierarchy Name), Activities Facet	*Not matched*
Search Wikidata | Search en.wikipedia | Google-search Wikipedias | Google-search Wikidata | Create Wikidata item		Set Q | New item | N/A
tetramethylammonium hydroxide	<solvent by composition or origin>, solvent, <materials by function>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
tetramethylammonium hydroxide Q420868	Chemical compound; chemical compound	Remove
cerargyrite	mineral, inorganic material, <materials by composition>, materials (matter), Materials (Hierarchy Name), Materials Facet	*Automatically matched*
chlorargyrite Q410592	Halite mineral group and silver chloride, named after chlorine and silver; halite mineral	Confirm | Remove | N/A
mirabilite	mineral, inorganic material, <materials by composition>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
mirabilite Q419296	Sulfate mineral class and sodium sulfate; sulfate mineral	Remove
rutin	compounds (materials), <materials by chemical form>, <materials by form>, materials (matter), Materials (Hierarchy Name), Materials Facet	Matched by Vladimir Alexiev
Rutin Q407857	Chemical compound; chemical compound	Remove
uronic acid	acid, <materials by property>, materials (matter), Materials (Hierarchy Name), Materials Facet	*Automatically matched*
Uronic acid Q412056	Chemical substance and carbohydrate	Confirm | Remove | N/A

6 LODLAM PROJECTS

GLAM and DH projects present a bewildering variety, eg

- Publishing Vocabularies/Thesauri as LOD
- Publishing Museum collections and National Bibliographies as LOD
- Enrichment of GLAM metadata with relevant thesauri, semantic and faceted search
- Study of artistic influence over time and space
- Literary traditions, parallel editions
- Poetic repertories
- Studying manuscripts, stematology (manuscript derivation)
- Historiography
- Studying charters, prosopography ("micro biographies"). "Prosopography is Greek for *Facebook*", SNAP:DRGN project, 2015

Research functions and sometimes integrated into Virtual Research Environments

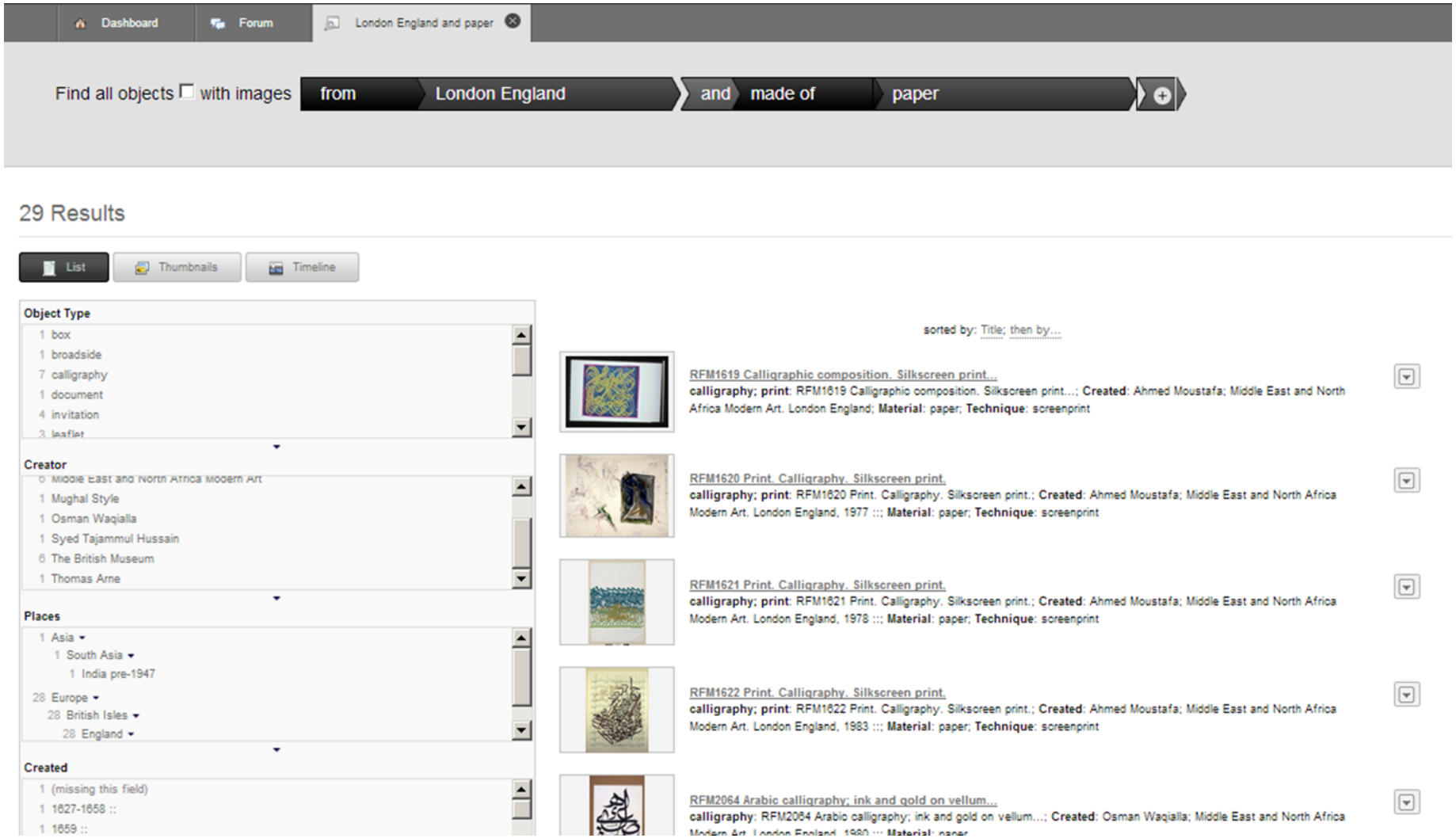
6.1 MELLON 'SPACE' PROJECTS

The Andrew Mellon Foundation funds many projects in CH and DH, and a few software projects, including:

- **CollectionSpace**: museum collection management
- **ArchiveSpace**: archive management
- **ResearchSpace**: semantic integration based on CIDOC CRM, search, data & image annotation, data basket, etc
- **ConservationSpace**: line of business application for conservation specialists

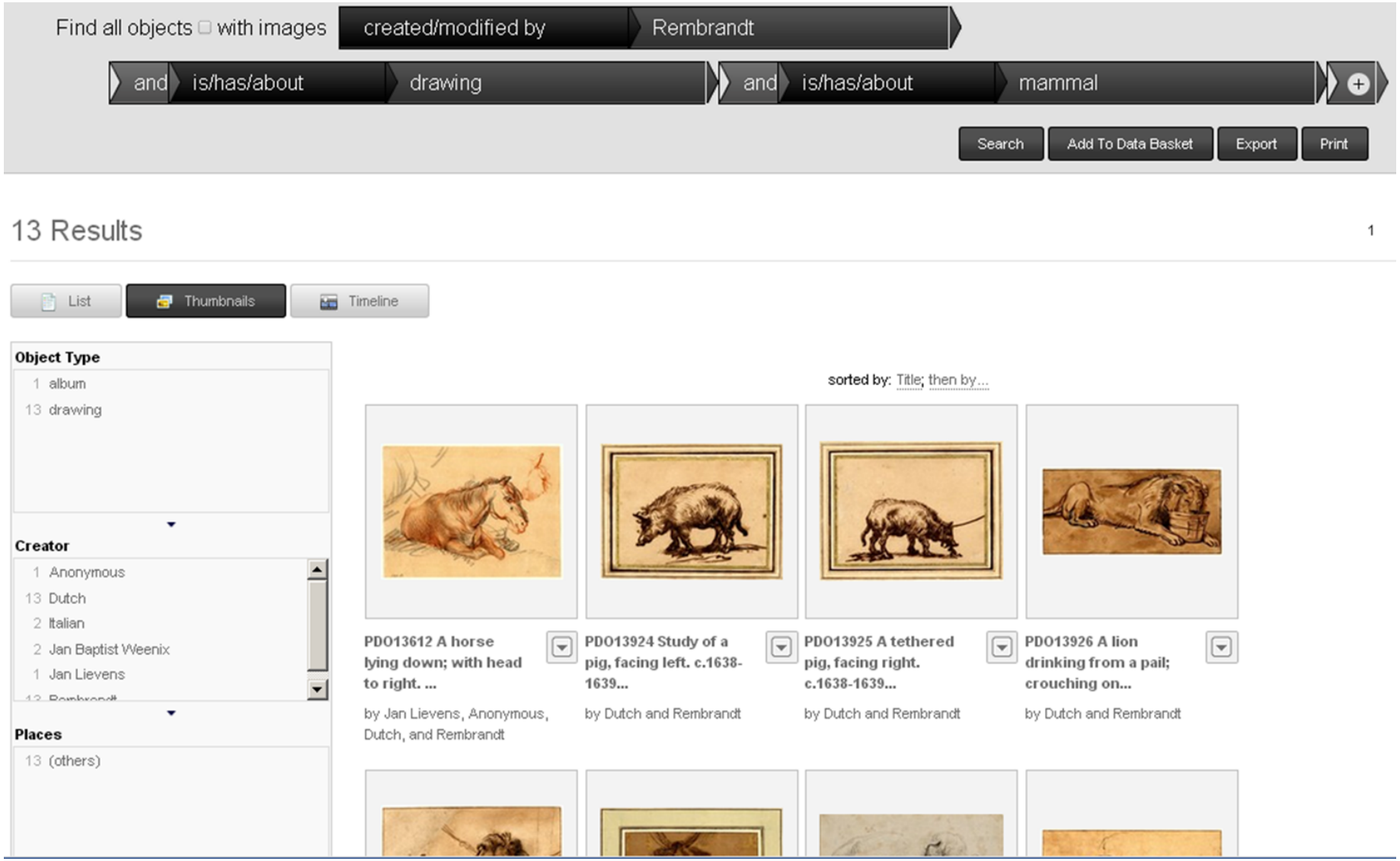
6.2 RESEARCHSPACE

Executed by the British Museum. Ontotext developed the first prototype (2010-2013). Semantic Search



6.2.1 RESEARCHSPACE SEARCH

Powerful and precise search: Drawings by Rembrandt that are about Mammals

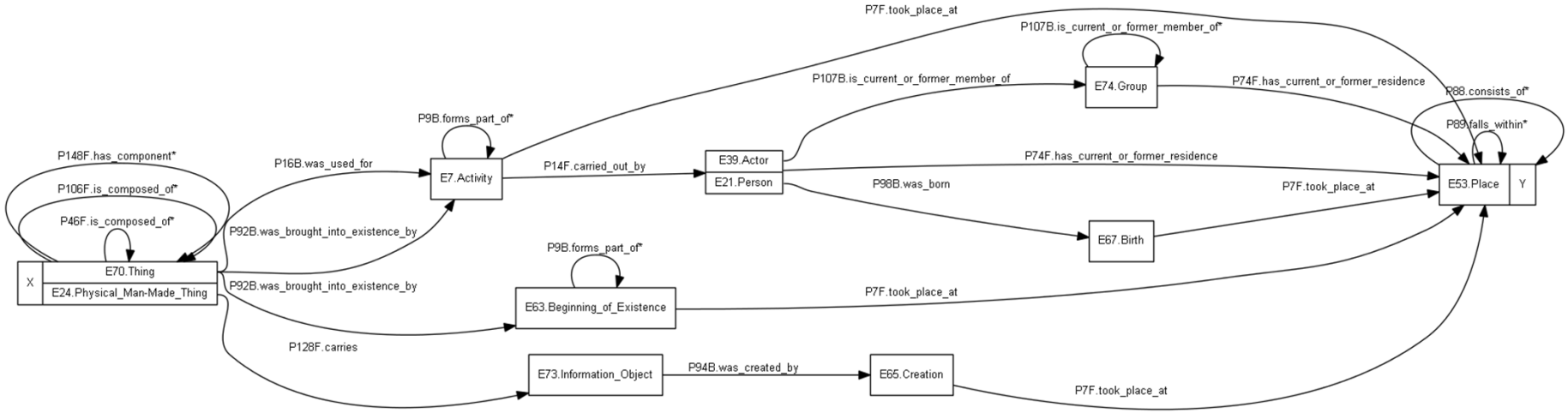


6.2.2 RESEARCHSPACE SEARCH: FUNDAMENTAL RELATIONS

First implementation experience of the CIDOC CRM Fundamental Relations approach

Domain (select)	Range(query parameter)				
	Thing	**Actor**	**Place**	**Event**	**Time**
Thing	8.has met 9.refers to or is about 10.is referred to by 3.has part 7.is similar or same with 5. from 4.is part of was made from	8.has met 5.from 9.refers to or is about 10.is referred to by 12.by Used by Created by Modified by Found or acquired by	9.refers to 10.is referred to at 5.from Used at Created at Found or acquired at Was created/produced by person from Is/was located at	9.refers to 10.is referred to by 5.from Destroyed in Created in Modified in Used in	5.from Destroyed on Created on Modified on Used on
Actor	8.has met 6.is owner or creator of 9. refers to 10.is referred by	4.is member of 3.has member 8. has met 5.has generator 6.is generator of 9.refers to 10.is referred by	8.has met 5.from 9.refers to 10.is referred to at	9.refers to 10.is referred to by 5.from 8.has met Brought into existence at Taken out of existence at Performed action at Influenced	9.refers to 5.from 8.has met Brought into existence at Taken out of existence at Performed action at Influenced
Place	8.has met 6.Is origin of 9.refers to or is about 10.is referred by	8.has met 6.Is origin of 9.refers to or is about 10.is referred by 8.has met	4.is part of 3.has part 11.borders or overlaps with	9.refers to 10.is referred by 8.has met	5.from 10.refers to 8.has met
Event	6.is origin of 10.is referred by 9.refers to or is about 8.has met created destroyed modified used	12.by 10.is referred by 9.refers to or is about 8.has met brought into existence took out of existence	9.refers to or is about 10. is referred to at 5.from	9.refers to or is about 10.is referred by 3.has part 5.from	9.refers to or is about 5.from starts ends has duration

6.2.3 RESEARCHSPACE SEARCH: ONE FR (THING FROM PLACE)

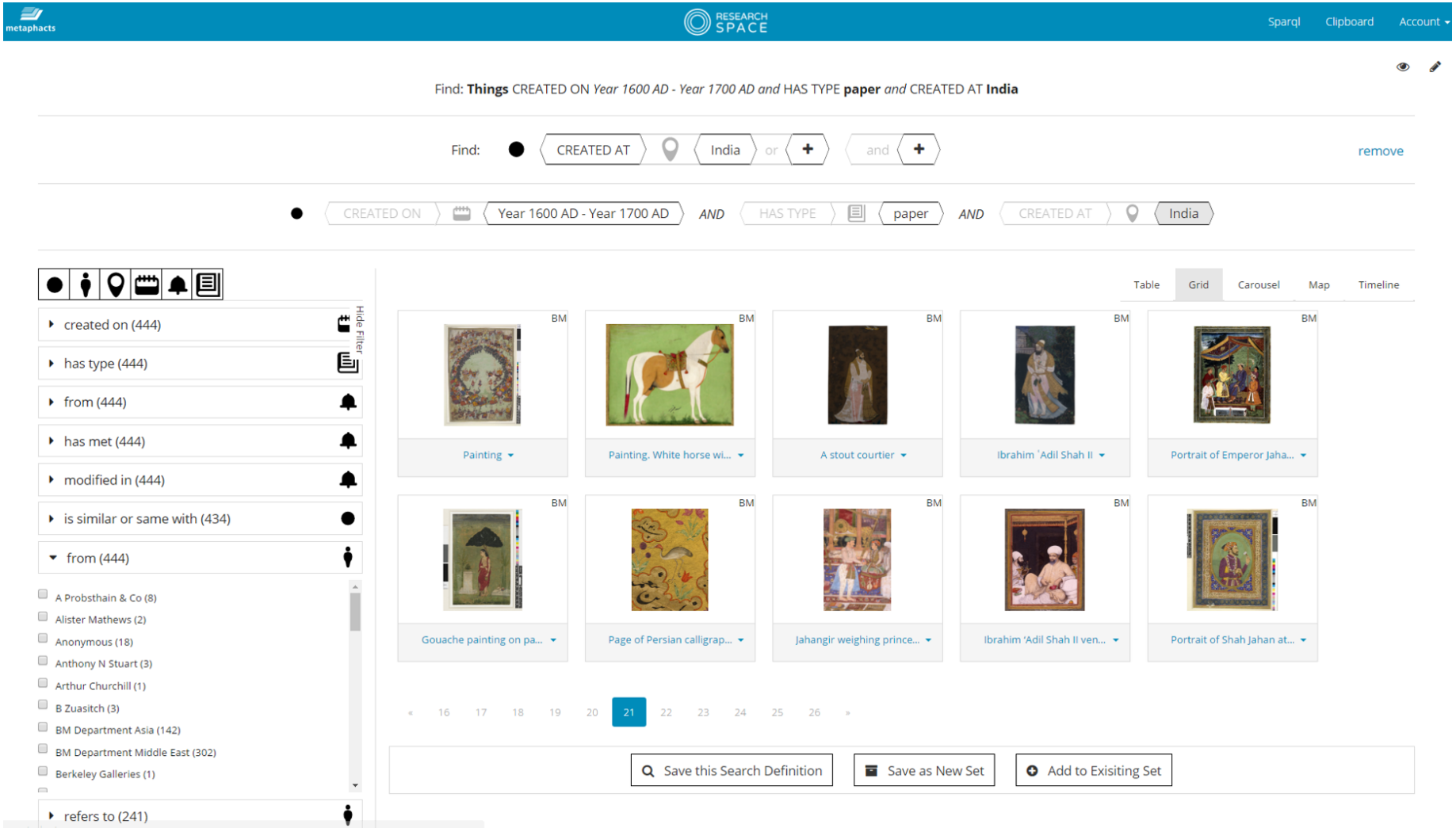


6.2.4 RESEARCHSPACE SEARCH: IMPLEMENTATION

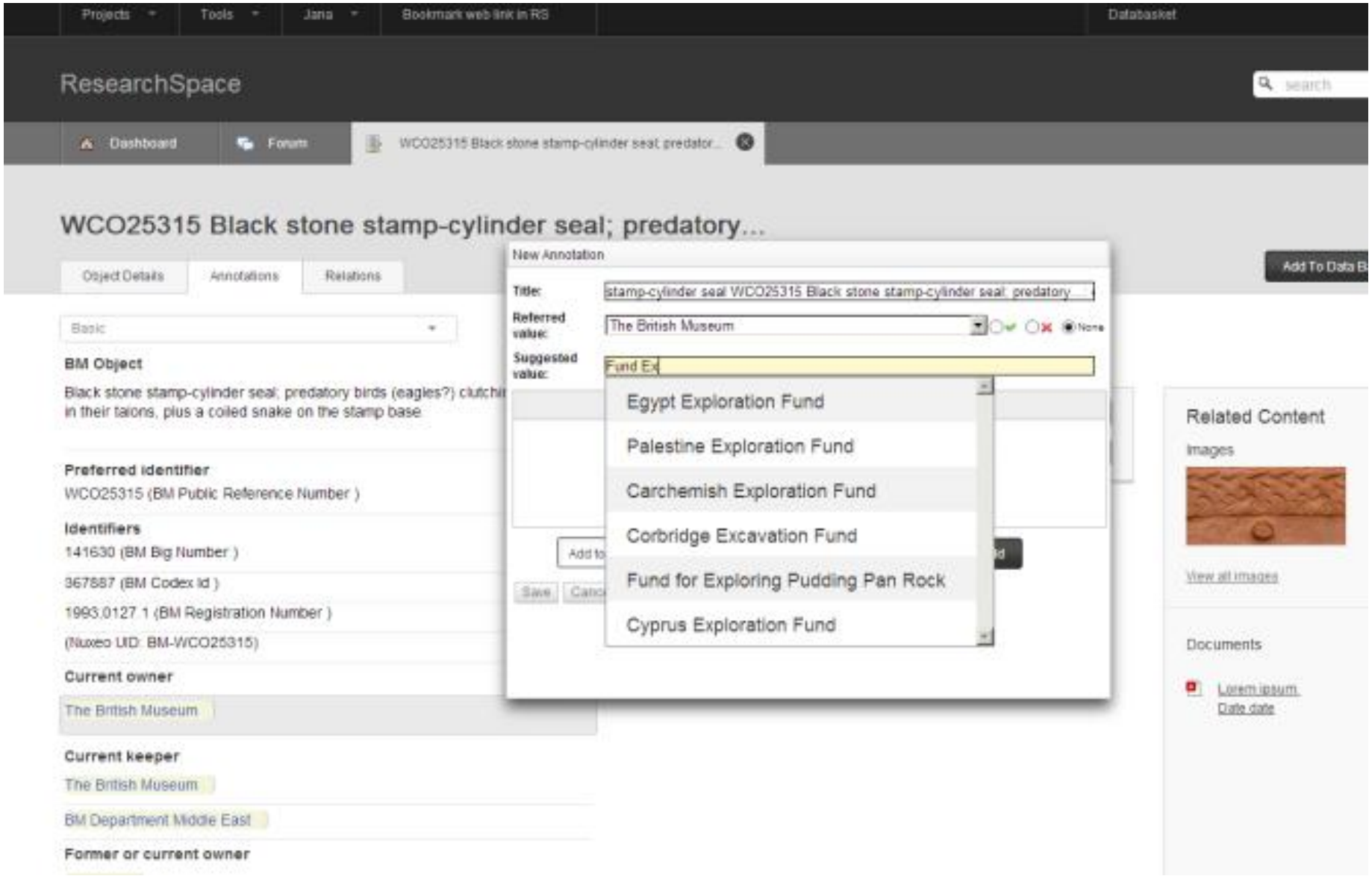
120 GraphDB rules, weaved using Literate Programming approach. Inference dependencies between props (text=input, gray=intermediate, white=output)

