A Semantic Multimedia Web: Create, Annotate, Present and Share your Media

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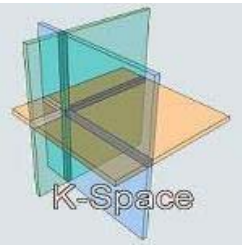
CWI, Semantic Media Interfaces



Learning Objectives

- Understand multimedia applications workflow
  - Take the canonical processes of media production model
- Explore various multimedia metadata formats
  - Be aware of the advantages and limitations of various models
  - Know the interoperability issues and understand COMM, a Core Ontology for Multimedia
- Discuss exploratory interfaces based on rich multimedia metadata semantics
  - Know how to link and expose your data on the web
  - See various multimedia presentation interfaces

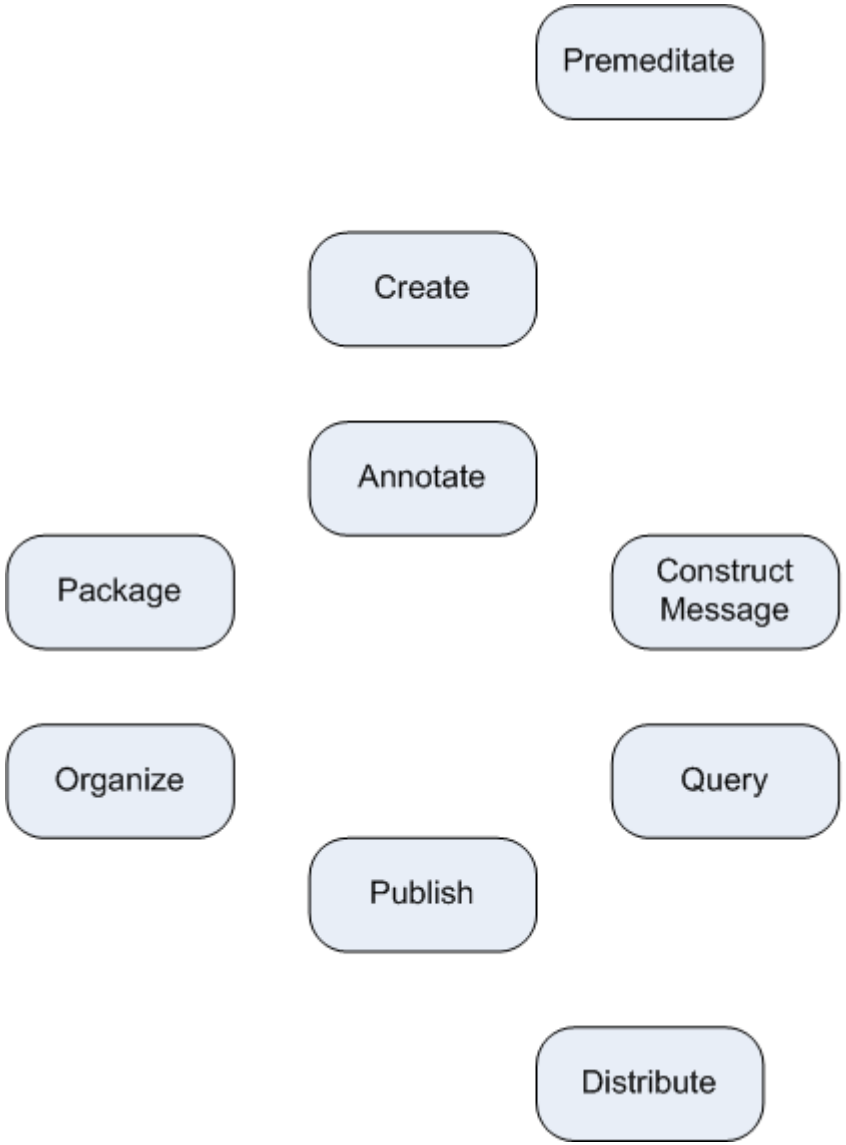
Agenda

1. Understanding Multimedia Applications Workflow
   - CeWe Color Photo Book creation application
   - Vox Populi argumentation-based video sequences generation
   - *Canonical Processes of Media Production*
2. Semantic Annotation of Multimedia Content
   - Multimedia metadata formats: use cases and requirements
   - Multimedia metadata interoperability issues
   - MPEG-7 based ontologies
   - *COMM: A Core Ontology for MultiMedia*
3. Semantic Search and Presentation of Multimedia Content
   - Link your data!
   - *Searching and Browsing Multimedia Semantic Datasets with Cliopatria*