6.2.5 RESEARCHSPACE SEARCH: NEW IMPLEMENTATION

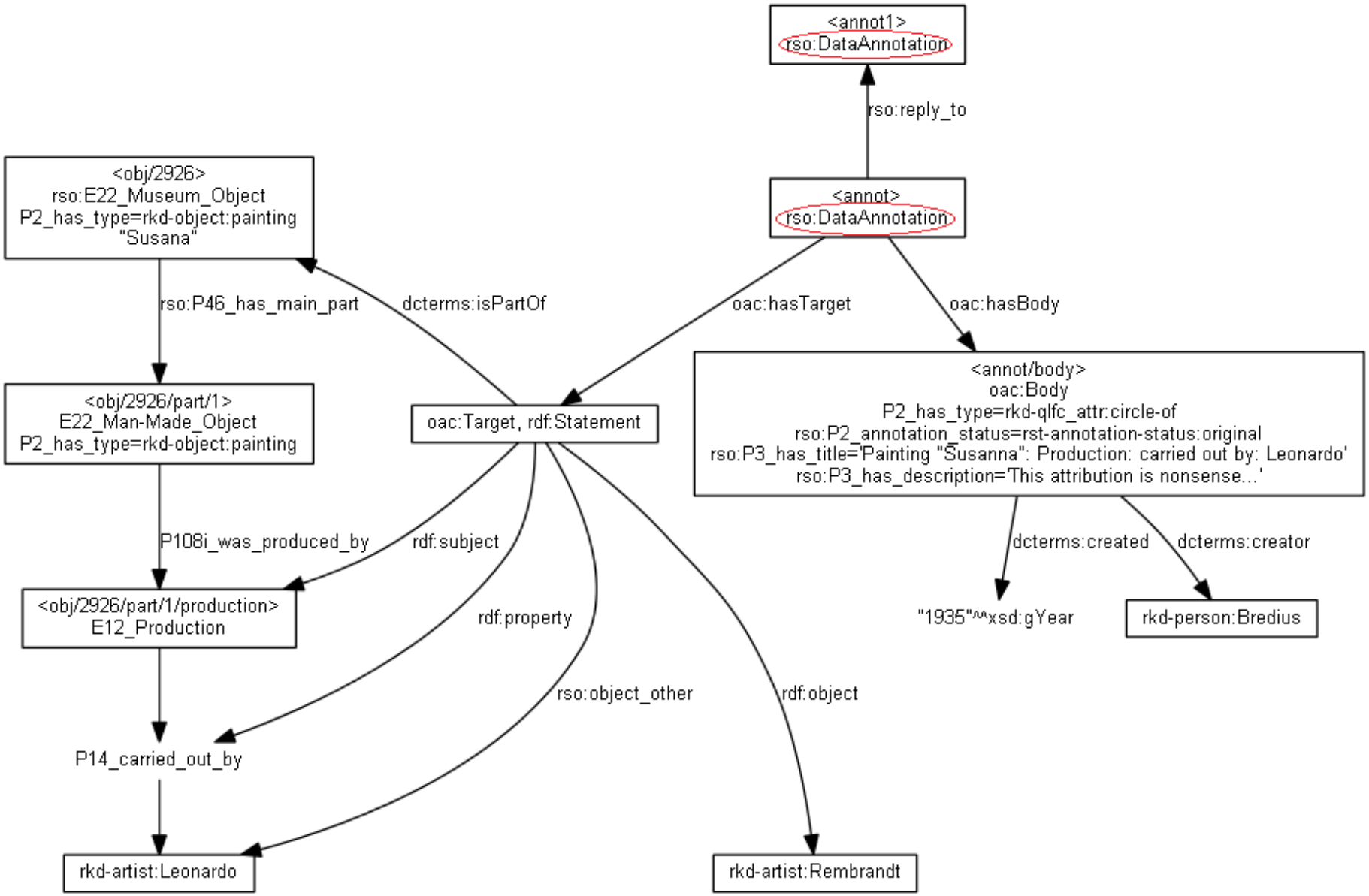
(Not Ontotext work). Watch the video (D.Oldman)



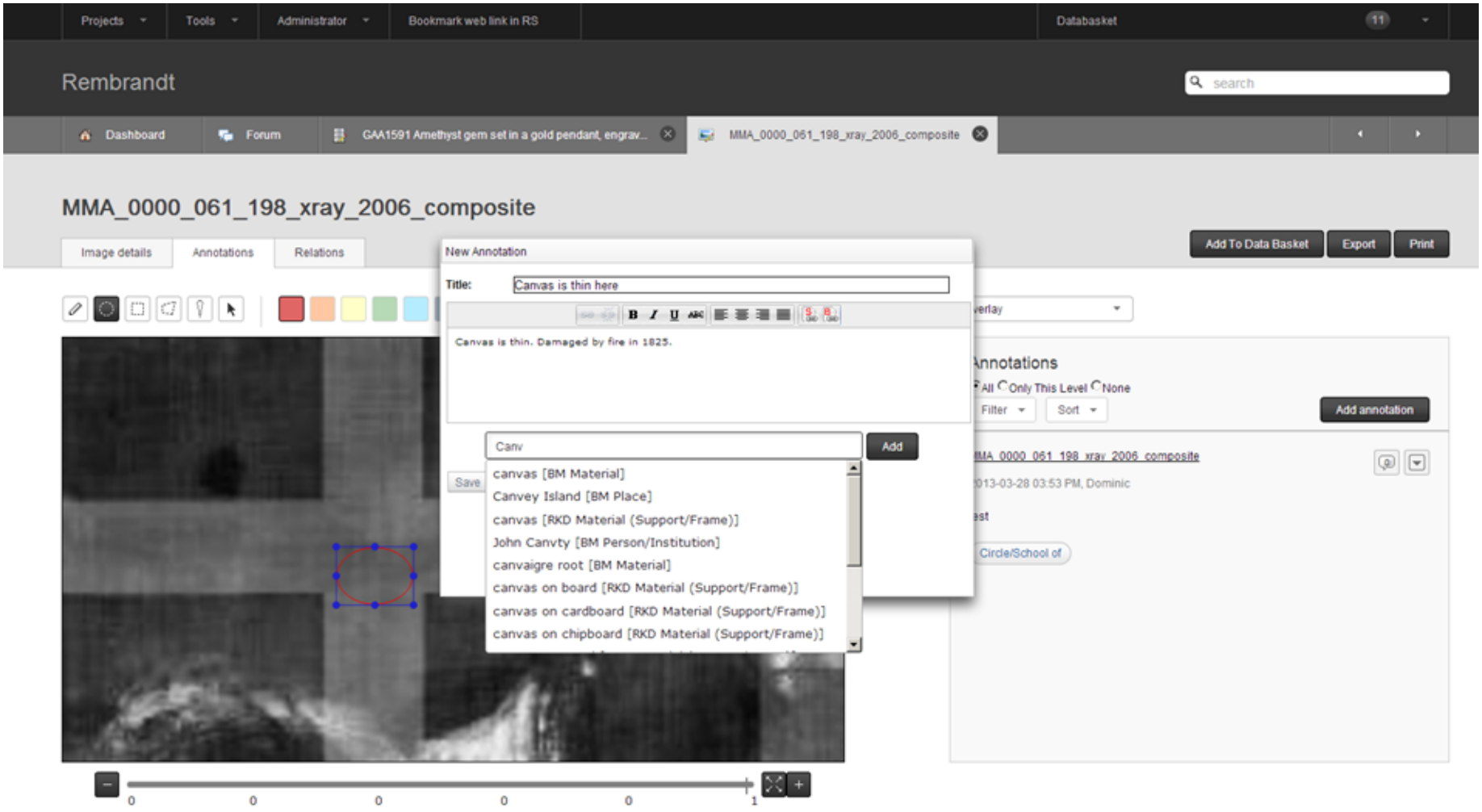
6.2.6 RESEARCHSPACE DATA ANNOTATION



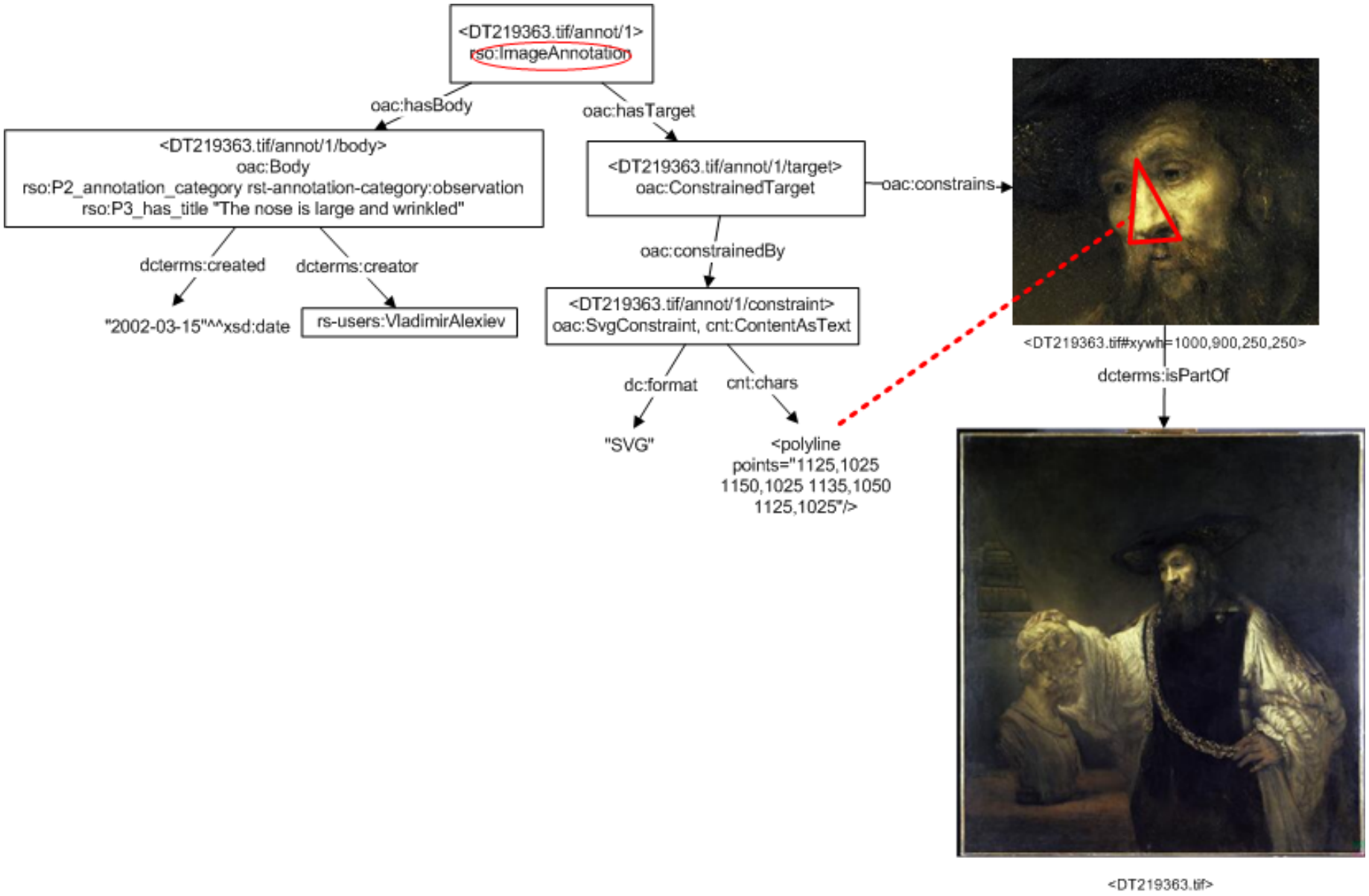
6.2.7 RESEARCHSPACE DATA ANNOTATION MODEL



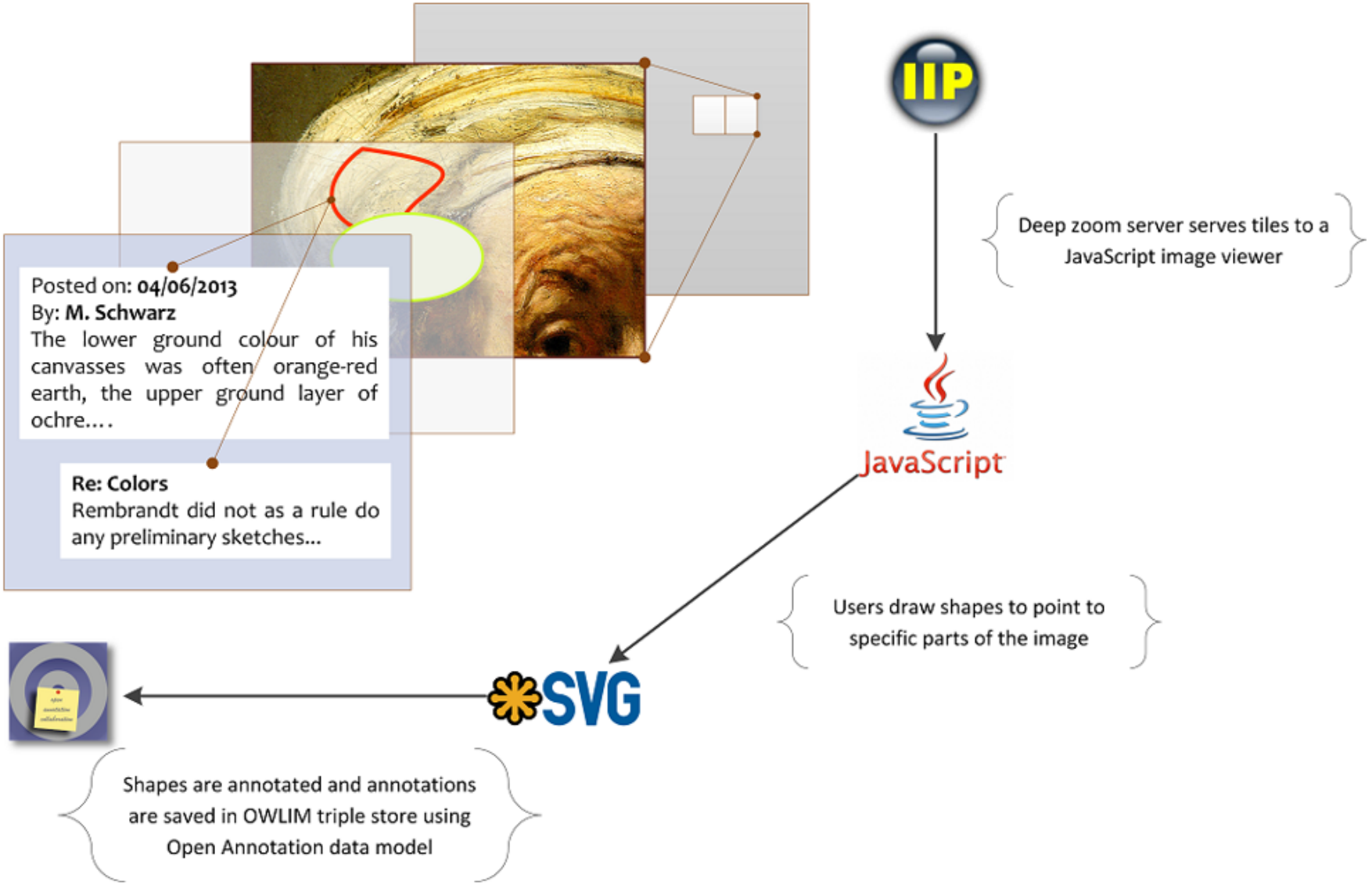
6.2.8 IMAGE ANNOTATION



6.2.9 IMAGE ANNOTATION MODEL



6.2.10 IMAGE ANNOTATION ARCHITECTURE



6.3 BRITISH MUSEUM (BM) AND YCBA LOD

- GraphDB runs the BM SPARQL endpoint. One of the biggest CH RDF collections (917M triples)
- As part of RS, developed mapping of BM data (2M objects) with BM, using CIDOC CRM
- This mapping was followed by the Yale Center for British Art (YCBA)
- Mapping Documentation: very comprehensive but is monolithic and has imprecisions. Includes the (in)famous diagram

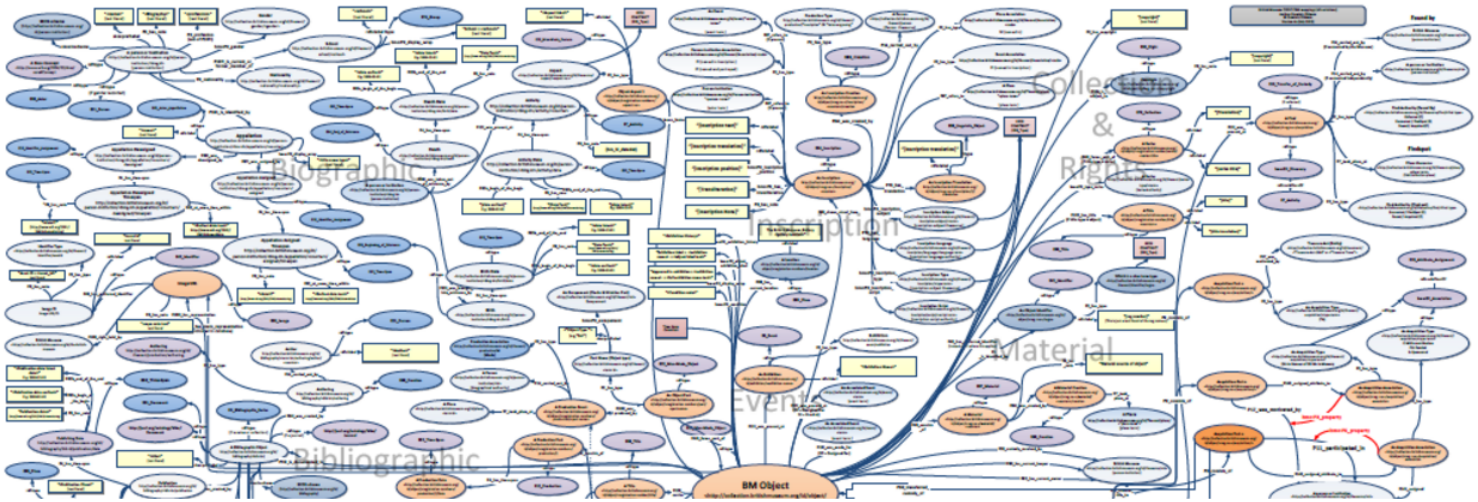
The Conceptual Reference Model Revealed
Quality contextual data for research and engagement: A British Museum case study
Dominic Oldman, Joshan Mahmud, Vladimir Alexiev
Version: Draft: 0.98, July 2013 (Confidential & Private – Limited Distribution for Discussion)

Contents: 359p

- 169: Main body, including discussion, illustrations and mapping diagrams
- 7p: Association Codes (see details at BM Association Mapping v2
- 49p: Example Object Graph
- 134p: RDFer configuration files (i.e. mapping implementation)

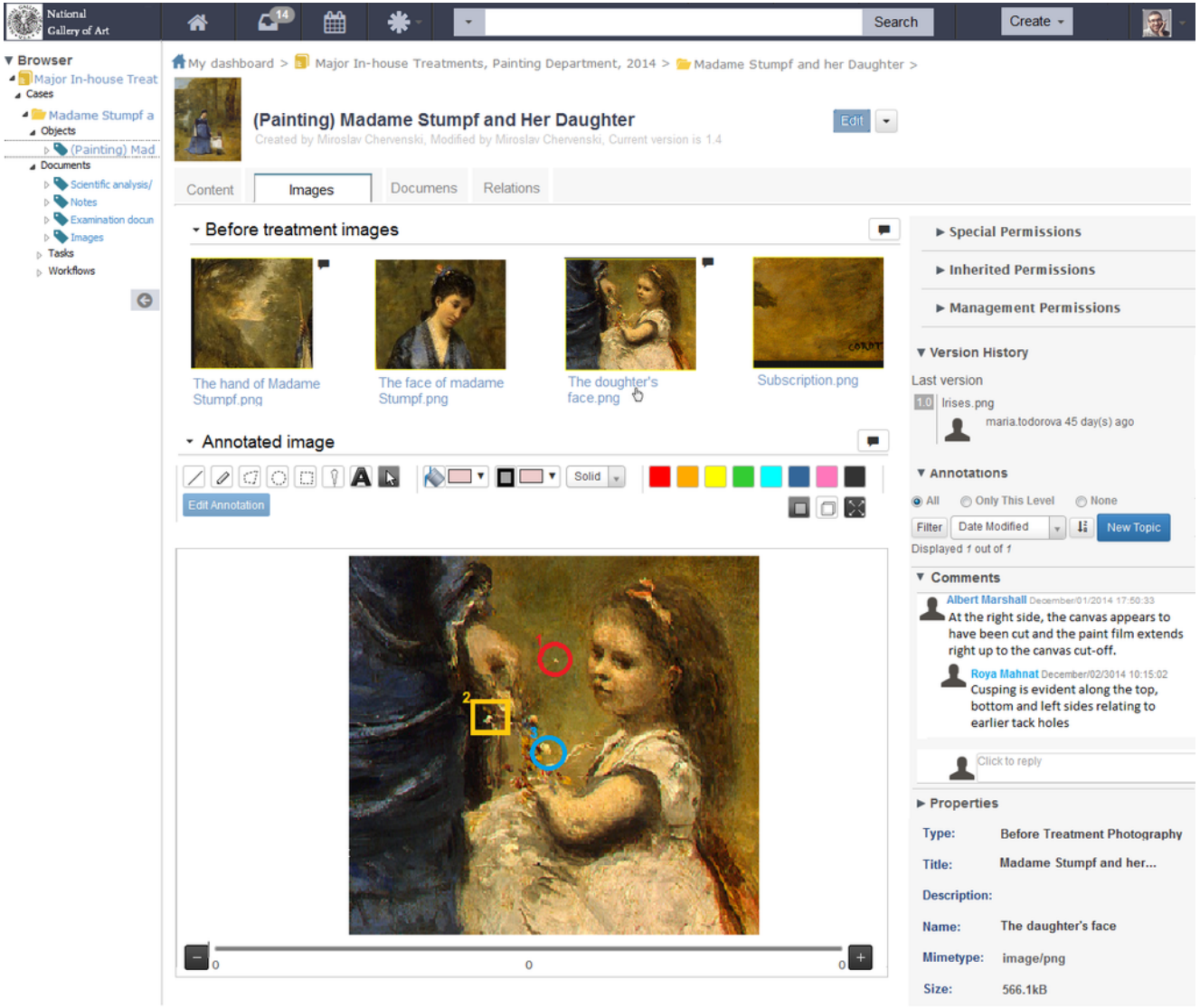
Overall Picture

mapping manual-diagram.pdf, mapping manual-diagram.png (Page 9 of 359)



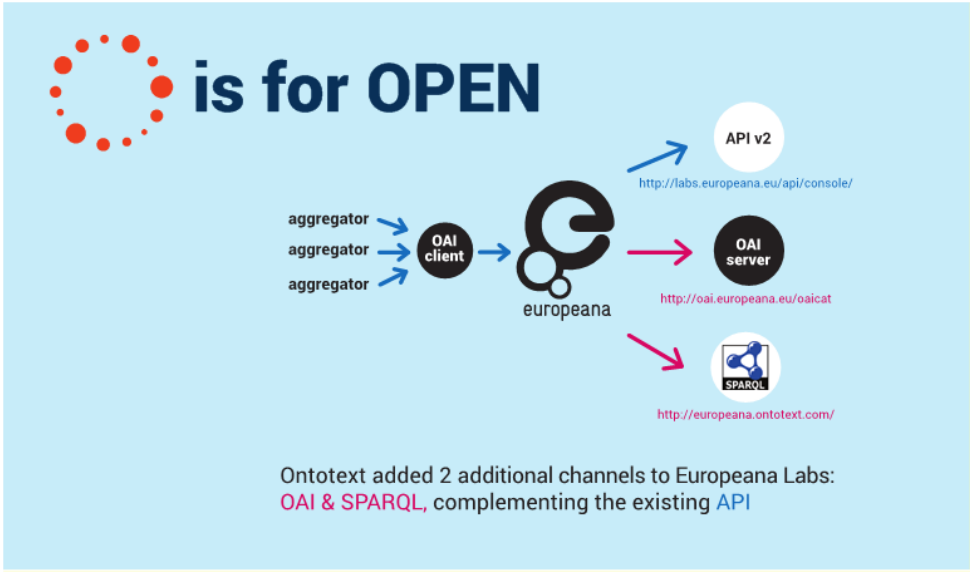
6.4 CONSERVATIONSPACE

Executed by a consortium led by US National Gallery of Art. Developed by Sirma ITT (Ontotext sibling). Based on Ontotext GraphDB (semantic metadata), Alfresco (document management), Smart Documents (Sirma product).

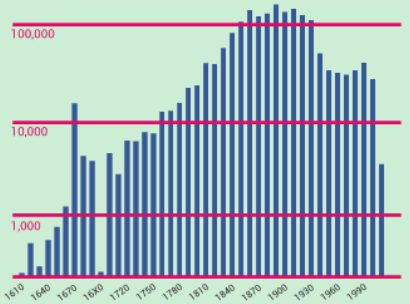


6.5 EUROPEANA LOD AND OAI PMH

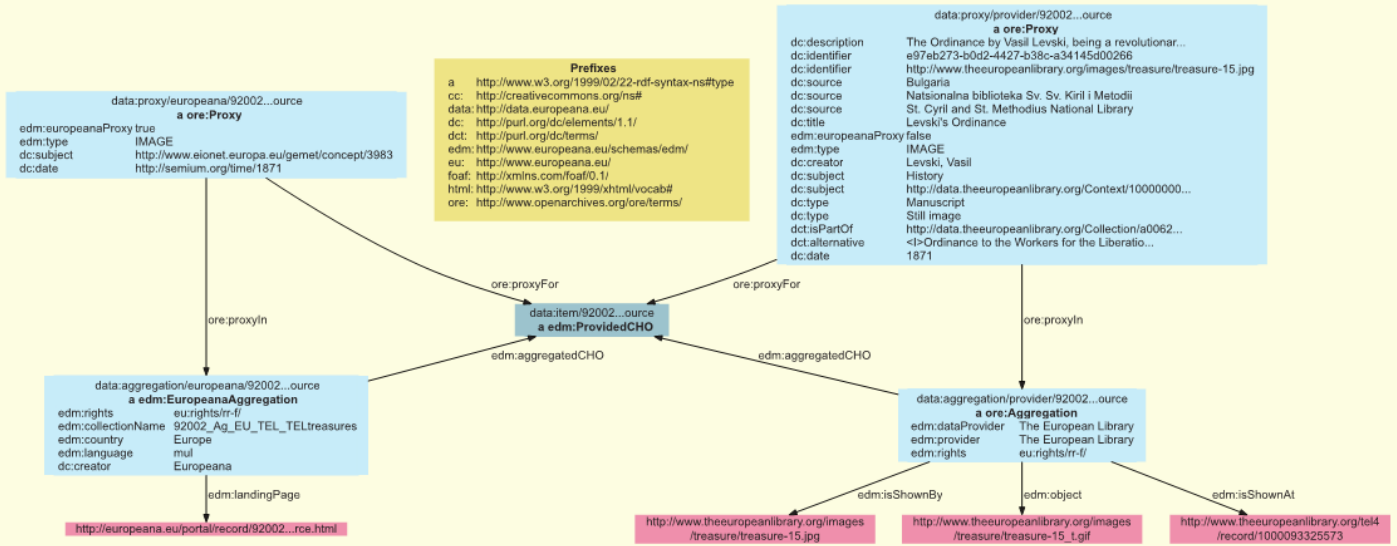
Ontotext crated and hosted the Europeana SPARQL and OAI PMH services



Ontotext added 2 additional channels to Europeana Labs:
OAI & SPARQL, complementing the existing API



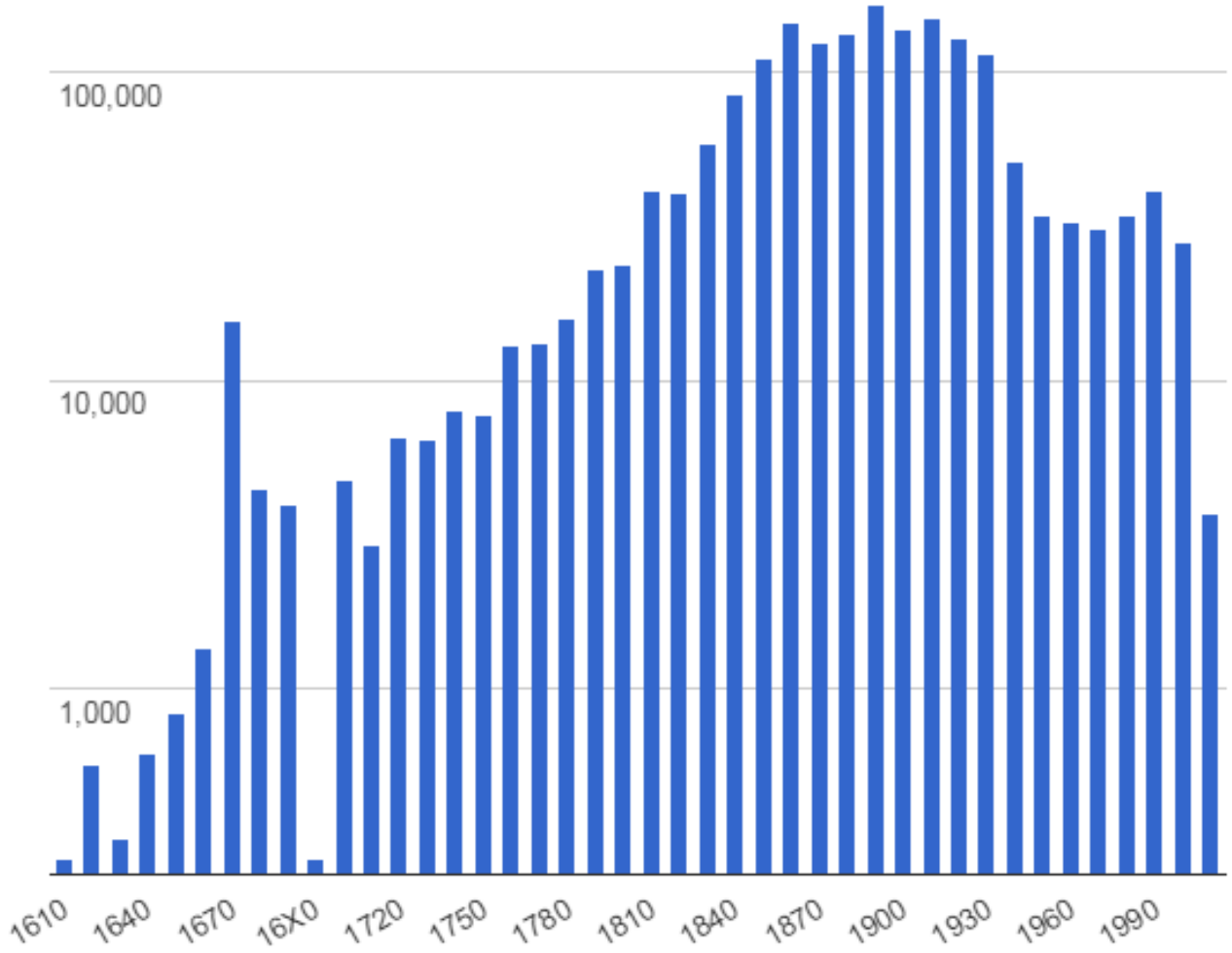
Using SPARQL for analytics: charting
millions of Europeana Newspapers,
spanning from 1618 to present



EDM (Europeana Data Model) is a semantic web format based on RDF and DC/DCT.
Fields representing the CHO (cultural heritage object) are split into 5 nodes

6.5.1 EUROPEANA STATISTICS

Eg chart of newspapers (several millions) by year: can't do this using the Europeana API, but is easy with SPARQL



6.6 EUROPEANA FOOD AND DRINK

Food & Drink content, semantically enriched (place and FD topic). EFD Semantic App: open data, SPARQL endpoint, open source (Github). Uses GraphDB and ElasticSearch enterprise connector

→ Showcases enrichment, faceted semantic search

→ Demo, Data, SPARQL. Homepage, Description, Deliverable

europeana
food and drink

6.6.1 TASTY BULGARIAN RECIPES

Eg 150 with beer, including pancakes!

Europeana Food & Drink

ontotext made with europeana

The Semantic Demonstrator shows the use of semantic technologies for classification and discovery of Europeana objects related to Food and Drink. Detailed description, data, SPARQL endpoint.

Selected filters: *FD:* Beer ✖ *Data provider:* Bulgariana ✖

Food and Drink

- Agriculture 148
- Beverages 149
- Cuisine 149
- Eating behaviors 149
- Food and drink by country 108
- Food and drink preparation 149
- Food and drink terminology 138
- Food culture 149
- Food decorations 30
- Food industry 148
- Food politics 143

Places

- Europe 149

Type (resource)

Language

Data provider

- Bulgariana 149

Results per page: 24

Results 49 - 72 of 149

Page 3 of 7

Бирени палачинки

Разбийте яйцата, прибавете постепенно брашното и бирата до получаване на гладка смес. Продължете да биете и добавете

Панирано пиле с бира

Пилето се сварява предварително. Приготвя се специална паста за паниране. За целта се отделят белтъците от

Пилешки сърца с бира на фурна

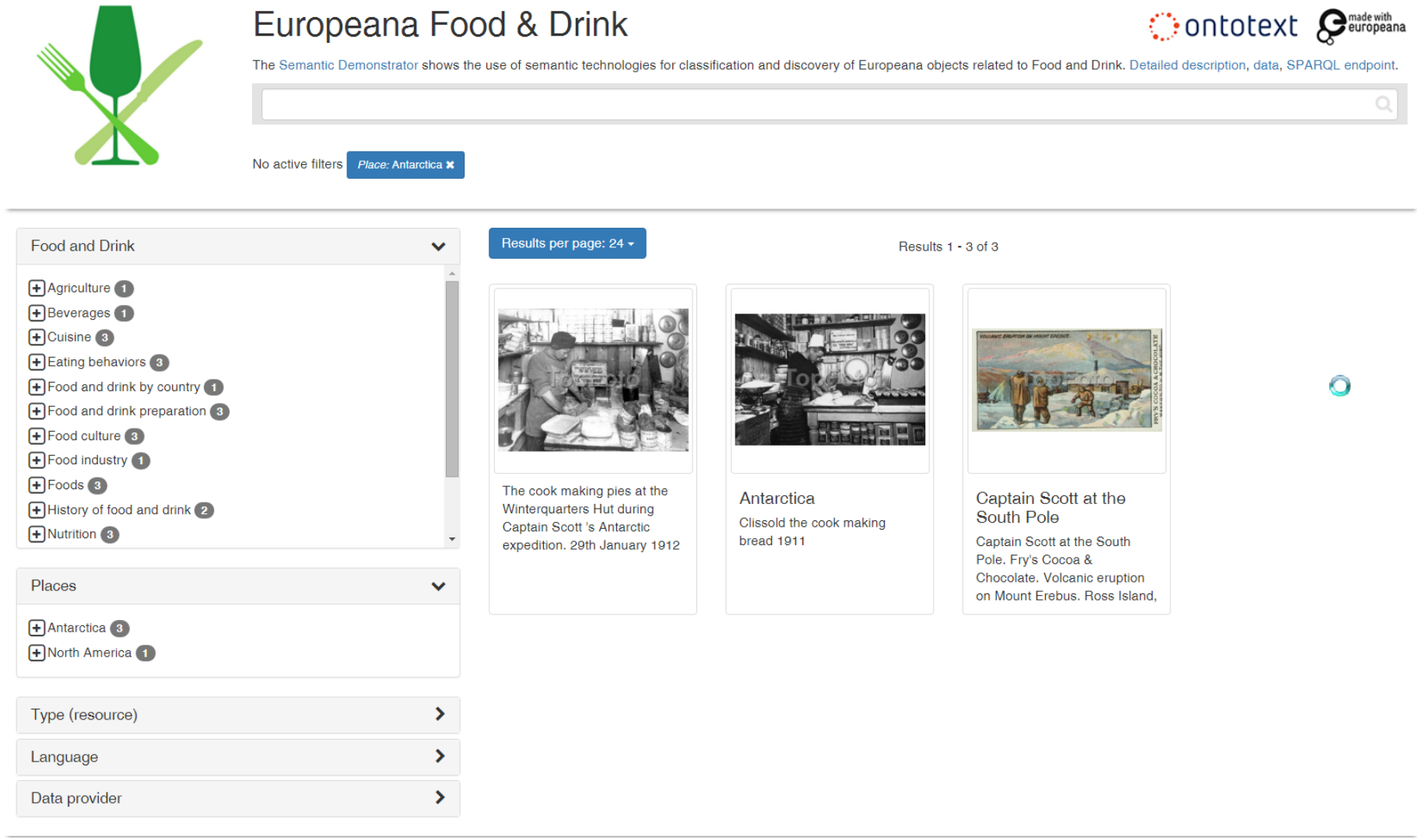
Смесете бирата, меда, пресования чесън, зехтина, малко сол и черен пипер на вкус и розмарина и

Свински бут във фолио на фурна

Разбийте всички продукти за маринатата, добре облейте месото, след като сте го пробили на няколко

6.6.2 WIDE GEOGRAPHIC COVERAGE

Objects from the Roman Empire to Antarctica (Scott's expedition to the South Pole), and everything in-between



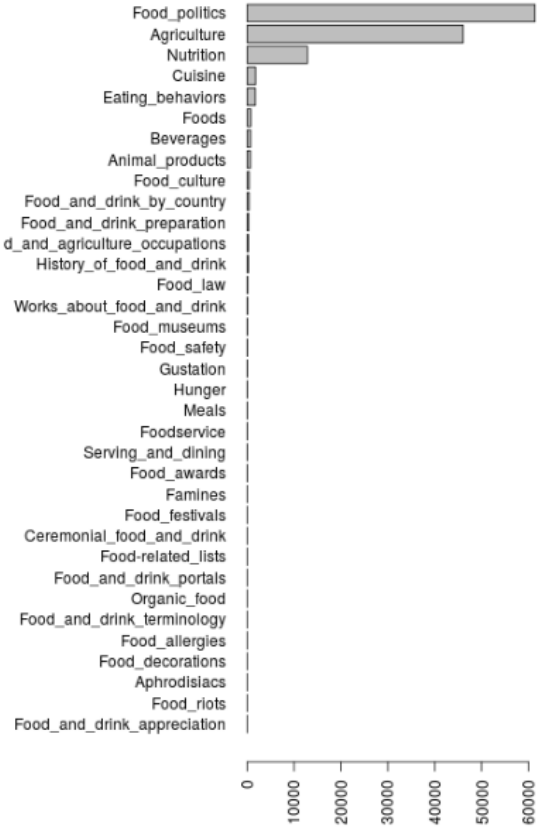
6.6.3 EFD ENRICHMENT: FD GAZETTEER

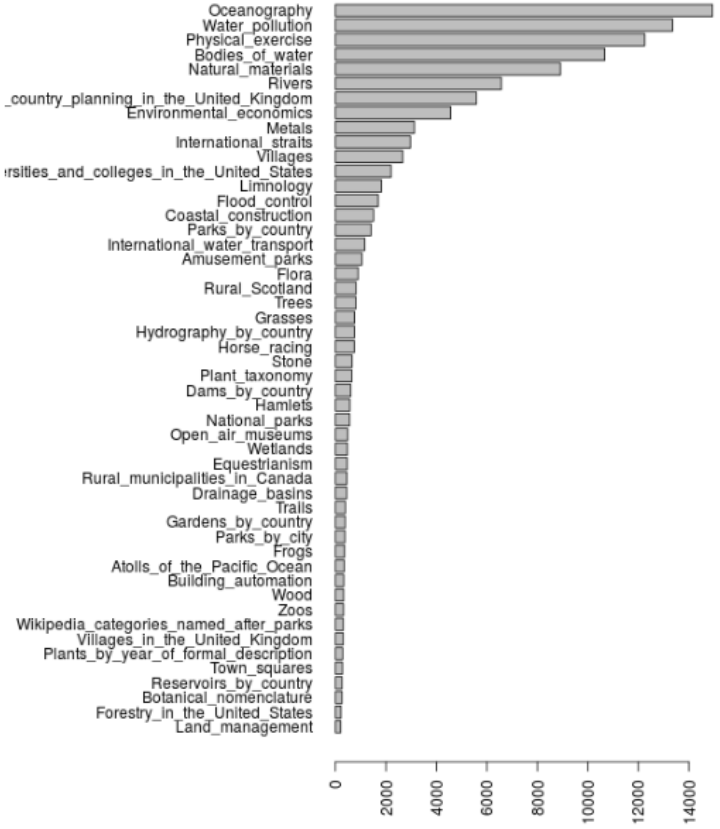
Use Wikipedia Categories to extract a FD Gazetteer.