Understanding Multimedia Applications Workflow

- Identify and define a number of canonical processes of media production
- Community effort
  - 2005: Dagstuhl seminar
  - 2005: ACM MM Workshop on *Multimedia for Human Communication*
  - 2008: Multimedia Systems Journal Special Issue (core model and companion system papers)
    editors: Frank Nack, Zeljko Obrenovic and Lynda Hardman

Overview of Canonical Processes



Example 1: CeWe Color PhotoBook

- Application for authoring digital photo books
- Automatic selection, sorting and ordering of photos
  - Context analysis methods: timestamp, annotation, etc.
  - Content analysis methods: color histograms, edge detection, etc.
- Customized layout and background
- Print by the European leader photo finisher company

http://www.cewe-photobook.com

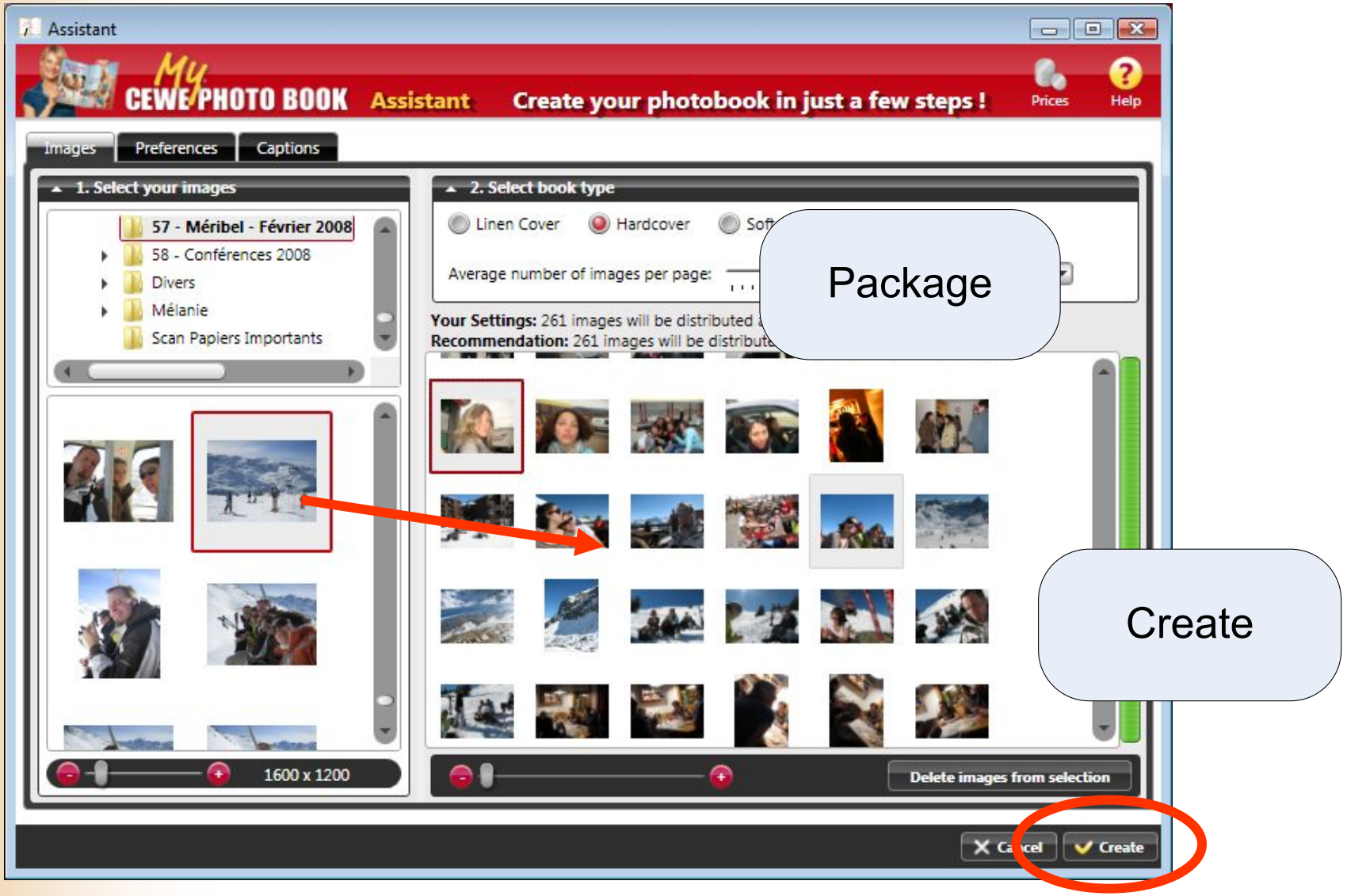
CeWe Color PhotoBook Processes

- My winter ski holidays with my friends
- 

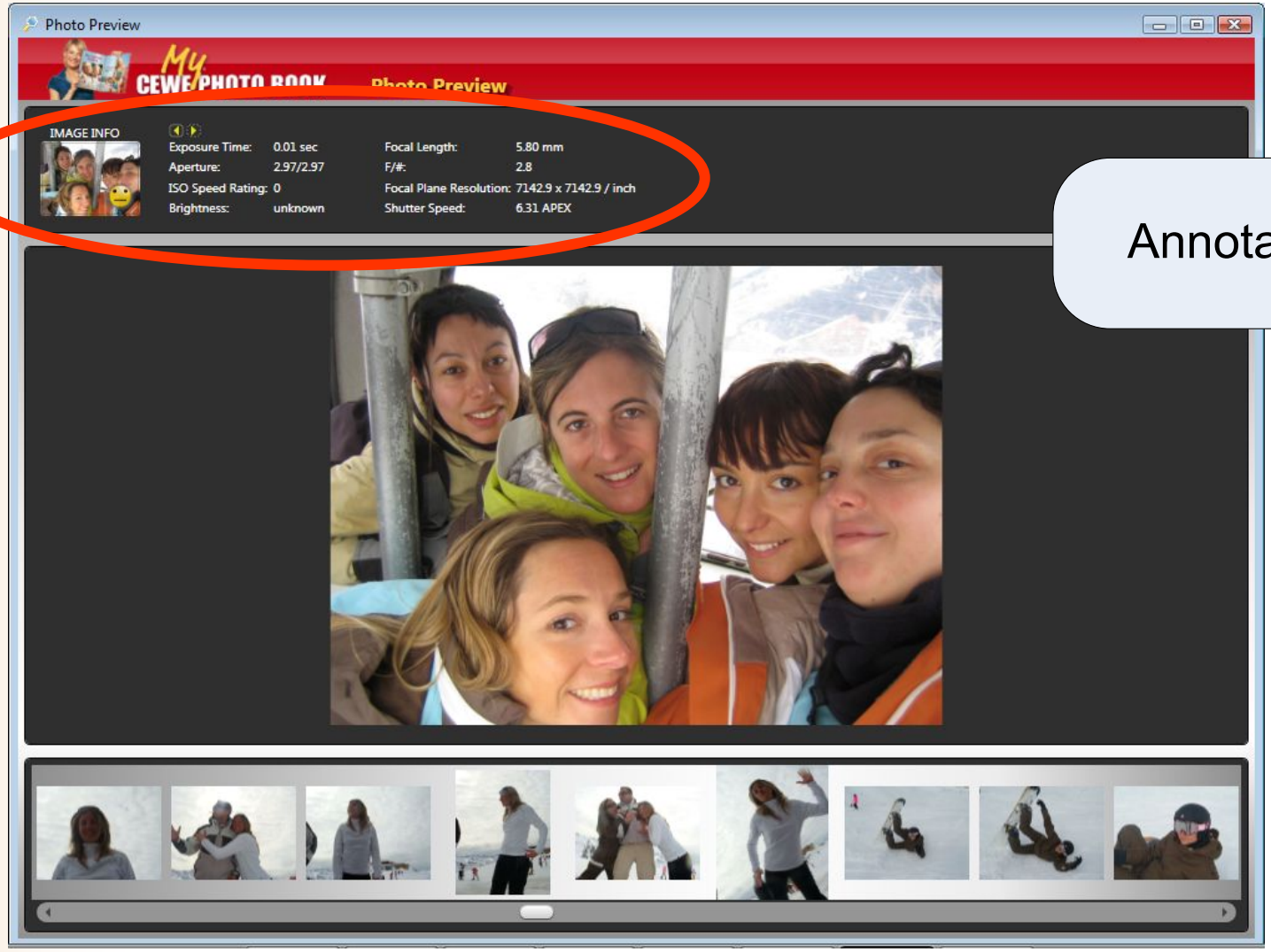
Premeditate

Construct Message

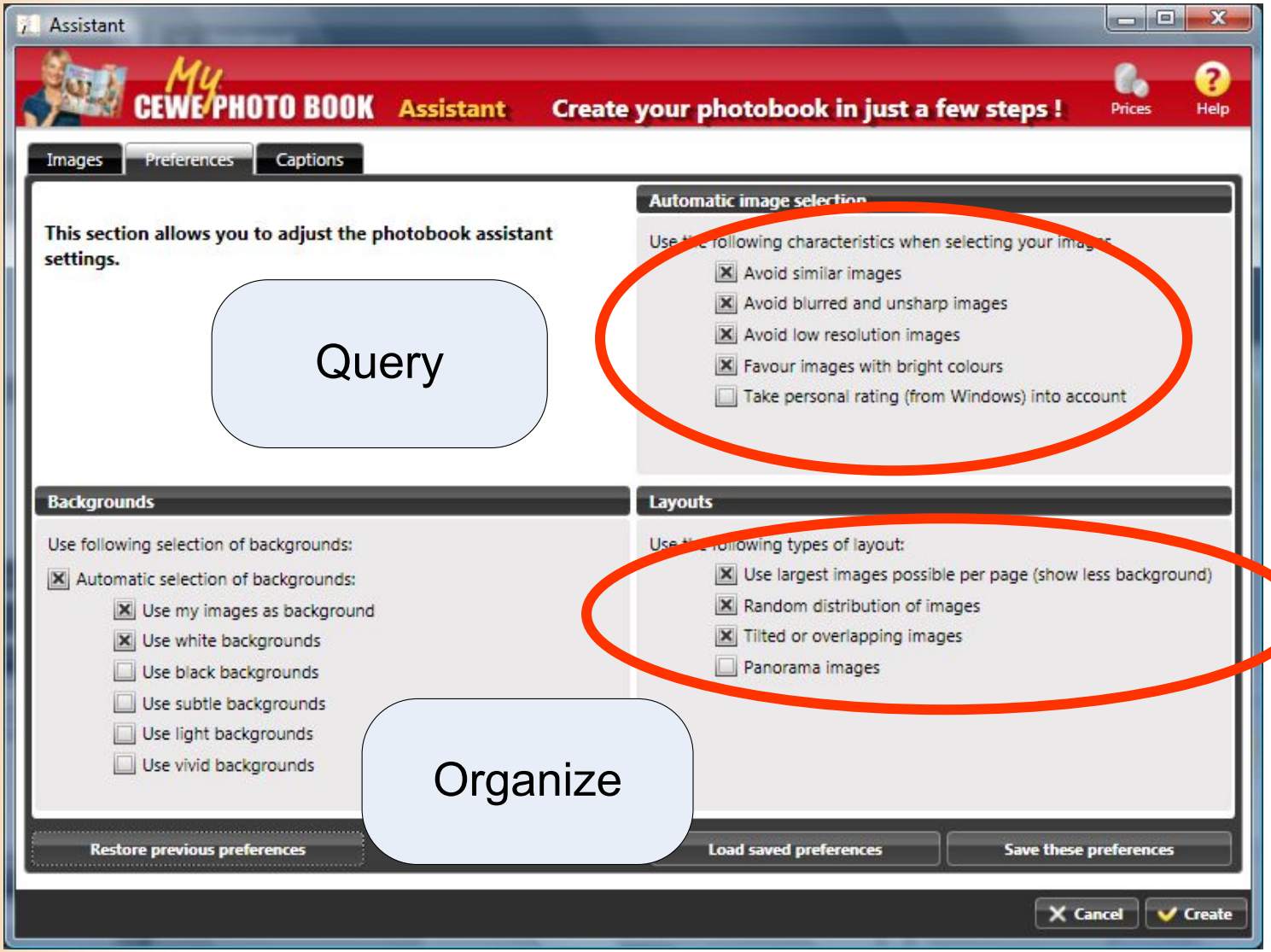
CeWe Color PhotoBook Processes

- 

CeWe Color PhotoBook Processes