- "Domain-specific modeling: Towards a Food and Drink Gazetteer", Tagarev, A.; Tolosi, L.; and Alexiev, V, LNCS 9398, p182-196, January 2016 (preprint)

→ Starting from dbc:Food_and_drink, you reach 887k cats, 26 levels deep, representing 80% of all categories

→ Most are irrelevant to FD (left: level 2, right: level 5)

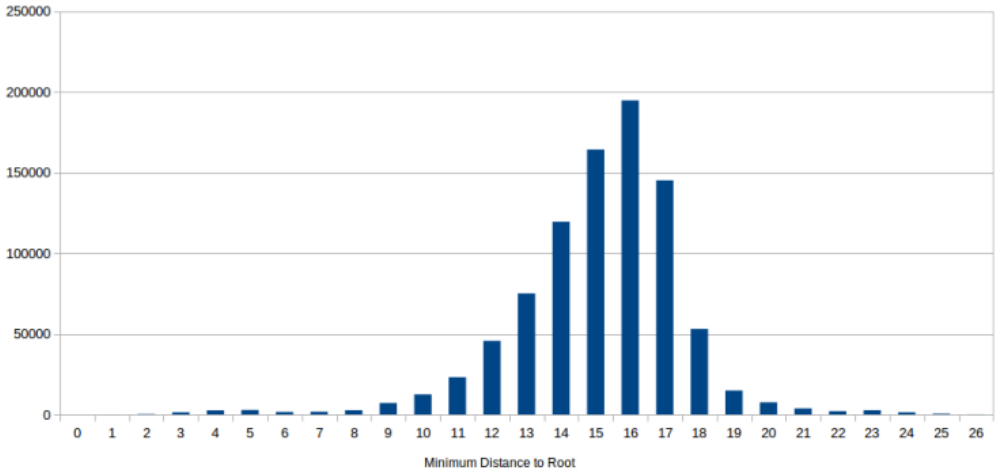


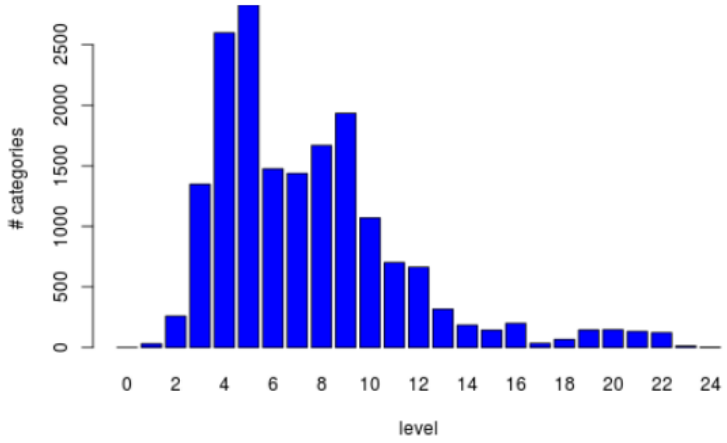


europeana
food and drink

6.6.4 EFD ENRICHMENT: PRUNING FD CATEGORY TREE

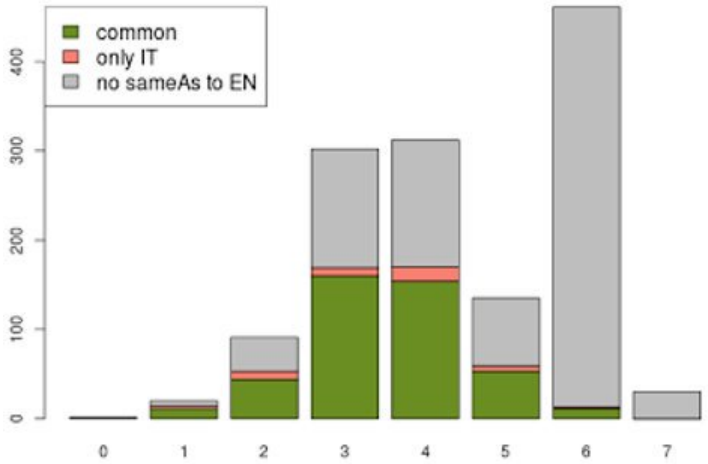
- Using DBPedia in Europeana Food and Drink. Alexiev, V. DBpedia meeting, February 2016.
  - → Mix of approaches:
    - Statistical analysis of the category network
    - Manual curation (chopping out irrelevant branches: about 300)
    - Evidence-based feedback (CHOs, UMBEL, DBTax)
  - → Reduced cats by 98%, level from 16 to 5 (reduce semantic drift)
    - Left relevant: 17.5k cats, 221k articles, ~900k labels



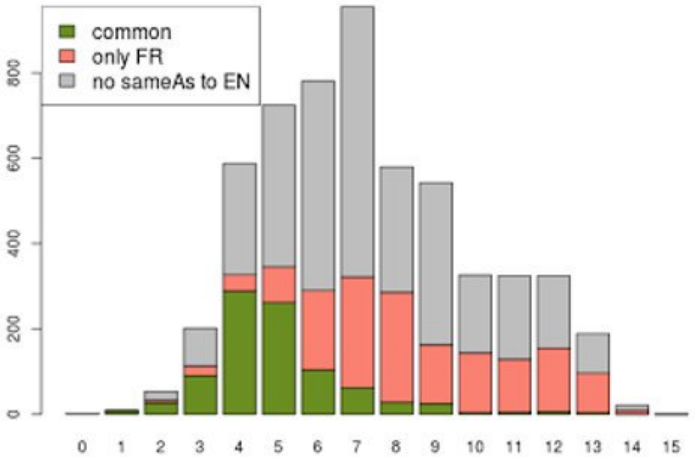


6.6.5 EFD ENRICHMENT: FRENCH

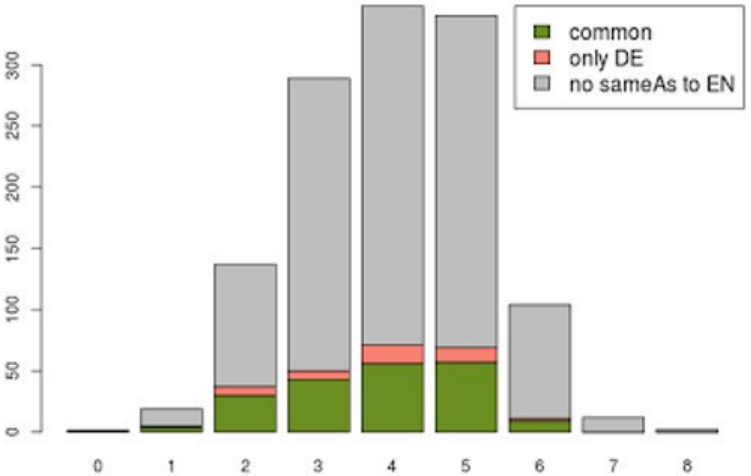
Selected French as second enrichment language after English, considering category overlap (work by L.Tolosi, x-axis is cat level), available content, NLP capabilities



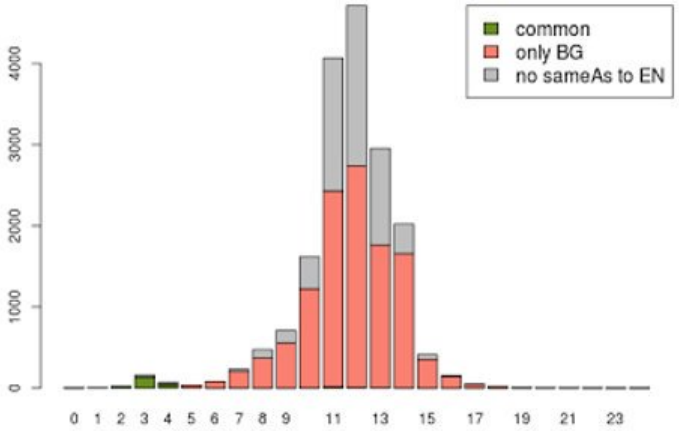
Italian



French



German



Bulgarian

6.6.6 EFD PLACE ENRICHMENT

We used standard Ontotext Concept Enrichment Service, which is a mix of DBpedia+Wikidata. But also had to add Geonames, to leverage the place hierarchy

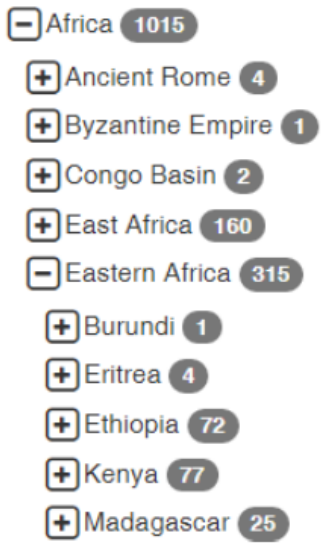
Using GeoNames for Parent Places

- Surprisingly, DBpedia doesn't have good Parent Place info:
  - No statement that Bulgaria and France are part of Europe.
  - Have classes yago:MemberStatesOfTheEuropeanUnion, yago:EuropeanCountries, yago:EuropeanUnionMemberEconomies, but no relation to dbr:Europe
- No uniform property. E.g. dbo:City has **dbo:region** and **dbo:country**, while dbo:Island (e.g. dbr:Andaman_Islands) has:
  - **dbo:archipelago** dbr:Andaman_and_Nicobar_Islands (physical parent)
  - **dbo:location** dbr:Bay_of_Bengal (physical parent)
  - **dbp:countryAdminDivisions** dbr:Andaman_and_Nicobar_Islands (admin parent)
  - **dbo:country** dbr:India (admin ancestor)
  - **dbo:capital** dbr:Port_Blair (admin child)
  - **dbo:majorIsland** dbr:North_Andaman_Island, dbr:South_Andaman_Island (physical child, partial)
- So we decided to use GeoNames, which has uniform property gn:parentFeature

6.6.7 EFD PLACE ENRICHMENT

Hierarchical semantic facet based on Geonames

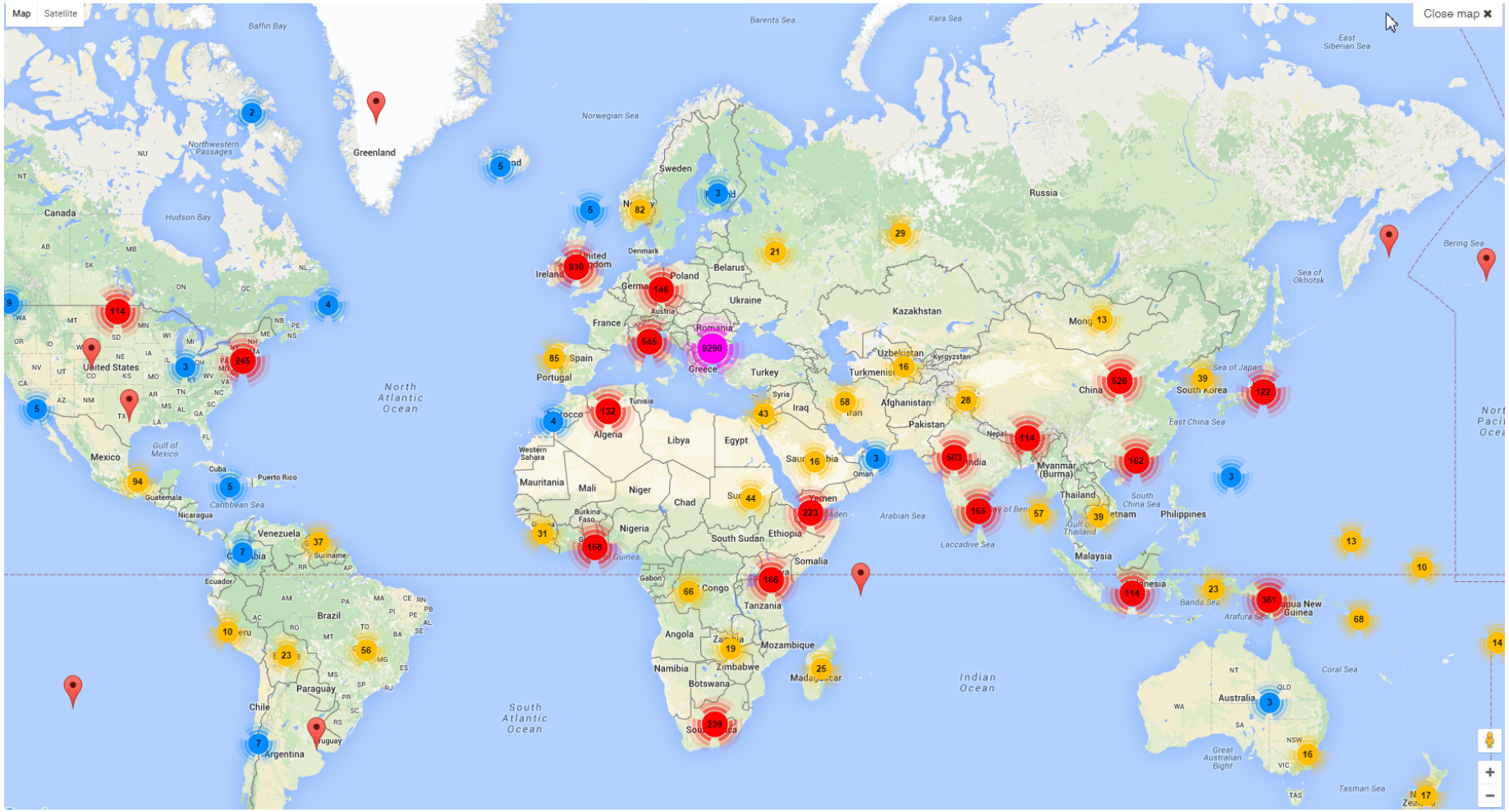
- → GeoNames→Wikipedia/DBpedia links
  - Got from geonames.org, used script from Dbpedia
  - Coverage is about 65% (Wikidata has similar coverage)
  - Added 250 links (e.g. dbr:Sloane_Street gn:parentFeature dbr:Royal_Borough_of_Kensington_and_Chelsea)
- → About 10 fixes to GeoNames on their site (e.g. North & South America were children of “America”…a small village)
- → Loaded GeoNames & DBpedia in Ontotext GraphDB, used owl:sameAs optimization to merge (smush) the corresponding nodes
- → Voila! A hierarchical semantic facet
  - Faceting is done by ElasticSearch, we use the GraphDB-ElasticSearch Connector



europeana

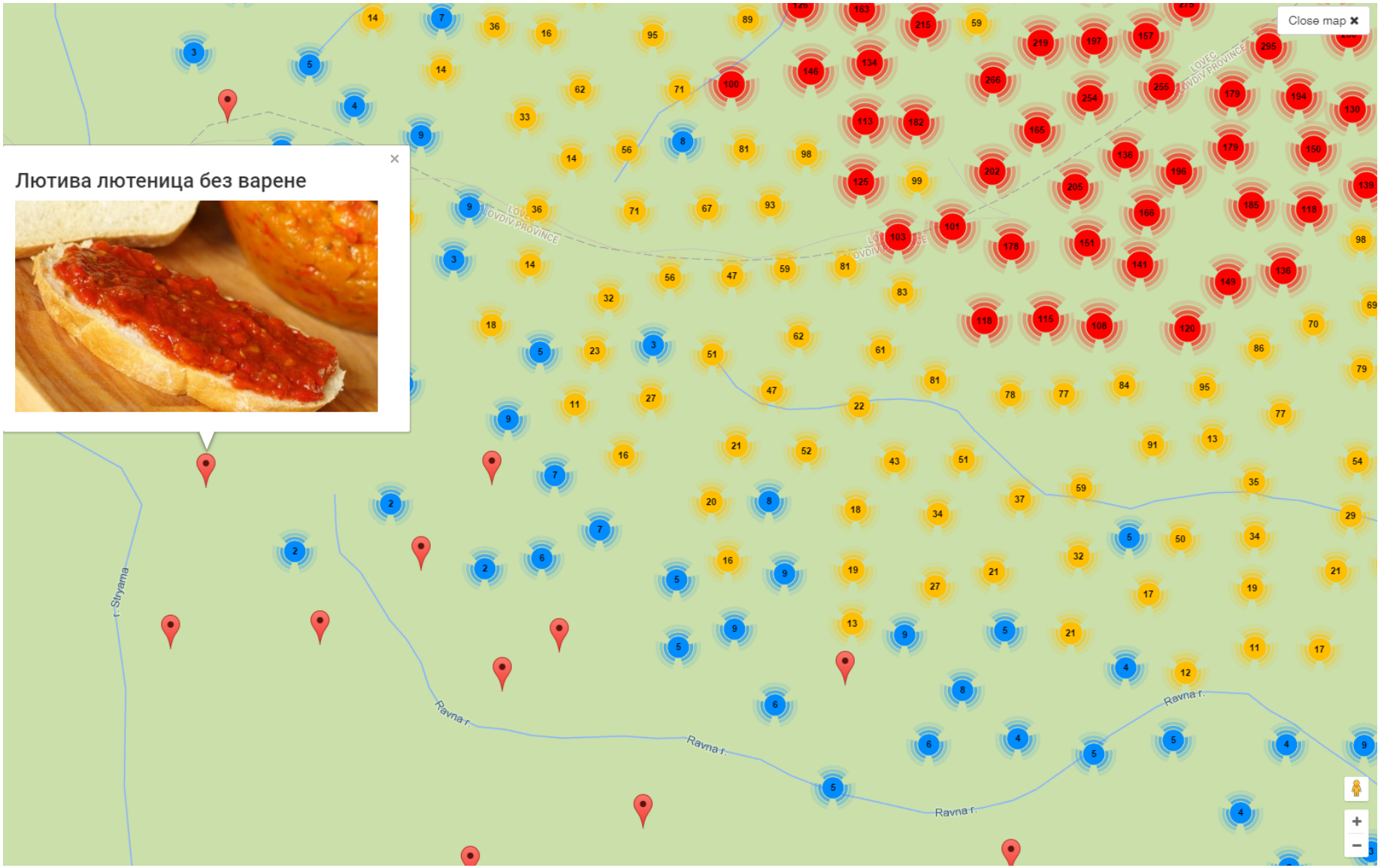
6.6.8 EFD GEOGRAPHIC MAPPING: CLUSTERING

Once we have places, it's relatively easy to map them. We used the Cluster Mapper library



6.6.9 EFD GEOGRAPHIC MAPPING: JITTERING

There are 9k objects marked "Bulgaria". We don't want all flags in the center of Bulgaria, so we jitter them up



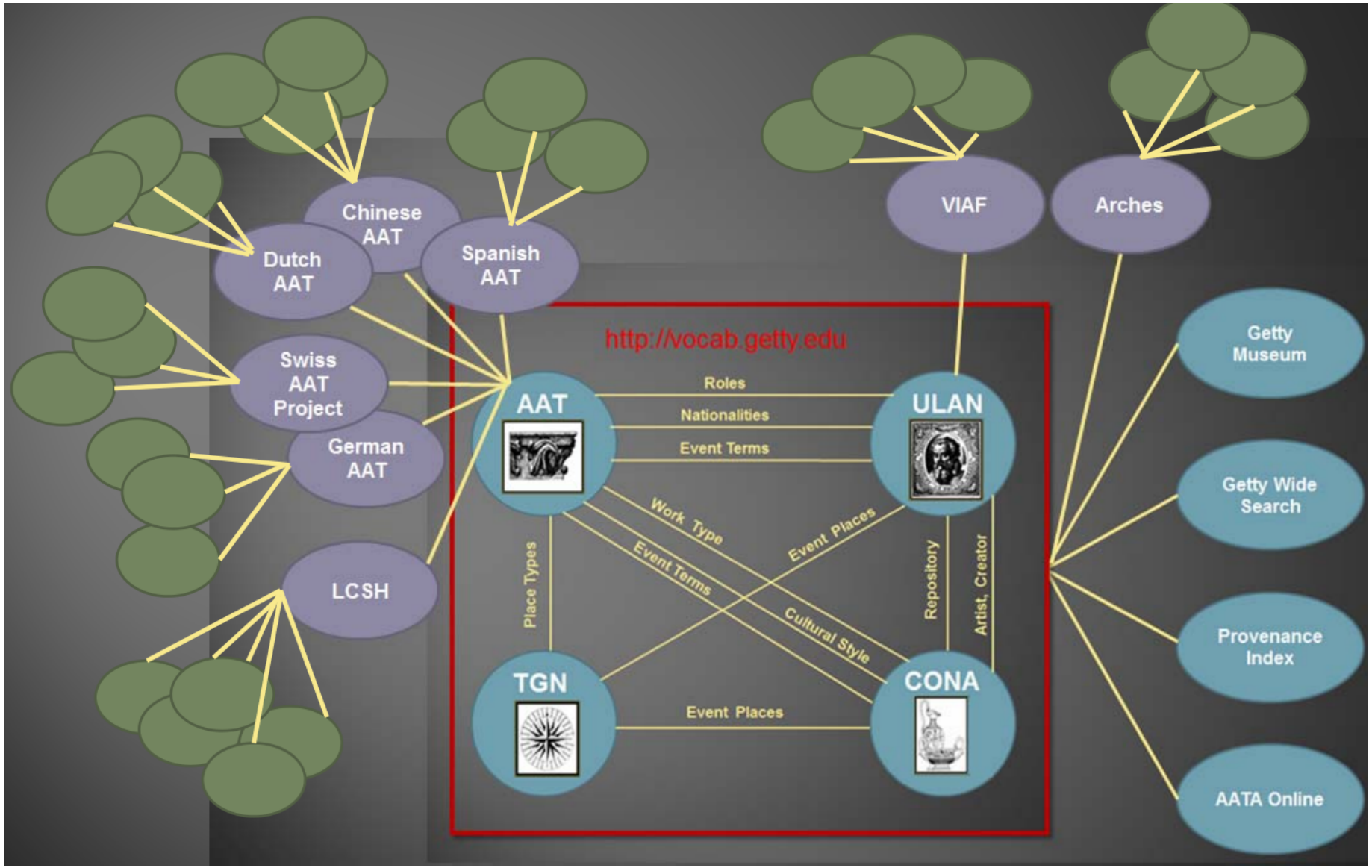
6.6.10 GLAMS WORKING WITH WIKIDATA

Why should GLAMs bother about Wikidata? Because it gives an excellent way to connect and expose your collection data to a multilingual audience

- Europeana Wikimedia Taskforce report:
  - Recommendation 1: For every Europeana project, considering the possible benefits of a Wikimedia component should be default behavior
  - Recommendation 7: Make Wikidata a central element of Europeana's "portal to platform" strategy
  - Recommendation 8: Europeana should continue to invest in technology that improves the interoperability between GLAMs and Wikimedia platforms
- GLAMs Working with Wikidata: easily add content about a colorful tradition "blessing of the baskets" ("swiecenie koszyczek" or just "Święconka" in Polish). With proper cats: when we merge them across languages (pl, en, de), we discover the content is about Food and Drink, Easter, and a Polish tradition

6.7 GETTY VOCABULARY PROGRAM LOD

GVP well-known and respected in GLAM. Dependencies: AAT-TGN-ULAN-CONA. Center of LODLAM cloud? GVP Training Materials (Diagram by J.Cobb, 2014)



6.7.1 GVP LOD RELEASES

AAT 2014-02, TGN 2014-08, ULAN 2015-03. Publicized in blog posts by J.Cuno, head of the Getty Trust

6.7.2 ONTOTEXT SCOPE OF WORK

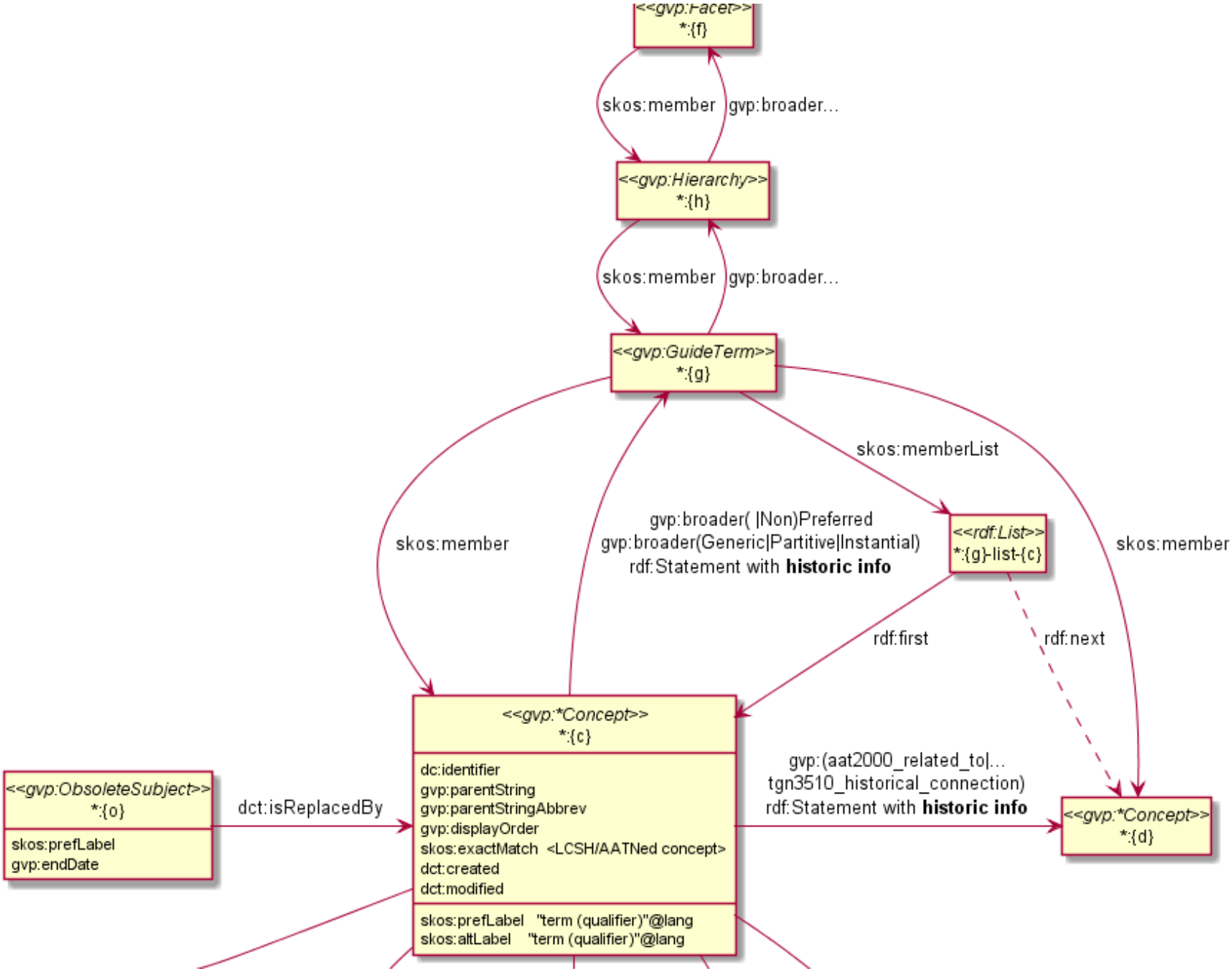
- Semantic/ontology development: http://vocab.getty.edu/ontology
- Contributed to ISO 25964 ontology (latest standard on thesauri). Provided implementation experience, suggestions and fixes
- Complete mapping specification
- Help implement R2RML scripts working off Getty's Oracle database, contribution to Perl implementation (RDB2RDF), R2RML extension (rrx:languageColumn)
- Work with a wide External Reviewers group (people from OCLC, Europeana, ISO 25964 working group, etc)
- GraphDB semantic repo, clustered for high-availability
- Semantic application development (customized Forest user interface) and tech consulting
- SPARQL 1.1 compliant endpoint: http://vocab.getty.edu/sparql
- Comprehensive documentation (100 pages): http://vocab.getty.edu/doc
- Sample queries (100), including charts, geographic queries, etc
- Per-entity export files, explicit/total data dumps. Many formats: RDF, Turtle, NTriples, JSON, JSON-LD
- Help desk / support on twitter and google group (see home page)
- Presentations, papers. On the composition of ISO 25964 hierarchical relations (BTG, BTP, BTI). Alexiev, V.; Lindenthal, J.; and Isaac, A. International Journal on Digital Libraries, August 2015, Springer.

6.7.3 COMPLETE REPRESENTATION OF ALL GVP INFO

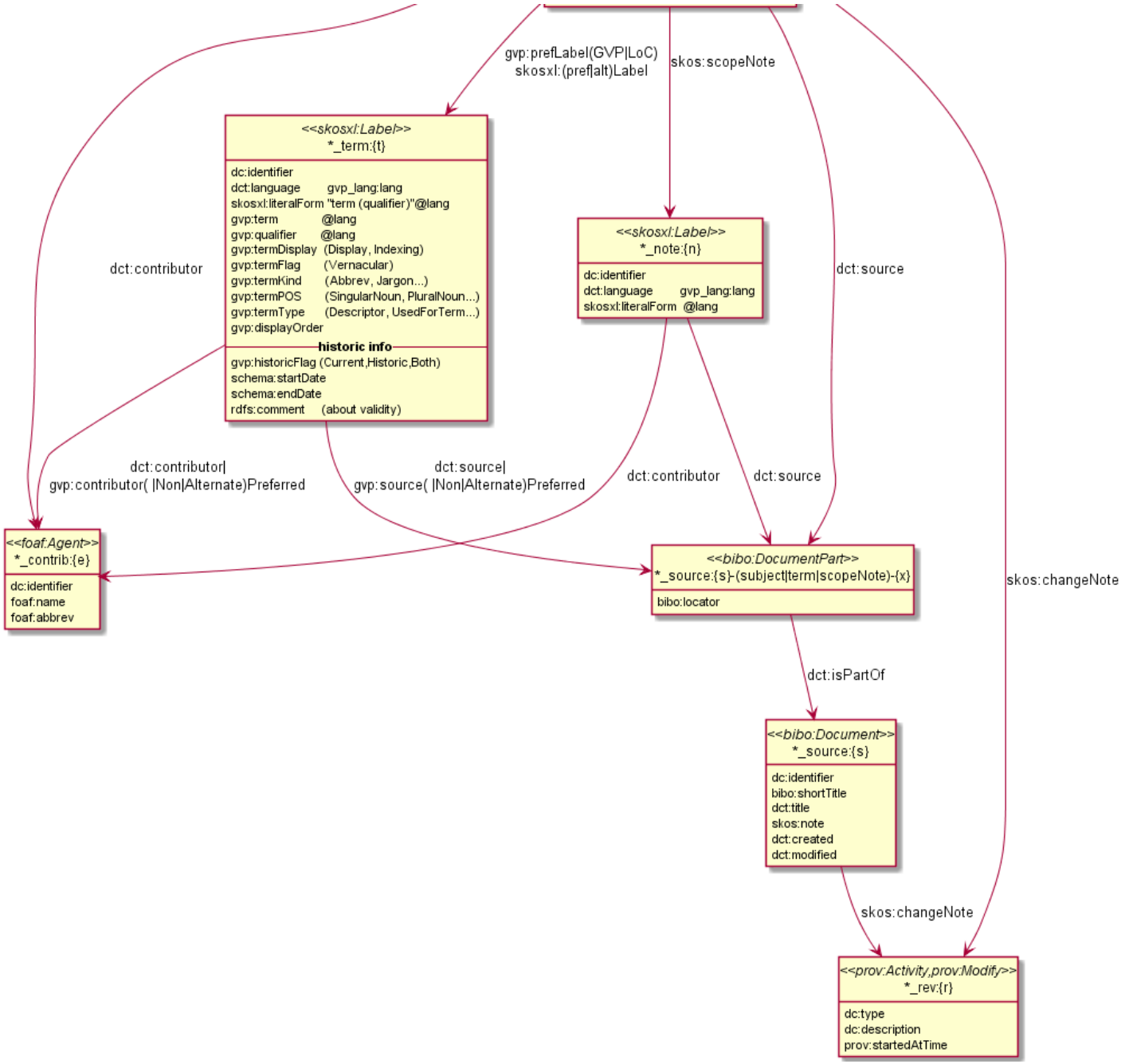
See GVP LOD: Ontologies and Semantic Representation, V.Alexiev, CIDOC 2014.
External Ontologies:

Prefix	Ontology	Used for
bibo:	Bibliography Ontology	Sources
dc:	Dublin Core Elements	common
dct:	Dublin Core Terms	common
foaf:	Friend of a Friend ontology	Contributors
iso:	ISO 25946 (latest on thesauri)	iso:ThesaurusArray, BTG/BTP/BTI
owl:	Web Ontology Language	Basic RDF representation
prov:	Provenance Ontology	Revision history
rdf:	Resource Description Framework	Basic RDF representation
rdfs:	RDF Schema	Basic RDF representation
schema:	Schema.org	common, geo (TGN), bio (ULAN)
skos:	Simple Knowledge Organization System	Basis vocabulary representation
skosxl:	SKOS Extension for Labels	Rich labels
wgs:	W3C World Geodetic Survey geo	Geo (TGN)
xsd:	XML Schema Datatypes	Basic RDF representation

6.7.4 GVP SEMANTIC REPRESENTATION (1)



6.7.5 GVP SEMANTIC REPRESENTATION (2)



6.7.6 KEY VALUES (FLAGS) ARE IMPORTANT

Excel-driven Ontology Generation™. Key **val** can be mapped to Custom sub-class, Custom (sub-)prop, Ontology Value (eg <term/kind/Abbreviation>)

voca	table	field	val	ObjectProperty	Class	label	domain	range	subProperty	subClassOf	ConceptSchem
	subject	record_type	F		gvp:Facet	Facet				gvp:Subject, iso:ThesaurusArray	
AAT	subject	record_type	H		gvp:Hierarchy	Hierarchy Name				gvp:Subject, iso:ThesaurusArray	
AAT	subject	record_type	G		gvp:GuideTerm	Guide Term				gvp:Subject, iso:ThesaurusArray	
AAT	subject	record_type	C		gvp:Concept	Concept				gvp:Subject, skos:Concept	
	subject	record_type	-		gvp:ObsoleteSubject	Obsolete Subject				gvp:Subject	
TGN	subject	record_type	P		gvp:PhysPlaceConcept	Physical Place Concept				gvp:Subject, skos:Concept	
TGN	subject	record_type	A		gvp:AdminPlaceConcept	Administrative Place Concept				gvp:Subject, skos:Concept	
TGN	subject	record_type	B		gvp:PhysAdminPlaceConcept	Physical and Administrative Place Concept				gvp:Subject, skos:Concept	
	subject_rels	preferred	P	gvp:broaderPreferred		Preferred Parent	gvp:Subject	gvp:Subject	gvp:broader		
	subject_rels	preferred	N	gvp:broaderNonPreferred		Non-Preferred Parent	gvp:Subject	gvp:Subject	gvp:broader		
	subject_rels	hier_rel_type	G	gvp:broaderGeneric		Parent (Generic)	gvp:Subject	gvp:Subject	gvp:broader		
	subject_rels	hier_rel_type	P	gvp:broaderPartitive		Parent (Partitive)	gvp:Subject	gvp:Subject	gvp:broader		
	subject_rels	hier_rel_type	I	gvp:broaderInstantial		Parent (Instantial)	gvp:Subject	gvp:Subject	gvp:broader		
	term	preferred	P	gvp:prefLabelGVP		Preferred Label for GVP	gvp:Subject	skosxl:Label			
	term	aacr2_flag	Y	gvp:prefLabelLoC		Preferred Label for LoC	gvp:Subject	skosxl:Label			
	term	vernacular	V	gvp:termFlag		Term Flag	skosxl:Label	skos:Concept			term/flag/
	term	other_flags	A	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	C	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	CN	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	F	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	J	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	N	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/
AAT	term	other_flags	S	gvp:termKind		Term Kind	skosxl:Label	skos:Concept			term/kind/

```
gvp:Facet a owl:Class ;
  rdfs:isDefinedBy <http://vocab.getty.edu/ontology> ;
  rdfs:subClassOf gvp:Subject, iso:ThesaurusArray ;
  rdfs:label "Facet" ;
  rdfs:comment "One of the major divisions of a vocabulary" ;
  skos:example "Objects Facet (AAT), World (TGN)" ;
  dct:description "One of the major divisions of a vocabulary.\nExample: Objects Facet (AAT), World (TGN)".
```

6.7.7 ASSOCIATIVE RELATIONS ARE VALUABLE

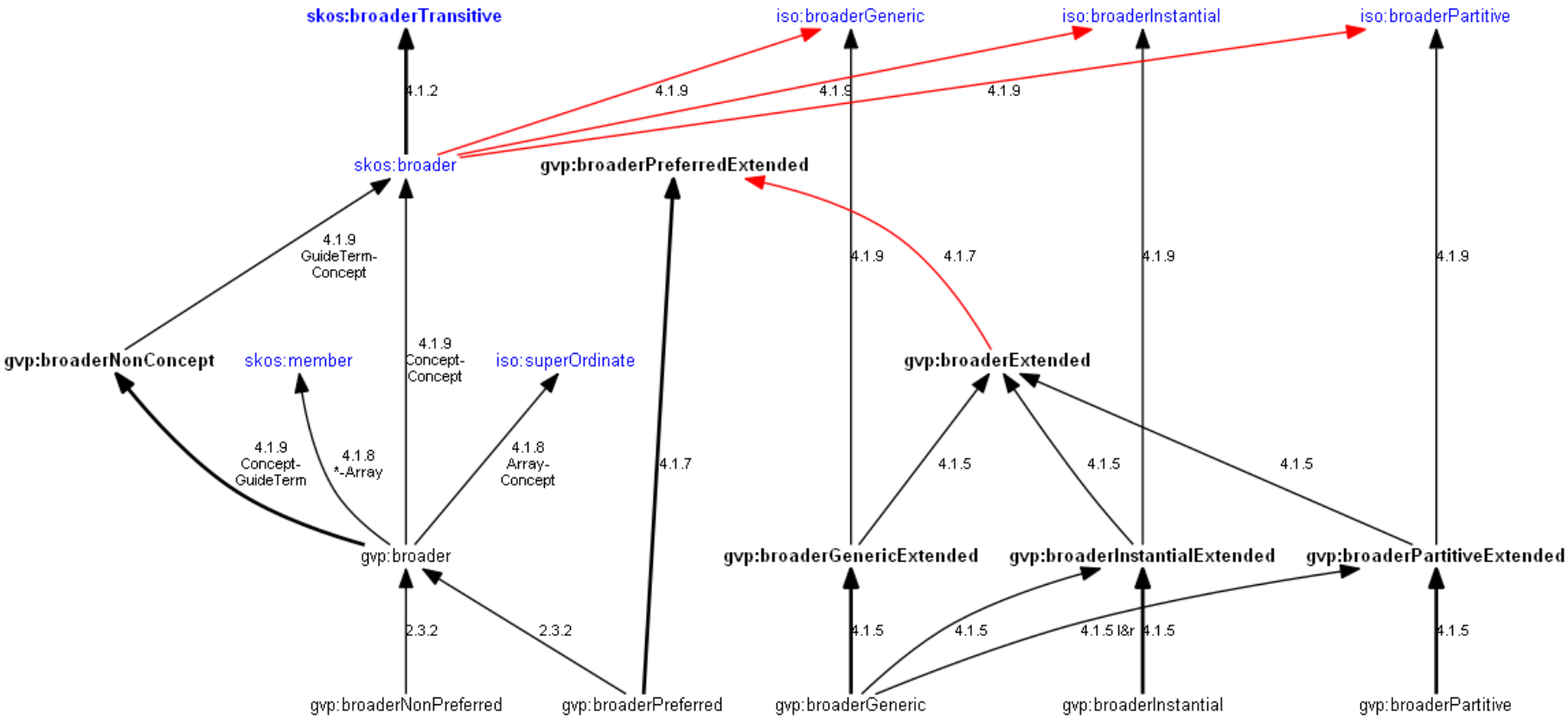
More Excel-driven Ontology Generation™

- Relations come in owl:inverseOf pairs (or owl:SymmetricProperty self-inverse)

fcode	icode	domain (C1)	LOD frel	range (C2)	LOD irel	Editor frel - From C1 to C2	Editor irel - From C2 to C1	fexample	iexample
2000		any	related to	any		any - related to - any	same	*gulf red* is related to *light red (pigment)*	*light red (pigment)* is related to *gulf red*
2001		any	formerly referred to	any		any - formerly referred - any	same	*gigues formerly referred to fiddles*	*fiddles* formerly referred to *gigues*
2100		any	distinguished from	any		any - distinguished from - any	same	*historic farms* are distinguished from *abandoned farms; naive art* is distinguished from *outsider art*	*abandoned farms* are distinguished from *historic farms; outsider art* is distinguished from *naive art*

```
gvp:aat2000_related_to a owl:ObjectProperty;
  rdfs:subPropertyOf skos:related;
  rdfs:domain skos:Concept; rdfs:range skos:Concept;
  # domain "any"; range "any";
  dc:identifier "2000";
  skos:prefLabel "aat2000_related_to";
  dc:title "related to - any";
  skos:example "gulf red is related to light red (pigment)";
  skos:scopeNote "generic relationship, not explained" ;
  dct:description """any - related to - any; generic relationship, not explained.
Example: gulf red is related to light red (pigment)""" .
gvp:aat2000_related_to a owl:SymmetricProperty.
```

6.7.8 INVOLVED INFERENCE OF HIERARCHICAL RELATIONS



6.7.9 COMPREHENSIVE DOCUMENTATION

Getty Vocabularies Linked Open Data: Semantic Representation. Alexiev, V.; Cobb, J.; Garcia, G.; Harpring, P. Getty Research Institute, 3.2 edition, March 2015.

Getty Vocabularies: Linked Open Data

Semantic Representation

Version: 2.0
Last updated: 19 Aug 2014
HTML version: http://vocab.getty.edu/doc/ (for link
PDF version: http://vocab.getty.edu/doc/gvp-lod.
Formerly at: http://www.getty.edu/research/tool
Initial version: Vladimir Alexiev, Joan Cobb, Greg
Updates: Vladimir Alexiev, Joan Cobb

Very detailed: 100 pages! Linkable anchors:

vocab.getty.edu/doc/#Full_Text_Search

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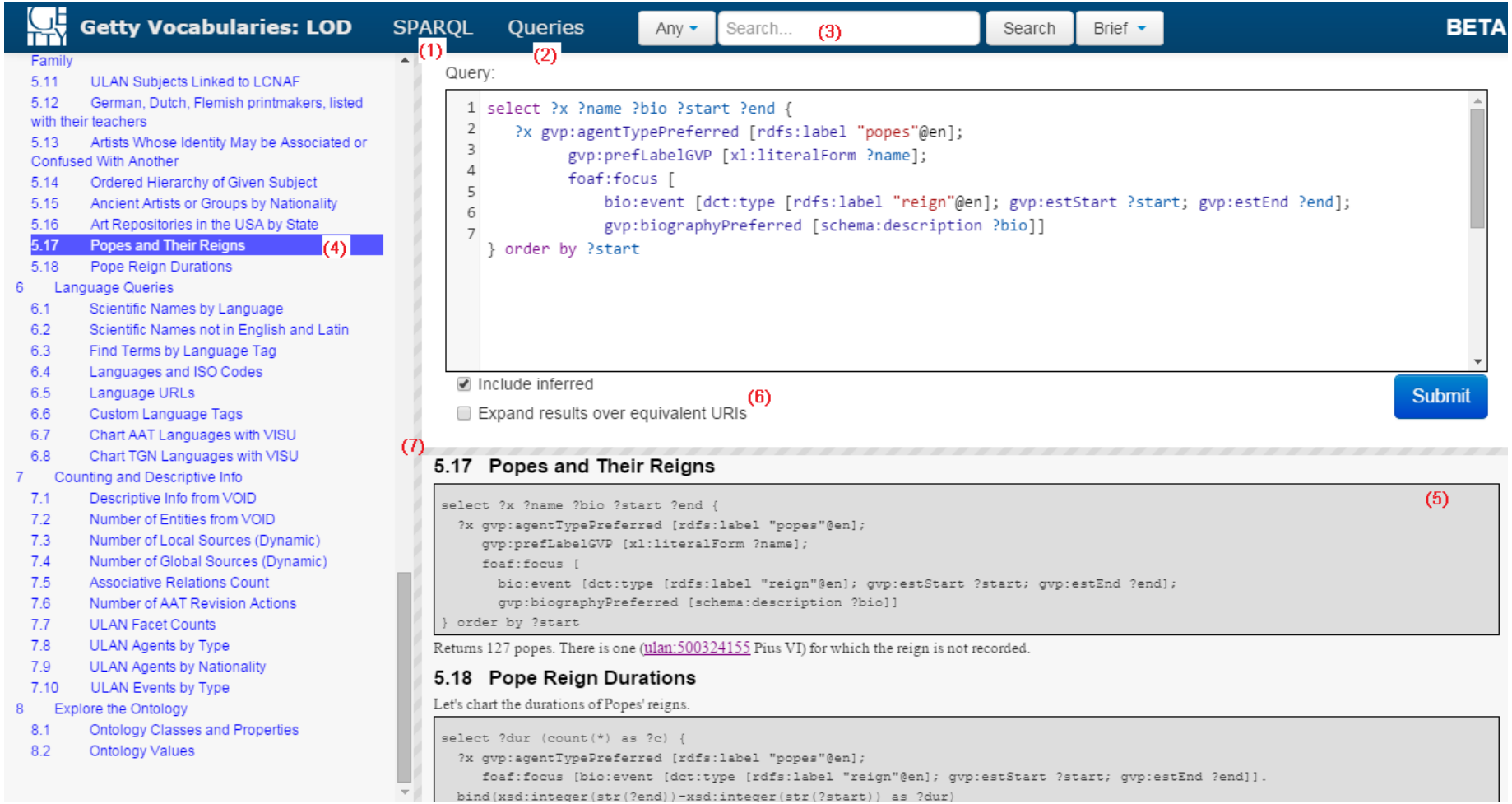
6.7.10 SAMPLE QUERIES (100), INTEGRATED UI