- 

CeWe Color PhotoBook Processes

- 

CeWe Color PhotoBook Processes

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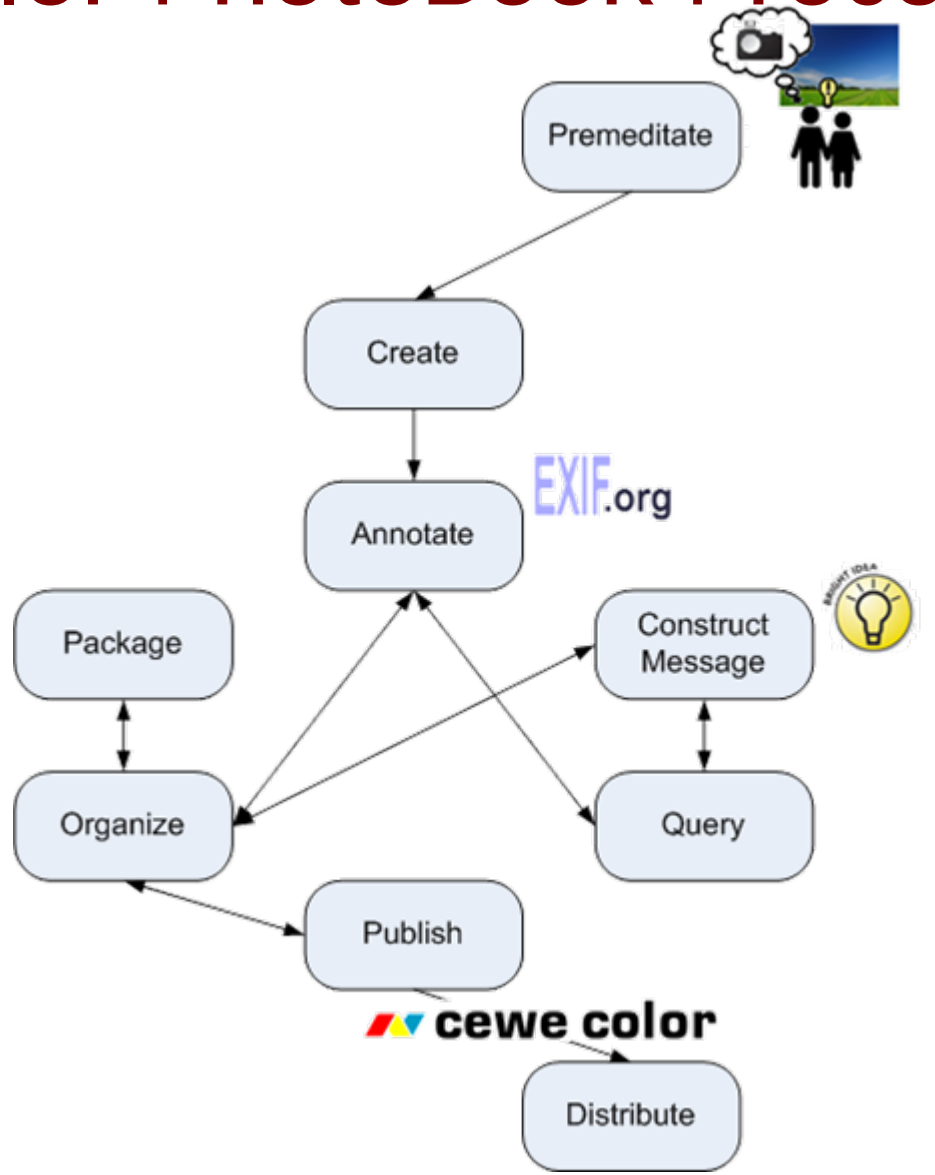
CeWe Color PhotoBook Processes



Example 2: Vox Populi Video Sequences Generation

Stefano Bocconi, Frank Nack

- **Interview with America**
  video footage with interviews and background material about the opinion of American people after 9-11
  http://www.interviewwithamerica.com
- Example question:
  What do you think of the war in Afghanistan?

"I am never a fan of military action, in the big picture I don't think it is ever a good thing, but I think there are circumstances in which I certainly can't think of a more effective way to counter this sort of thing…"

Vox Populi Premeditate Process

- Analogous to the pre-production process in the film industry
  - *Static* versus *dynamic* video artifact
- Output
  - Script, planning of the videos to be captured
  - Questions to the interviewee prepared
  - Profiles of the people interviewed: education, age, gender, race
  - Locations where the interviews take place