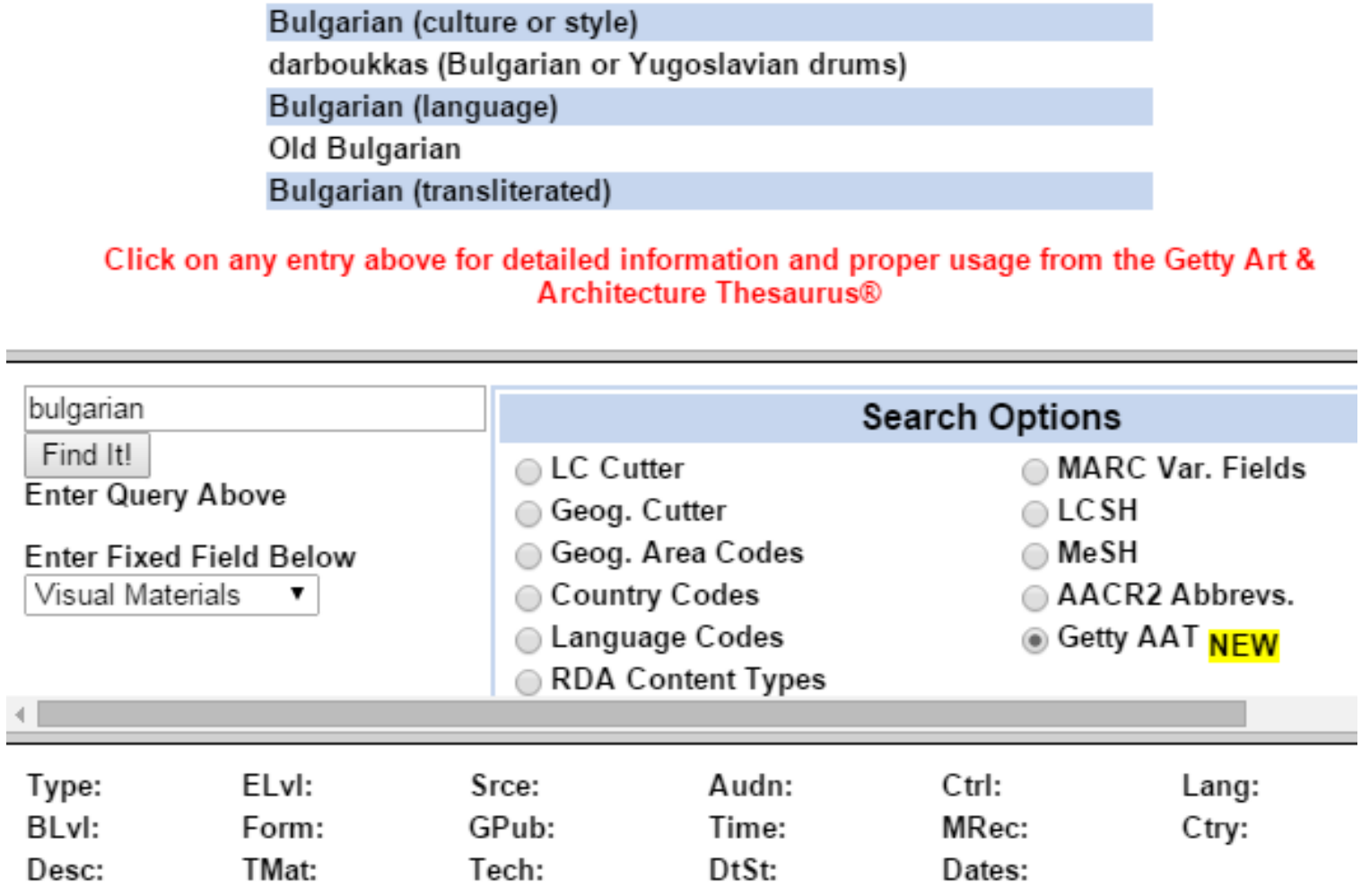
Some charts, eg "Year Joined UN" (TGN), "Pope Reign Durations" (ULAN)



6.7.11 GVP VOCABS USAGE

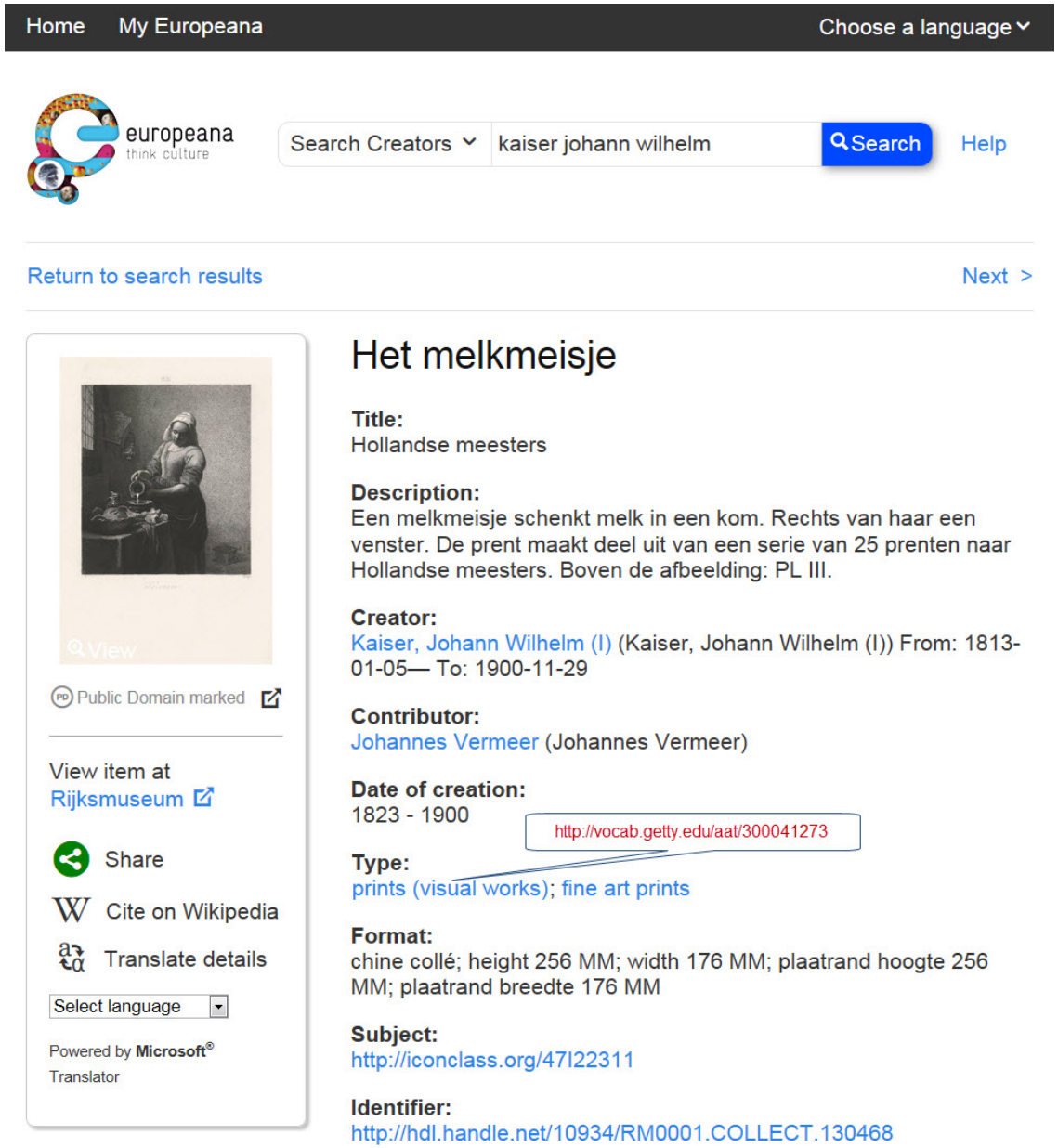
Collected about 100 usages of the vocabs, many in Collection Management and Search. Many described in Getty Vocabs: Why LOD? Why Now?, J.Cobb, 2014. Eg

- AAT used in Cataloging Calculator: finds bibliographic and authority data: language codes, geographic area codes, publication country codes, AACR2 abbreviations, LC main entry, Cutter numbers, AAT concepts, etc



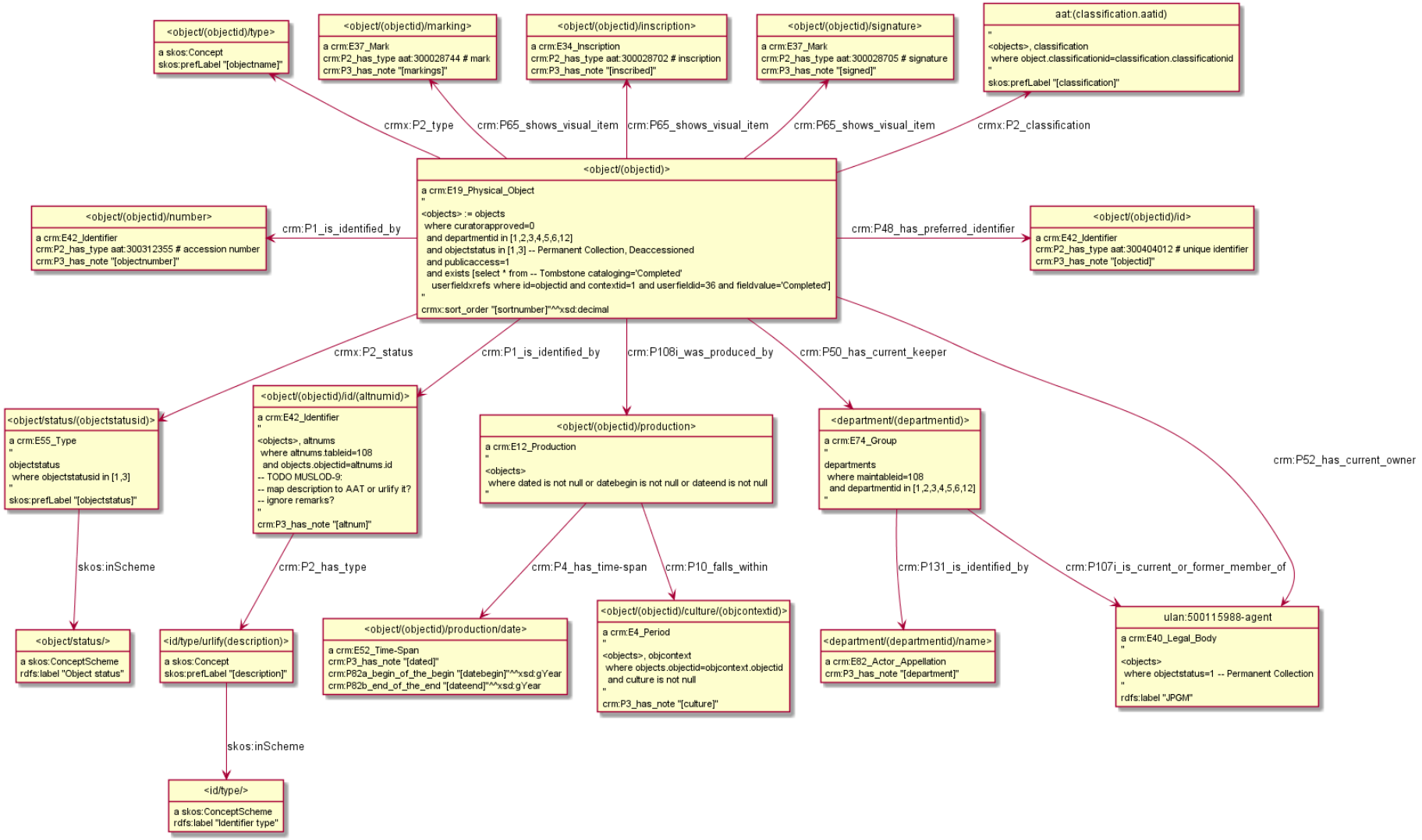
6.7.12 AAT IN EUROPEANA

- Europeana uses AAT to enrich type/subject/material fields
- PartagePlus matched Art Nuveau candidate concepts to AAT; enriched labels



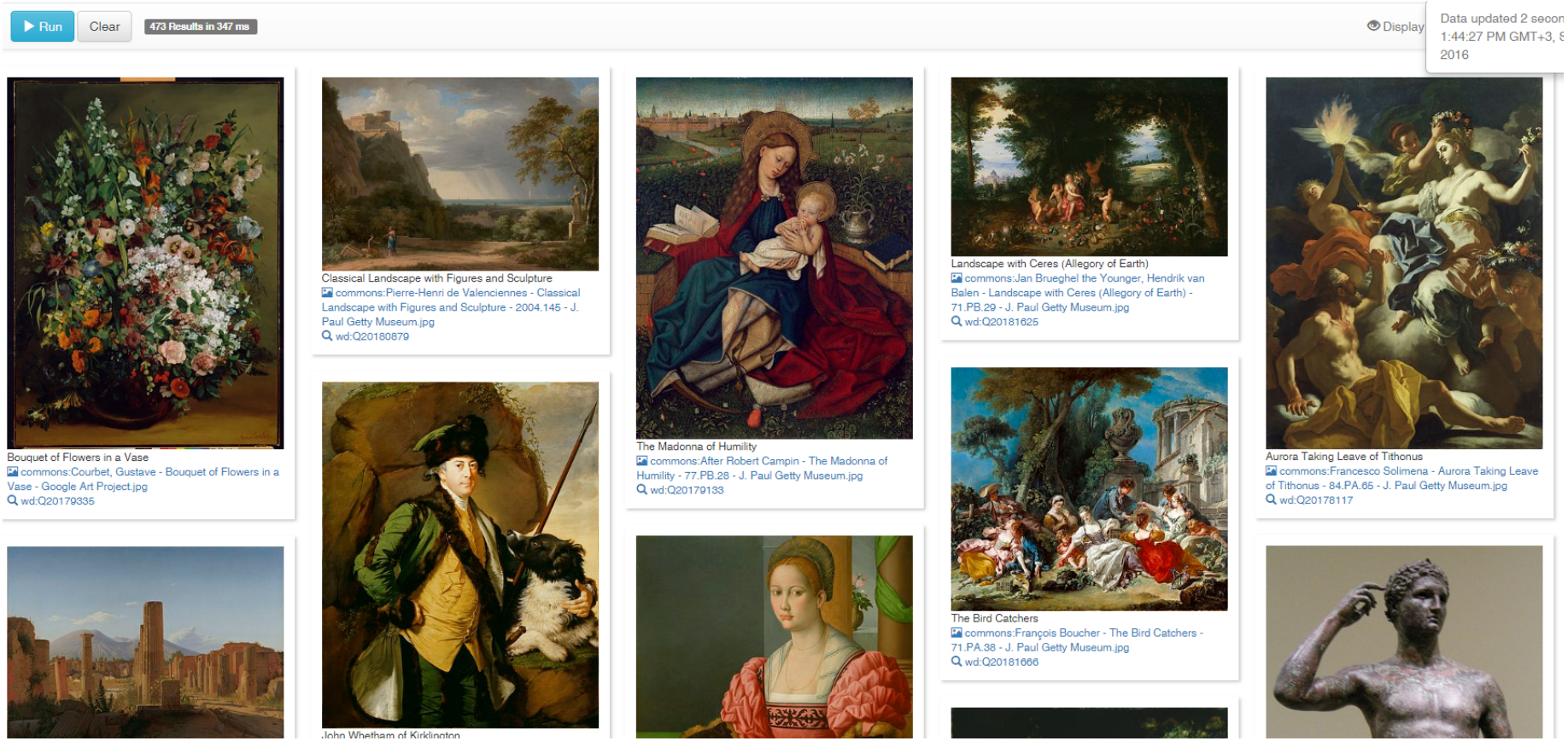
6.8 J.P.GETTY MUSEUM

Working with JPGM on publishing LOD. Considering CIDOC CRM, maybe also simpler ontologies. Hoping to generate R2RML from instance examples like:



6.8.1 J.P.GETTY MUSEUM AND WIKIDATA

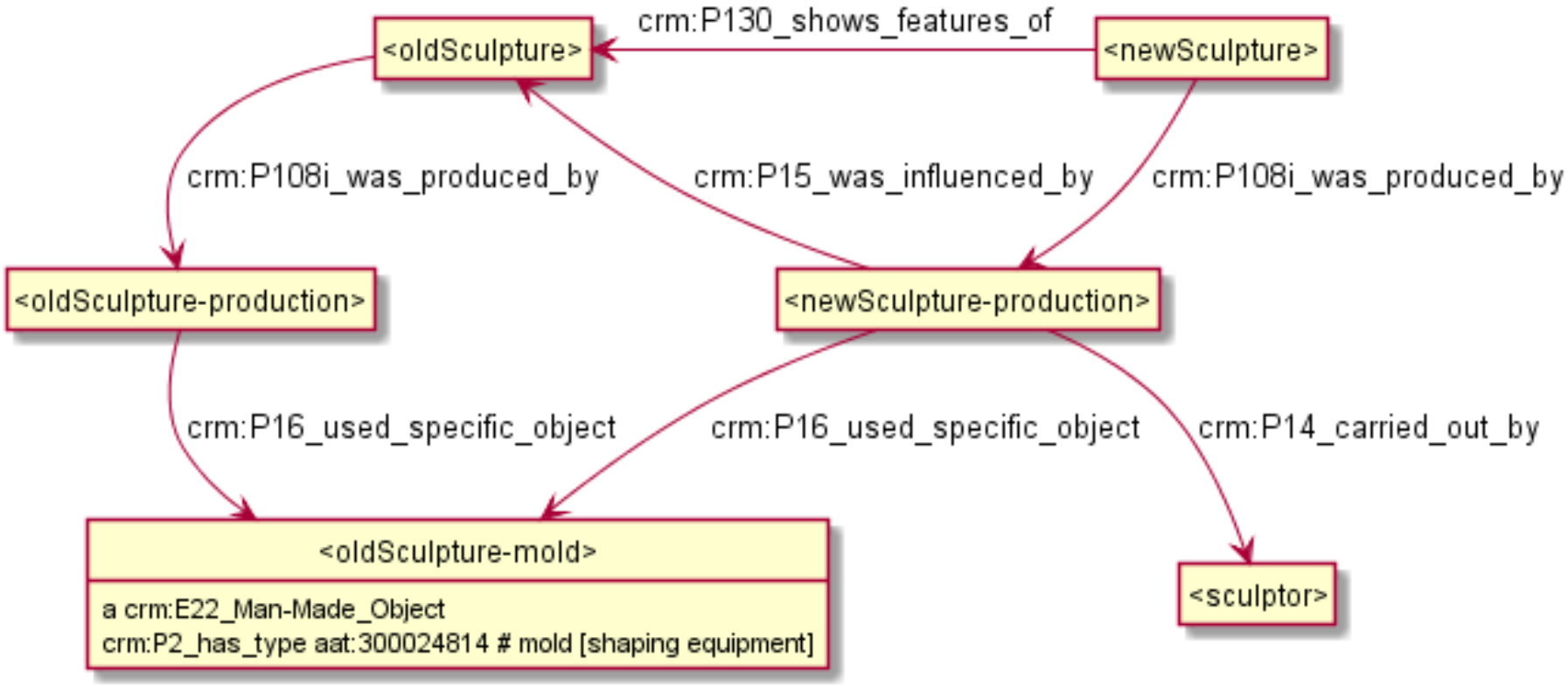
Discussing making data for Wikidata. WD has 480 Getty paintings, but the Museum has 180k artworks. WD query shown as image grid



6.9 AMERICAN ART COLLABORATIVE

American Art Collaborative: 14 US art museums committed to establishing a critical mass of LOD on the semantic web. Consulting on CRM mapping.

- Work ongoing at https://github.com/american-art, eg see NPG mapping issues
- Eg possible mapping of "(sculpture) Cast after"



6.10 EUROPEAN HOLOCAUST RESEARCH INFRASTRUCTURE

EHRI is a large-scale EU project that involves 23 Holocaust archives (Europe, Israel and the US), DH and IT organizations.

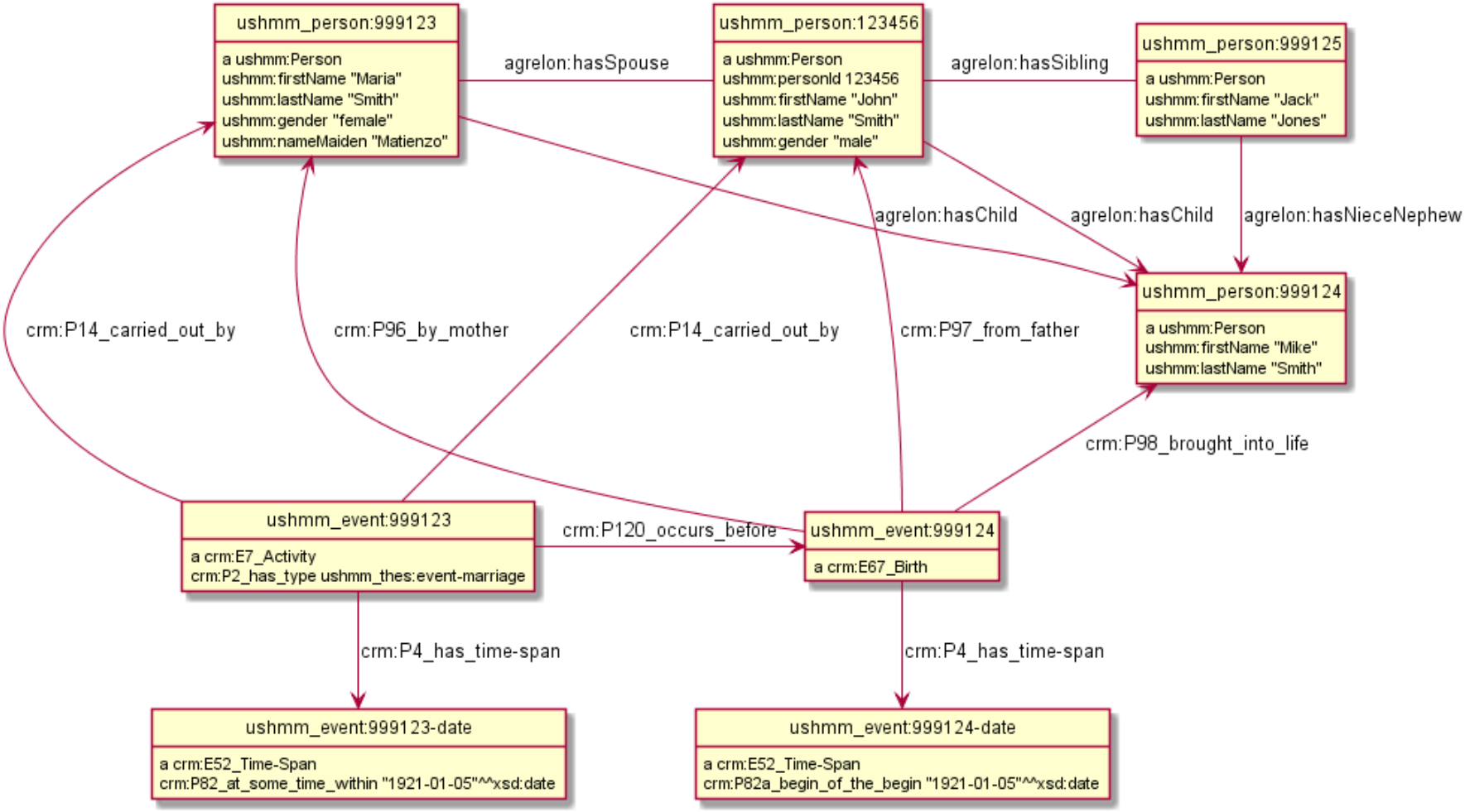
- In its first phase (2011-2015) it aggregated archival descriptions and materials on a large scale and built a Virtual Research Environment (portal) for Holocaust researchers based on a graph database.
- In its second phase (2015-2019), EHRI2 seeks to enhance the gathered materials using semantic approaches: enrichment, coreferencing, interlinking. Semantic integration involves Four of the 14 EHRI2 work packages and helps integrate databases, free text, and metadata to interconnect historical entities (people, organizations, places, historic events) and create networks.