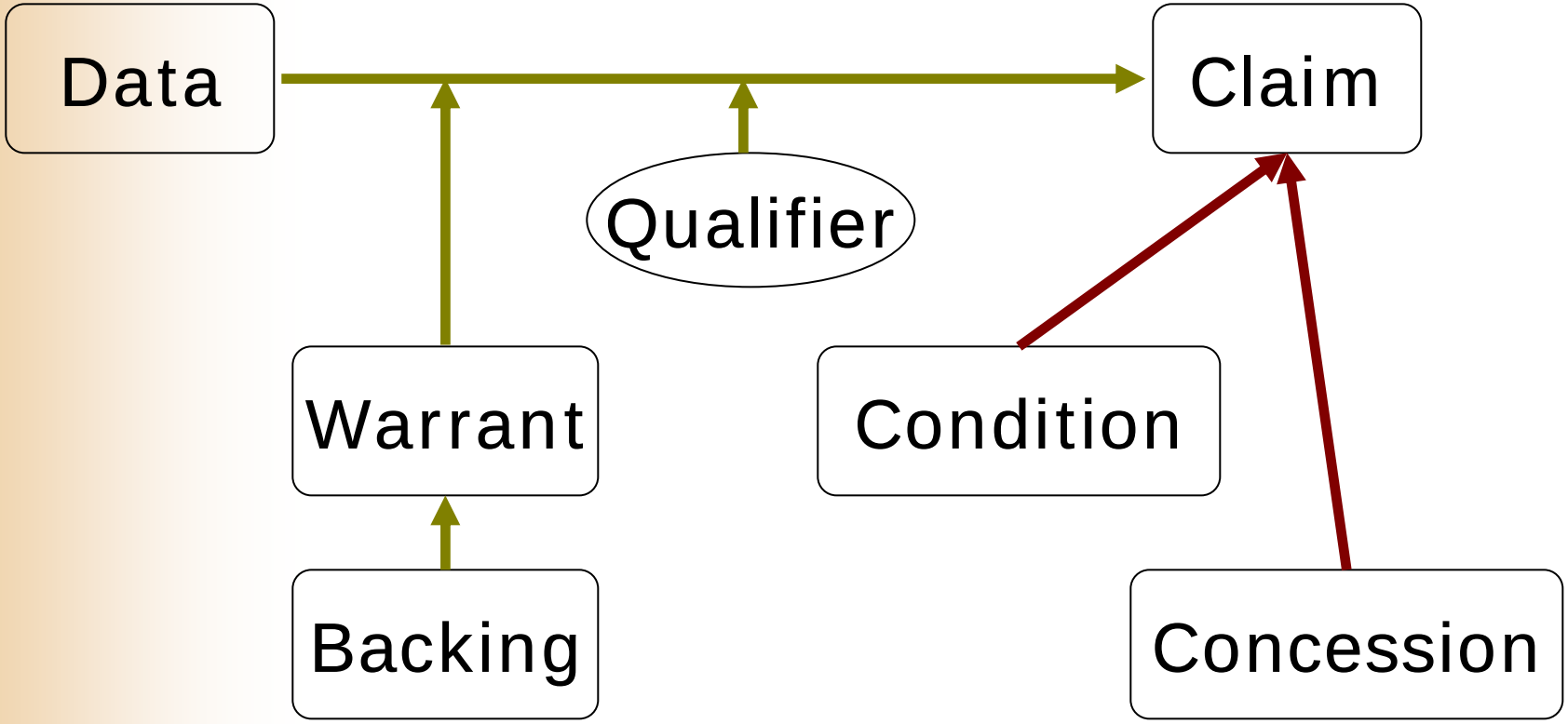
Vox Populi Annotations

- Contextual
  - Interviewee (social), locations
- Descriptive
  - Question asked and transcription of the answers
  - Filmic continuity, examples:
    - gaze direction of speaker (left, centre, right)
    - framing (close-up, medium shot, long shot)
- Rhetorical
  - Rhetorical Statement
  - Argumentation model: Toulmin model