"Semantic Archive Integration for Holocaust Research: the EHRI Research Infrastructure", V.Alexiev, L.Brazzo, CIDOC Congress 2016.

6.10.1 EHRI: PERSON NETWORKS

Research question: how person networks influenced chance of survival. Idea:

- Rec 123456: firstName “John”, lastName “Smith”, gender Male, dateMarriage 1921-01-05, *additional names* nameSpouseMaiden “Matienzo”, nameSpouse “Maria Smith”, nameChild “Mike Smith”, nameSibling “Jack Jones”
- We can create Person records for the people mentioned, make some likely inferences, then try to match to other Person records in the database



6.10.2 EHRI: LARGE-SCALE PLACE MATCHING

Match USHMM places to Geonames, also achieving deduplication. A Geonames matching pipeline in free text was also developed

ushmm_id	ushmm url	City Town, Country, State Province, County, Place	Geonames URL	Geonames place names
111898	nm_place/111898	Ostrowiece	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
461952	hm_place/461952	Ostrowiec; p. Wilno	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
577175	hm_place/577175	Ostrowiec, Kielce	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
577079	hm_place/577079	Tarnow, Ostrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
540428	hm_place/540428	Ostrowiec; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
575033	hm_place/575033	OSTROWIEG	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
533691	hm_place/533691	Ostrowiec [Ghetto]; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
577113	hm_place/577113	Gniezno, Ostrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
3439	hmm_place/3439	Ostrowiec Swietokrzyski; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
442993	hm_place/442993	Ostrowjec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
250202	hm_place/250202	Ostrowiec, Niel.	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
533745	hm_place/533745	Ostrowiec; Kielce; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
248156	hm_place/248156	Ostrowiece; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
256787	hm_place/256787	Osztrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
577328	hm_place/577328	Ostrowiec, Krakow	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
467480	hm_place/467480	Osrtowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
437534	hm_place/437534	Ostrowiec.	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
550745	hm_place/550745	Ostrowiec, Dorf Strodlolz	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
466191	hm_place/466191	Oastrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
160876	hm_place/160876	Ostrowic	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
479692	hm_place/479692	Ostroiwec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
576091	hm_place/576091	Ostrowiec, Lodz	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
134984	hm_place/134984	Ostrowiec Kielecki	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
432822	hm_place/432822	Otsrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
461868	hm_place/461868	Ostrowiec Swietokrzyski	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
457828	hm_place/457828	Ostroweic	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
22667	mm_place/22667	Ostrowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
533041	hm_place/533041	Ostrowiec [Ghetto]; Kielce; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
474815	hm_place/474815	Ostorowiec	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie
463	shmm_place/463	Ostrowiec; Poland	mes.org/762863/	Ostrowiec Świętokrzyski < Ostrowiec Świętokrzyski < Powiat ostrowiecki < Województwo Świętokrzyskie

guard	Cos dist	punishment	Cos dist

6.10.3 EHRI: ORAL HISTORY INTERVIEWS

Analyze 2.5k OH Interviews:

- ONTO: Place enrichment, Person name recognition
- INRIA: word2vec experiments

guard	Cos dist	punishment	Cos dist
guarding	0.593507	punishments	0.668144
sentry	0.512083	punish	0.601212
hlinka	0.496201	punishing	0.543213
gate	0.490032	beatings	0.527033
watching	0.484647	penalty	0.497262
rifle	0.484379	deserved	0.490157
lookout	0.482025	beaten	0.473870
patrol	0.477233	straf	0.473338
soldier	0.475982	offense	0.461230
guarded	0.474689	executing	0.459965
police	0.474291	merciless	0.455123

- semantic "differencing" (**interesting**)

```
KGB - Stalin + Hitler = SS
```

6.10.4 EHRI: DISCOVERING CAMPS, GHETTOS, STALAGS

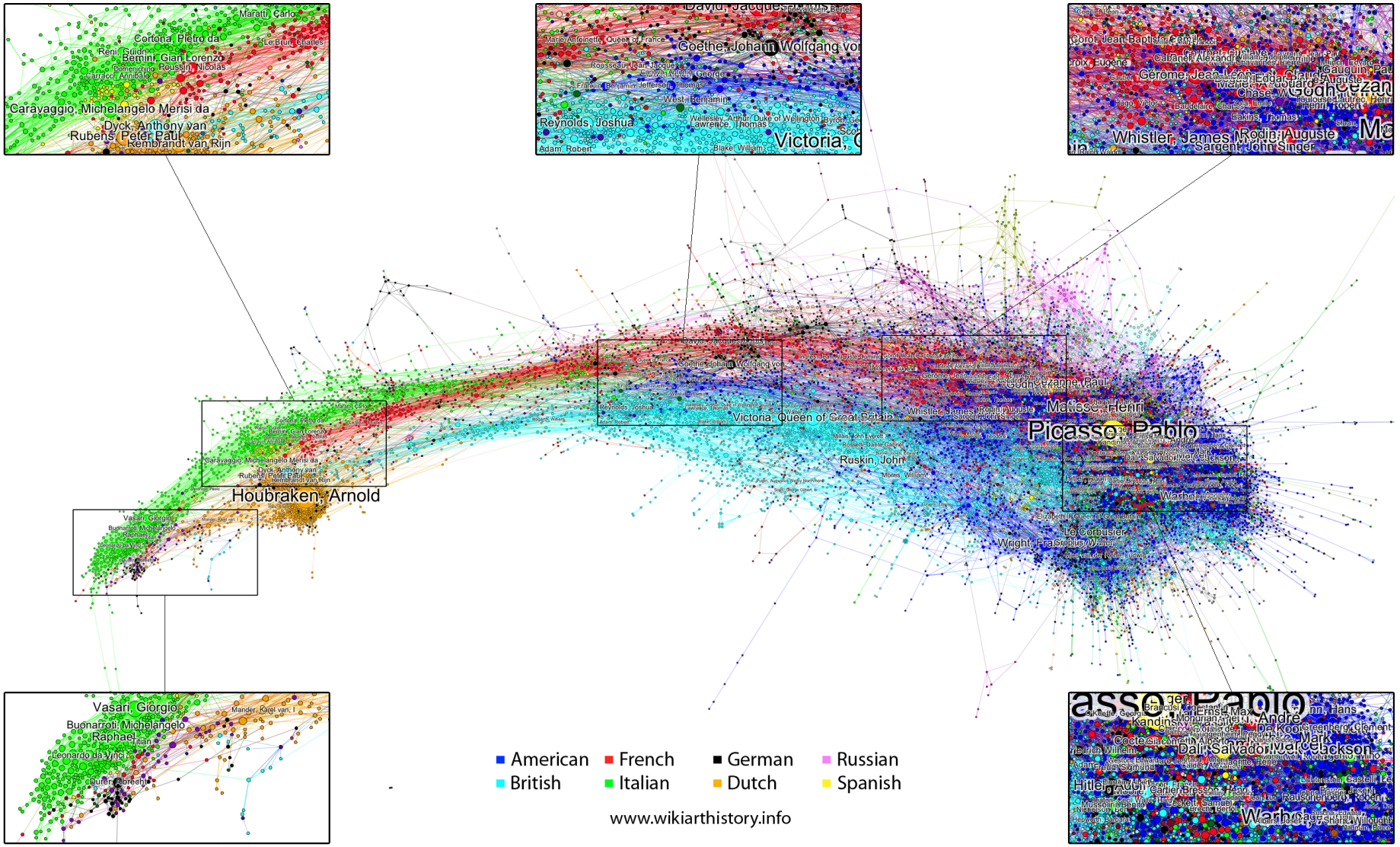
And referencing to Geonames so we can get coordinates

ushmm	shmm URL	name	penames url	geonames place hier	judg	notes
534046	ace/534046	Landweer [Concentration Camp]; Netherlands	org/2750405/	Kingdom of the Netherlands < Western Europe	-1	not specific enough
533743	ace/533743	Kremboong [Concentration Camp]; Netherlands	org/2750405/	Kingdom of the Netherlands < Western Europe	-1	not specific enough
433661	ace/433661	Lager Westerbork; Holland	org/2750405/	Kingdom of the Netherlands < Western Europe	-1	not specific enough
538730	ace/538730	Legionowo [Concentration Camp]; Poland	s.org/766555/	Legionowo < Legionowo < Powiat legionowski < Województwo Mazowiecki	1	
534116	ace/534116	Legionowo [Ghetto]; Poland	s.org/766555/	Legionowo < Legionowo < Powiat legionowski < Województwo Mazowiecki	1	
538124	ace/538124	Arnau [Concentration Camp]; Czechoslovakia	org/3075058/	Hostinné < Okres Trutnov < Královéhradecký kraj < Czech Republic < Cze	1	
542825	ace/542825	Konotop [POW Camp]; Chernigov / Ukraine; USSR	s.org/705134/	Konotop < Chernihivs'ka Oblast' < Ukraine < Union of Soviet Socialist Rep	1	
529789	ace/529789	Westerbork [concentration camp]; Netherlands	org/2744769/	Westerbork < Gemeente Midden-Drenthe < Provincie Drenthe < Kingdom o	1	
555800	ace/555800	Westerbork/unbekanntes Lager	org/2744769/	Westerbork < Gemeente Midden-Drenthe < Provincie Drenthe < Kingdom o	1	
581222	ace/581222	Kamp \"Westerbork\"	org/2744769/	Westerbork < Gemeente Midden-Drenthe < Provincie Drenthe < Kingdom o	1	
540898	ace/540898	Giessen [Concentration Camp]; Germany	org/2920512/	Gießen < Gießen, Universitätsstadt < Landkreis Gießen < Regierungsbezir	1	
537909	ace/537909	Uglich [Soviet Concentration Camp]; Iaroslavl' / Russia; U	s.org/479532/	Uglich < Yaroslavskaya Oblast' < Russian Federation < Union of Soviet Sc	1	
534954	ace/534954	Rokitno [Ghetto]; Poland	org/3087032/	Rokitno < Szczekociny < Powiat zawierciański < Województwo Śląskie < F	-1	this one: http://www.geonames.org/6
548590	ace/548590	STALAG VI A [POW Camp]; Hemer; Germany	org/2906595/	Hemer < Hemer < Märkischer Kreis < Regierungsbezirk Arnsberg < Nordrh	1	
540770	ace/540770	STALAG VI A [POW Camp]; Hemer; Germany	org/2906595/	Hemer < Hemer < Märkischer Kreis < Regierungsbezirk Arnsberg < Nordrh	1	
550537	ace/550537	Hemer [Prisoner of war camp]	org/2906595/	Hemer < Hemer < Märkischer Kreis < Regierungsbezirk Arnsberg < Nordrh	1	
550041	ace/550041	Stalag (VI A) Hemer [Prisoner of war camp]	org/2906595/	Hemer < Hemer < Märkischer Kreis < Regierungsbezirk Arnsberg < Nordrh	1	
548056	ace/548056	Chaul'sk [Ghetto]; Vinnitsa; Ukraine; USSR	s.org/710910/	Chaul'sk < Vinnyts'ka Oblast' < Ukraine < Union of Soviet Socialist Repub	1	
533400	ace/533400	Saybusch [Concentration Camp]; Poland	org/3079855/	Żywiec < Żywiec < Powiat żywiecki < Województwo Śląskie < Republic of	1	
548342	ace/548342	Bornum [Concentration Camp]; Germany	org/2946043/	Bornum < Zerbst < Anhalt-Bitterfeld < Saxony-Anhalt < Federal Republic o	0	cannot differentiate between the two
537497	ace/537497	Berlin-Köpenick [Concentration Camp]; Germany	org/2885656/	Köpenick < Berlin < Berlin < Berlin, Stadt < Land Berlin < Federal Republic	1	
545839	ace/545839	Güstrow [Concentration Camp]; Germany	org/2913433/	Güstrow < Güstrow < Landkreis Rostock < Mecklenburg-Western Pomeran	1	

6.11 OTHERS PROJECTS: WIKIARTHISTORY

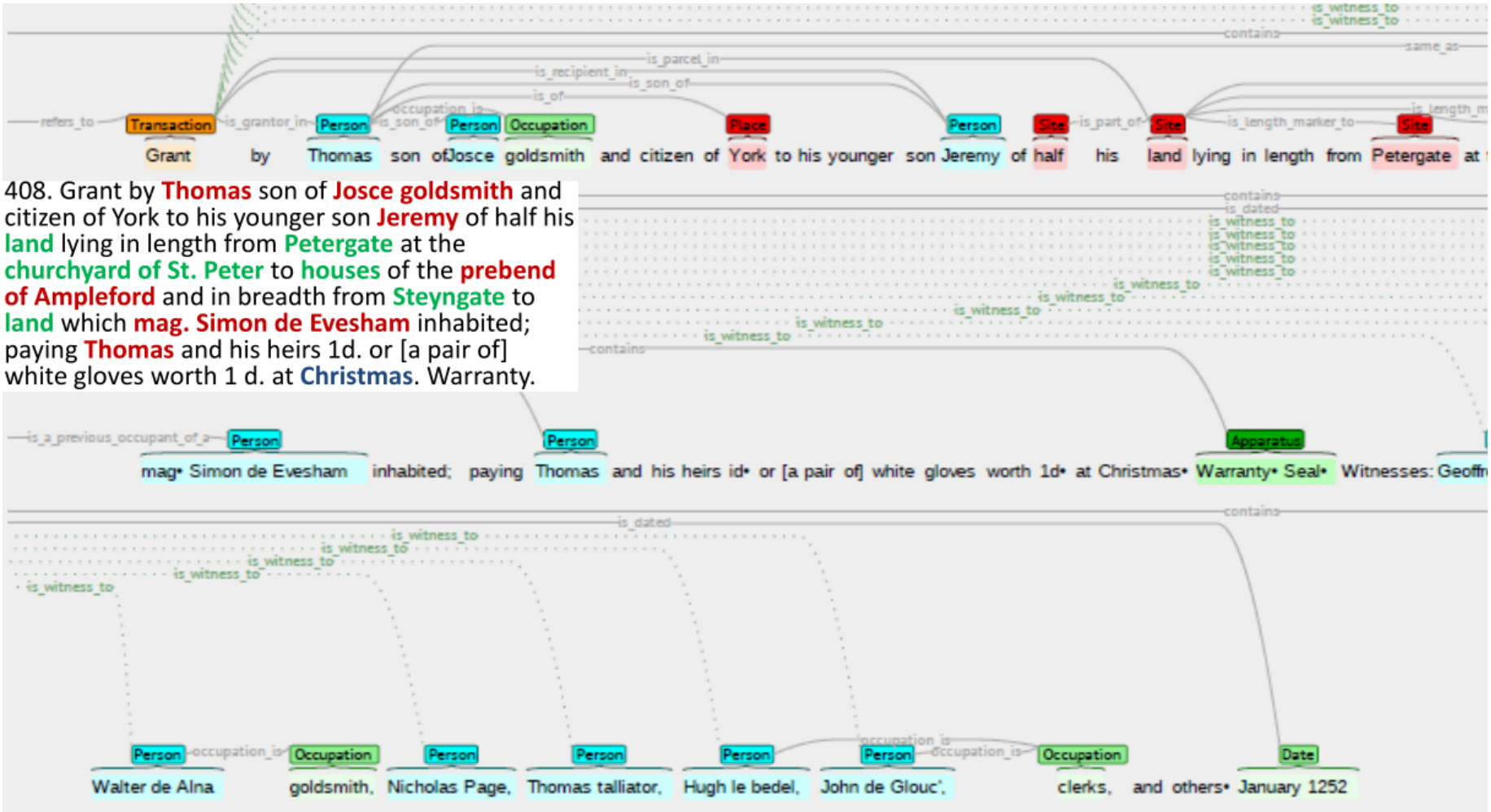
Vienna University of Technology (site, paper)

- Art History networks from Wikipedia, through VIAF id
- Time and nationality from ULAN



6.12 CHARTEX

NLP analysis of medieval **Charters** and Deeds. Funded by Digging Into Data cross-country SSH funding initiative. Visualized with BRAT



6.13 NUMISMATICS

My good friend Ethan Gruber at the American Numismatic Society has developed a host of amazing software that uses and produces LOD.

- Numishare: Data platform for coins/medals, 100k coin types
- Nomisma: Shared authorities for numismatics
- Kerameikos: Pottery LOD
- EADitor: EAD Editor: based on XML & XForms, uses/produces LOD
- xEAC: EAC/CPF Editor: based on XML & XForms, uses/produces LOD

6.13.1 COINS IN TIME AND SPACE

Spatiotemporal distribution of hoards containing a particular Roman Republican coin type. Below: examples of this type in partner collections

Date: 45 B.C.
Object Type: Coin
Manufacture: Struck
Denomination: Denarius
Material: Silver

Authority

Issuer: (Lollius) Palicanus

Geographic

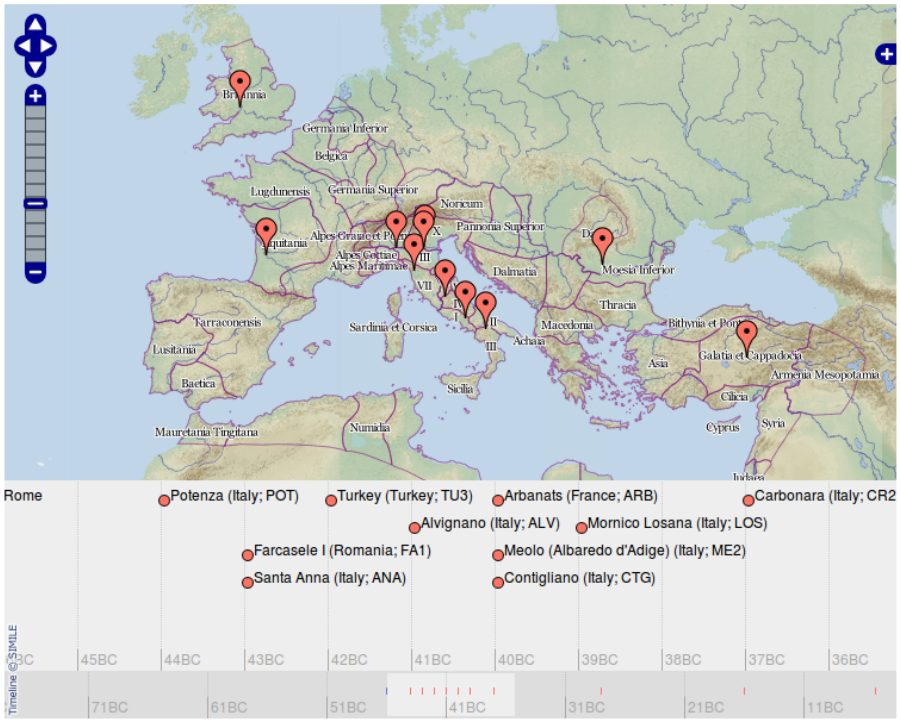
Mint: Rome

Obverse

Legend: LIBERTATIS
Type: Head of Libertas right. Border of dots.
Deity: Libertas

Reverse

Legend: PALIKANVS
Type: Rostra, on which stands subsellium (Tribune's bench) . Border of dots.



Legend Mint Findspot

View map in fullscreen.

Examples of this type

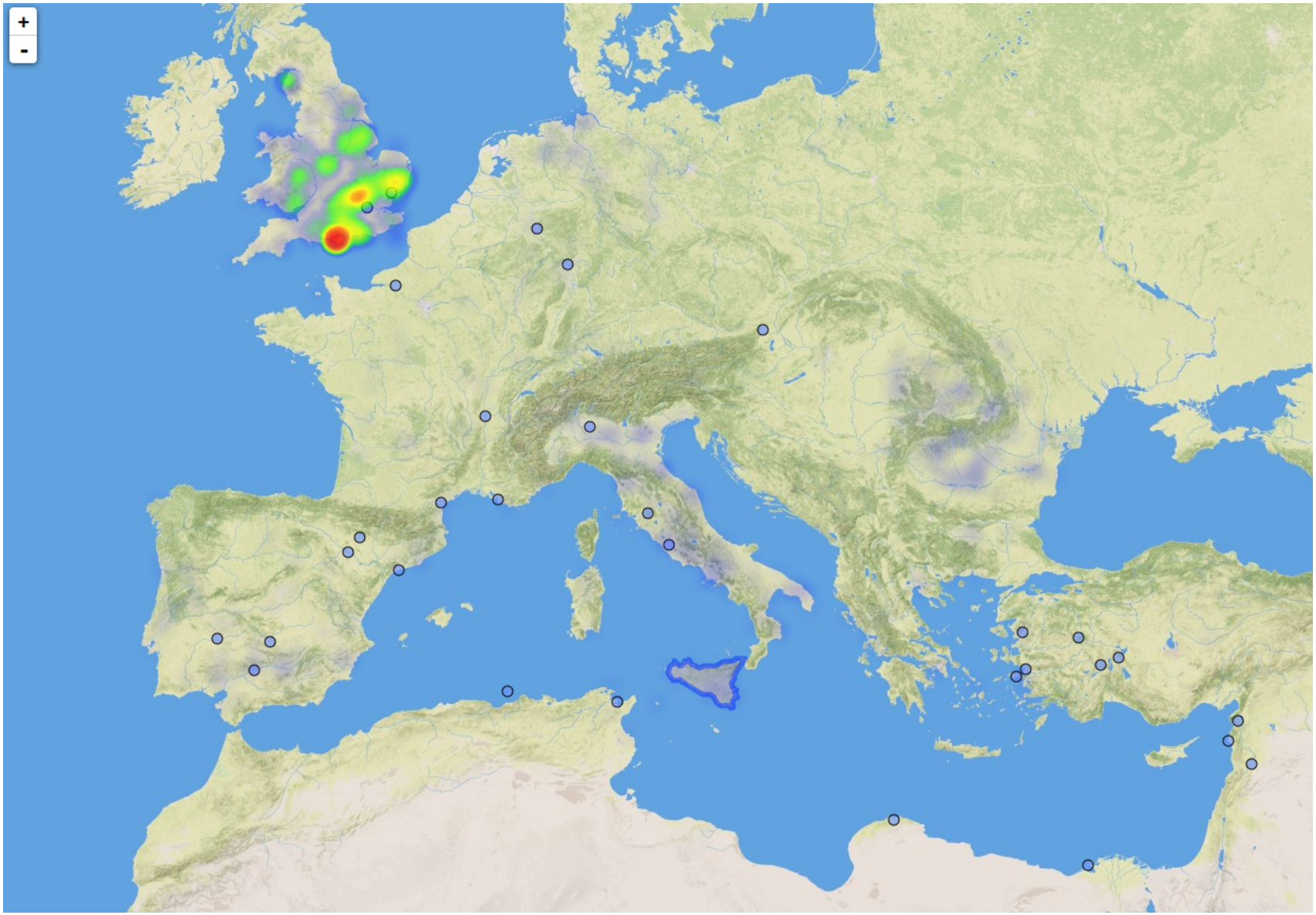
RRC 473/1. 1944.100.3528
Collection American Numismatic Society
Axis 12
Weight 3.87

RRC 473/1. 1937.158.281
Collection American Numismatic Society
Axis 4
Weight 3.81

RRC 473/1. 1937.158.282
Collection American Numismatic Society
Axis 4
Weight 3.81

6.13.2 GEOGRAPHIC DISTRIBUTION

Distribution of the Roman denarius: blue dots for mints, heatmap of finds (a lot in the UK Portable Antiquities Scheme)



6.13.3 NUMISHARE

Data platform with over 100k coin types. Powers custom collections, eg Art of Devastation: Medalic Art of the Great War

AoD 7513.7155.204

Examples of this type

Physical Description

Date on Object 1918

Typological Description

Date	1918
Legend (Obv.)	ENGLAND BEW -- EINT -- DAS -- RVSSENVOLK/ in field: 10./ JAN . 1918/ SOWJET. VOLKSRAT
Description (Obv.)	Male figure holding tissue on his face/ l. eye, to r.; behind him another male figure with broom to l. but head facing.
Legend (Rev.)	1914-/ ALLES . FVR . DEN GROSSEN . SCHLAG
Description (Rev.)	An elaborate pot filled with paper money and bonds, being held by two hands from above.
Mint	Munich
Artist	Goetz, Karl
Authority	German Empire

References

Reference Kienast.204

SubjectSet

Associated Subject	Soviet Russia
Associated Subject	United Kingdom
Associated Subject	Treaty of Brest-Litovsk

Map

Legend Mint Findspot

View map in fullscreen.

6.13.4 NOMISMA

Shared authorities for numismatics. Eg a mint:

nomisma.org Browse IDs APIs Documentation Ontology SPARQL Datasets Search

harpasa (nmo:Mint)

skos:prefLabel	Harpasa *(ca)*, Diecéze harpaská *(cs)*, Harpasa (Titularbistum) *(de)*, Ἅρπασα *(el)*, Harpasa *(en)*, Diocesi di Arpasa *(it)*
skos:definition	The mint at the ancient site of Harpasa in Caria. *(en)*
dcterms:isPartOf	http://nomisma.org/id/greek_numismatics
geo:location	http://nomisma.org/id/harpasa#this
rdf:type	skos:Concept
skos:broader	http://nomisma.org/id/caria
skos:closeMatch	http://collection.britishmuseum.org/id/place/x47008
skos:closeMatch	http://dbpedia.org/resource/Harpasa
skos:closeMatch	http://pleiades.stoa.org/places/599637
skos:closeMatch	http://vocab.getty.edu/tgn/7682854
skos:closeMatch	http://www.geonames.org/10109064
skos:closeMatch	https://www.freebase.com/m/0h5bvd
skos:closeMatch	https://www.wikidata.org/entity/Q1586010

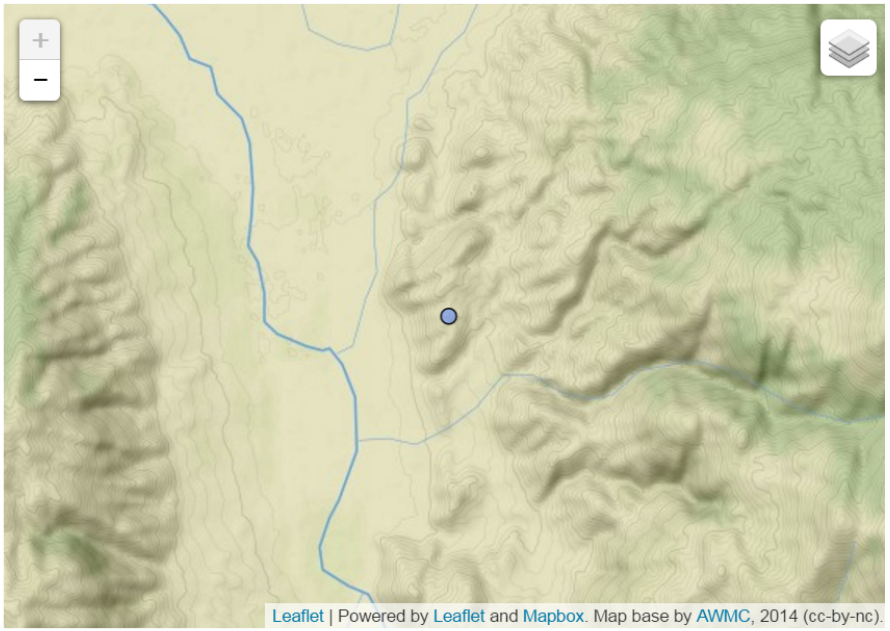
#this (geo:SpatialThing)

dcterms:isPartOf	http://nomisma.org/id/caria#this
geo:lat	37.796623
geo:long	28.362084

Export

Linked Data GitHub File RDF/XML RDF/TTL JSON-LD

Geographic Data KML geoJSON (mints) geoJSON (hoards) geoJSON (finds)



Mints Hoards Finds View fullscreen

6.13.5 COINHOARDS

- Greek coin data provided by CoinHoards.org
- Geo mapping data provided by nomisma.org
- Below: reference to the coin in an archival notebook (linked via OA)

Reverse: ΦΙΛΙΠΠΟΥ - Nude youth on horseback

Findspot Description

Source: http://coinhoards.org/id/igch0389

Map

Legend Mint Findspot

View map in fullscreen.

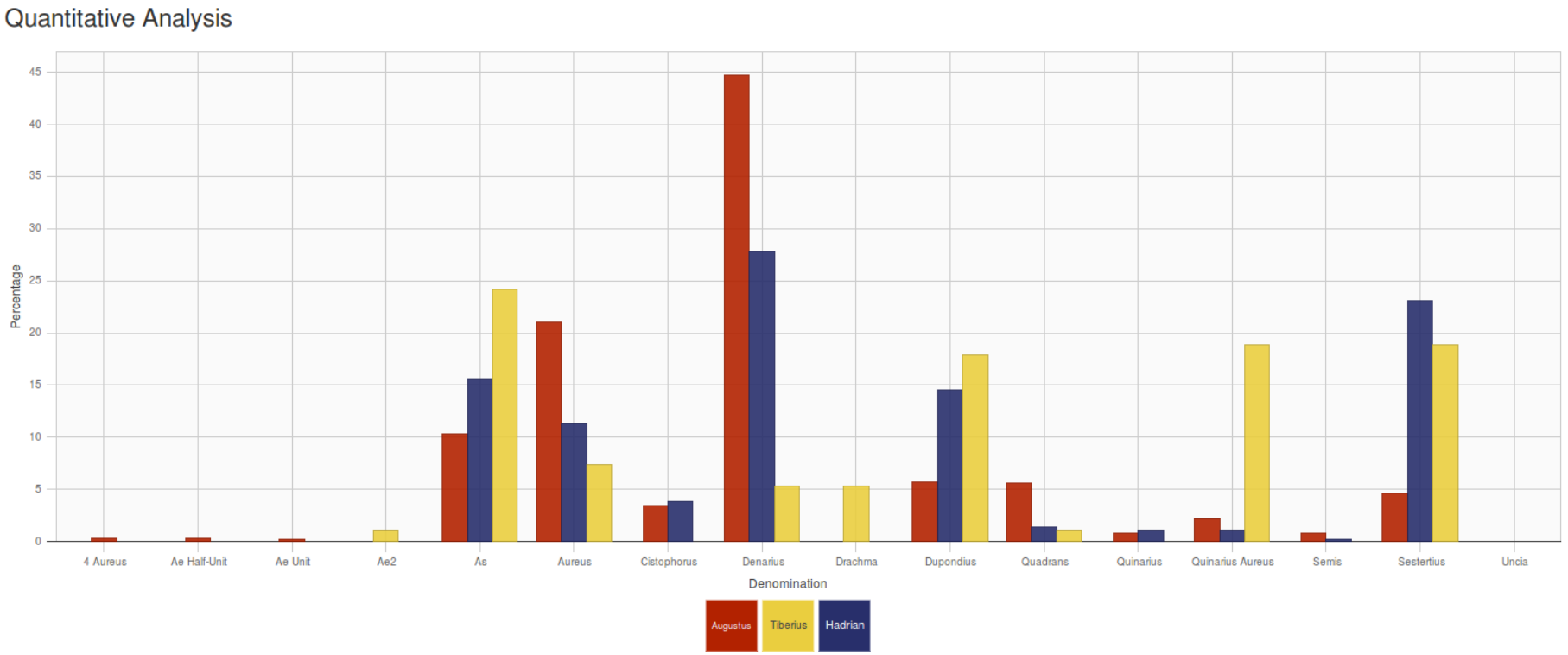
Annotations

1. Edward T. Newell hoard notebook, undated

Sections 178
Creator Newell, Edward Theodore, 1886-1941
Abstract Notebook containing notes on coins of various hoards, along with loose leaves with additional coin lists, notes, and rubbings. A detached label once adhered to the cover of the album reads, "HOARDS II." Includes a letter to Margaret Thompson from Martin Price of the British Museum relating to a joint project on the coins of Alexander the Great (1968). Hoards covered in the notebook are Sardis, Anadol, Aleppo, Ankyra, Aintab, Andhritsena, Abu Hommos, Taranto, Bithynian, Demanhur, Chalcis (Eretria), Calabria, Constantinople, Cyprus (Larnaka), Peloponessos, Drama, Greece (Tiffany), Eretria, Epidaurus, Sparta, Patras, Gesou, Haiffa, Prof. Haynes, Saida, Jandolo, Anadol, Kuft, Kyparissia, Keleler, Karditsa, Messene, Larnaka, Lamia, Latakie, Mosul, Marasesti, Patras, Parthian, Philip II Staters, Ravel, Salonica, Sophikon, Taranto, Tripolitsa, Thebes, Urfa, Gejou, Lamia, and Kyparissia.

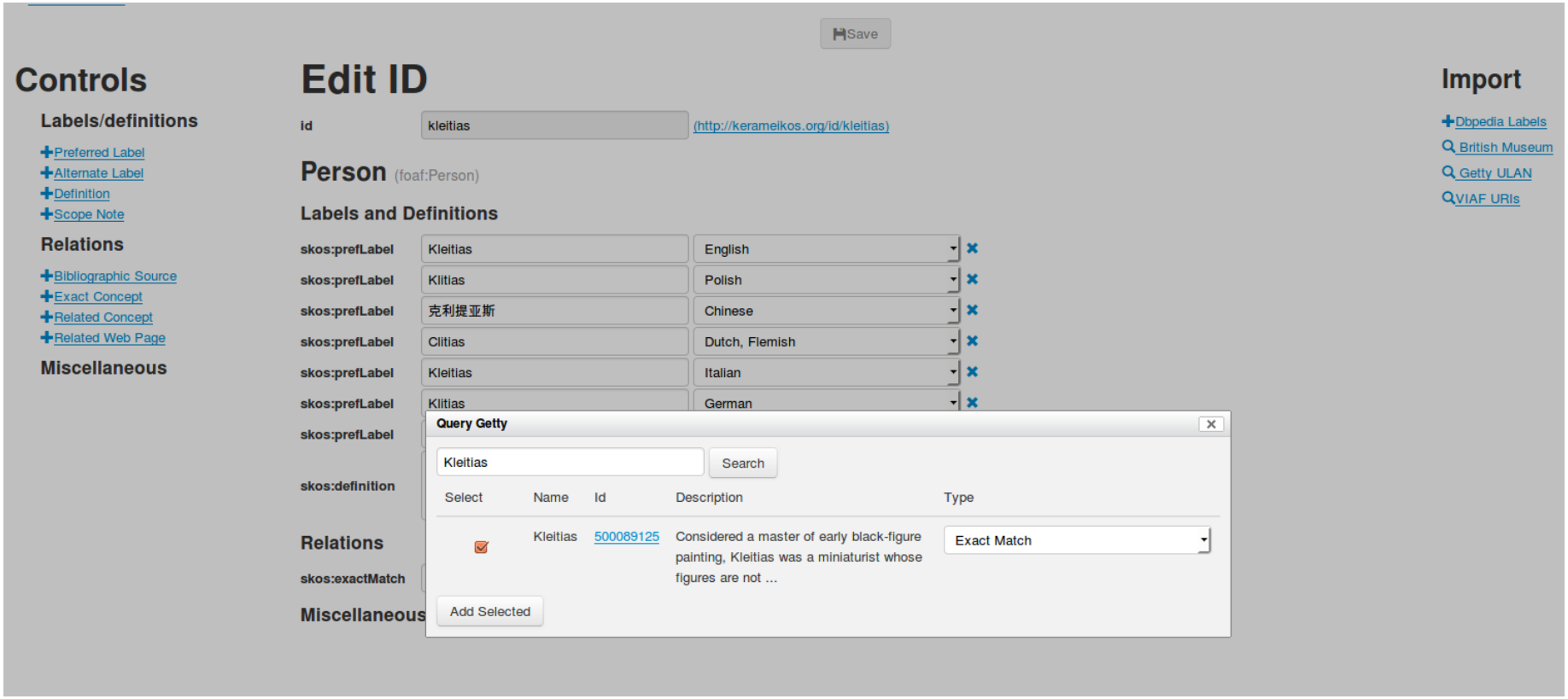
6.13.6 STATISTICAL CHARTS

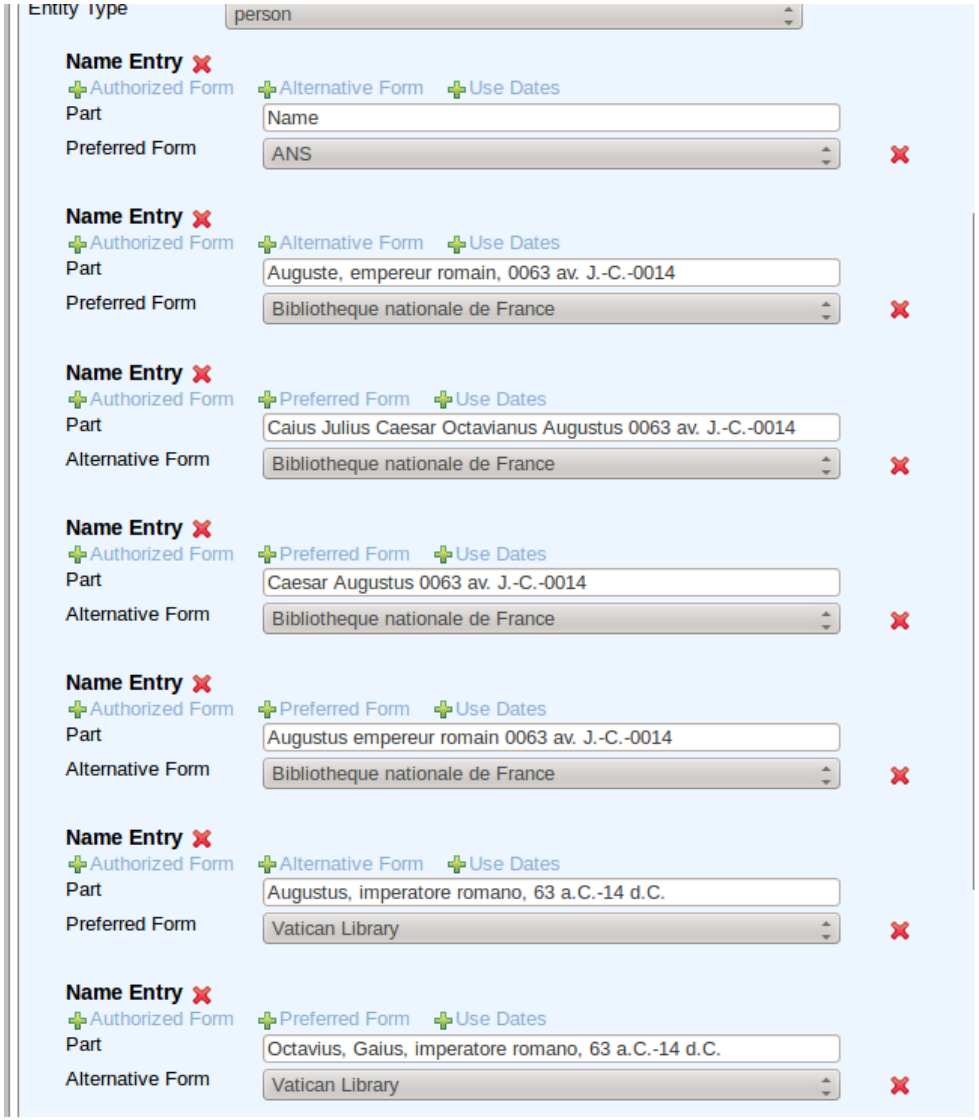
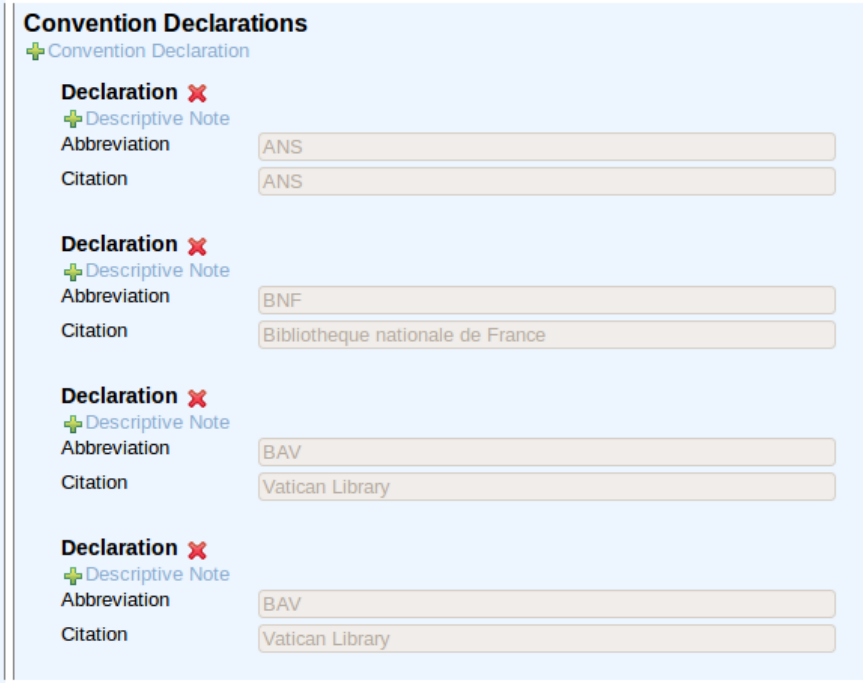
Denominations issued by Augustus, Tiberius… rendered in a chart using d3js



6.13.7 KERAMEIKOS: POTTERY LOD

Kerameikos Project editor. Based on XForms, leverages Getty and BM LOD



6.13.8 EADITOR AND XEAC

Blog, Wiki. Based on XForms. Leverages the Getty thesauri and VIAF, imports data as needed