Vox Populi Statement Annotations

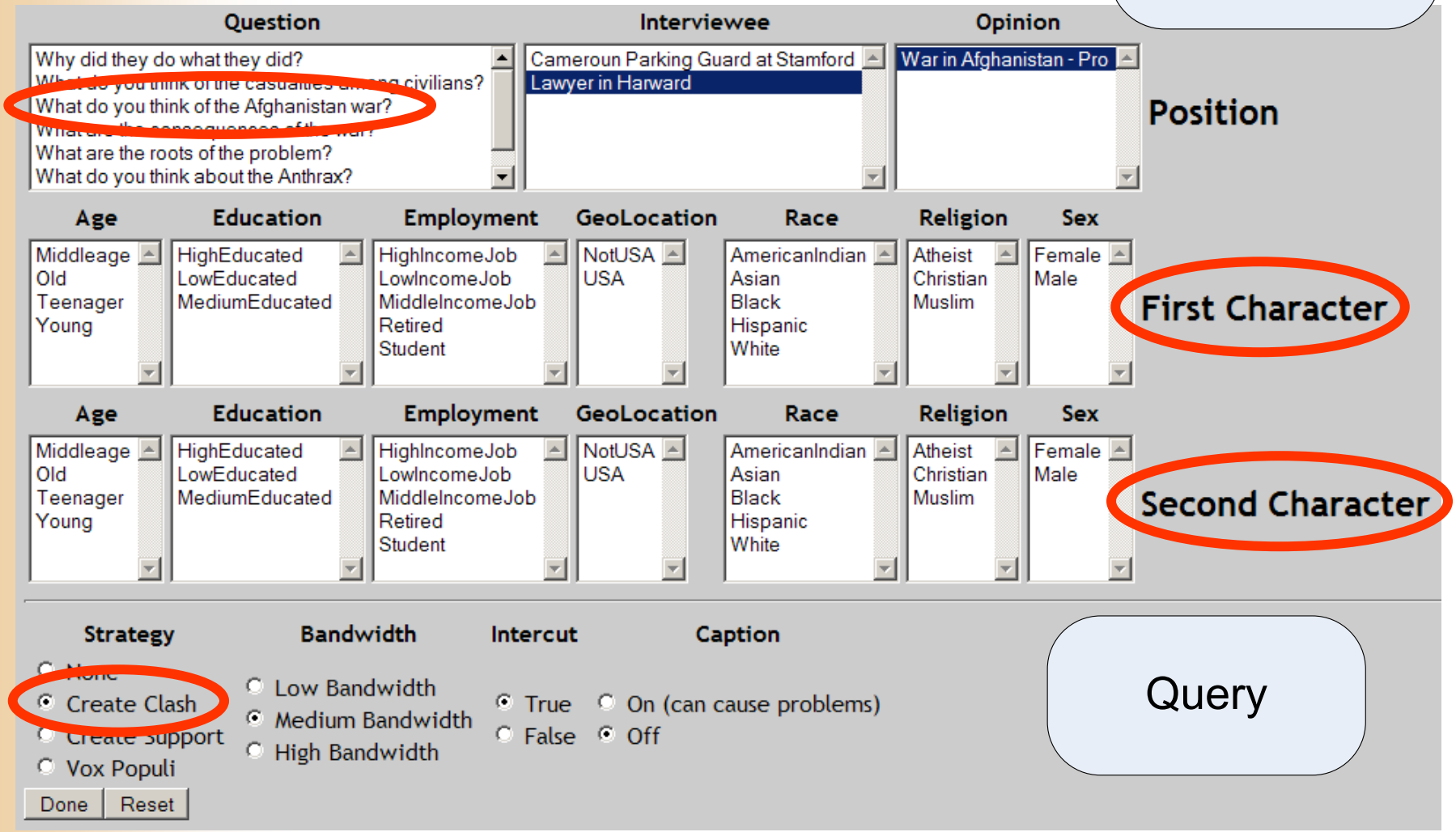
- Statement formally annotated:
  - <subject> <modifier> <predicate>
  - E.g. "**war best solution**"
- A thesaurus containing:
  - Terms on the topics discussed (155)
  - Relations between terms: *similar* (72), *opposite* (108), *generalization* (10), *specialization* (10)
  - E.g. **war** *opposite* **diplomacy**

Toulmin Model



57 Claims, 16 Data, 4 Concessions,
3 Warrants, 1 Condition

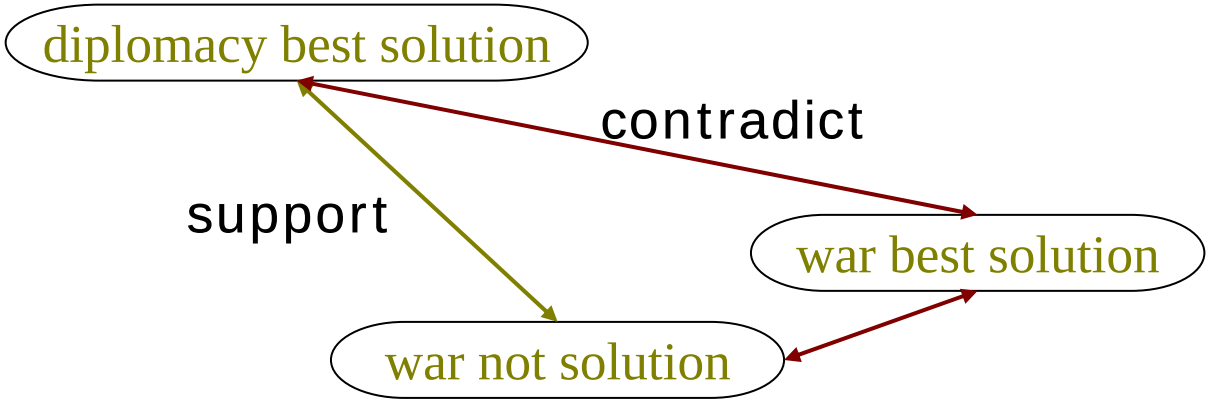
Vox Populi Query Interface



Vox Populi Organize Process

- Using the thesaurus, create a graph of related statements
  - nodes are the statements (corresponding to video segments)
    "*war best solution*",
    "*diplomacy best solution*",
    "*war not solution*"
  - edges are either *support* or *contradict*

Organize



Result of Vox Populi Query

I am not a fan of military actions

I cannot think of a more effective solution

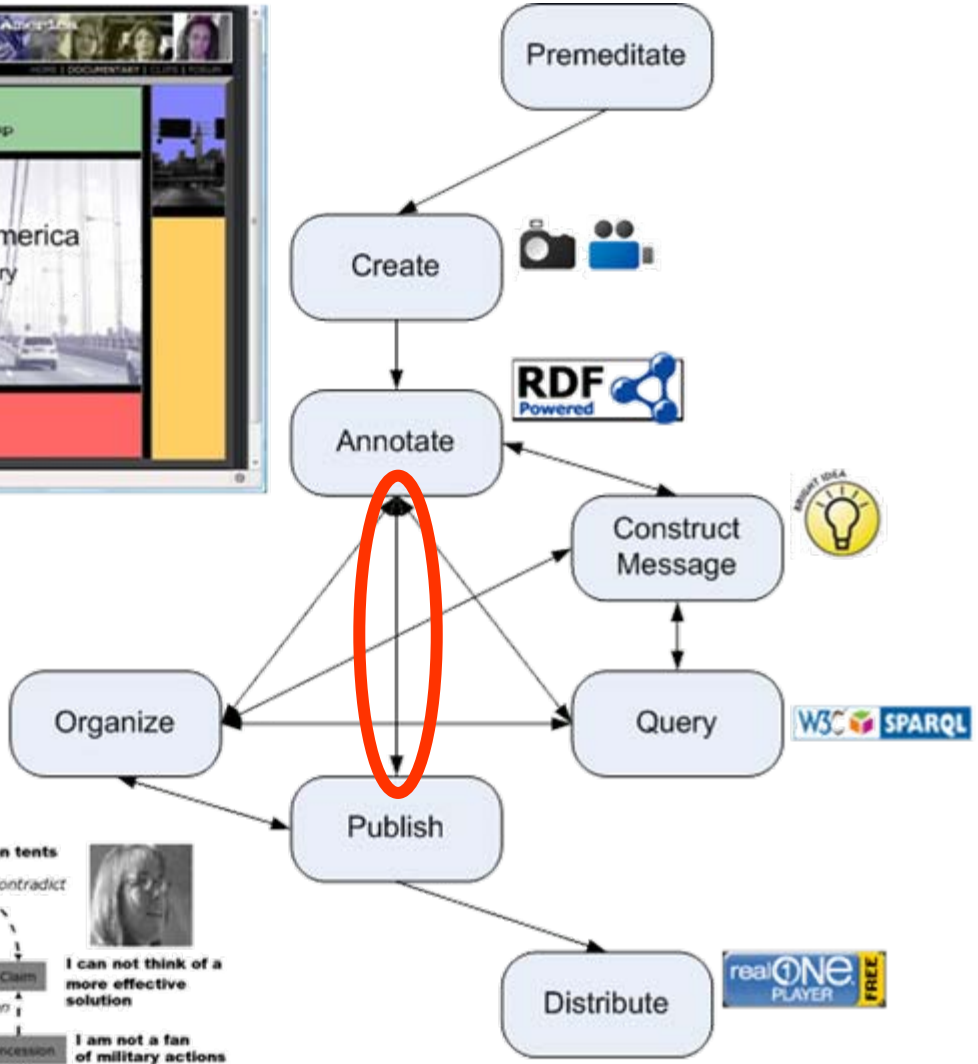
Publish

Distribute

War has never solved anything

Two billions dollar bombs on tents

Vox Populi Processes



Canonical Processes 101

- Canonical: reduced to the simplest and most significant form possible without loss of generality
- Each process
  - short description
  - illustrated with use cases
  - input(s), actor(s) & output(s)
- Formalization of processes in UML diagrams in paper (see literature list)

Premeditate

- Establish initial ideas about media production
  - *Design a photo book of my last holidays for my family*
  - *Create argument-based sequences of videos of interviews after September 11*
- Inputs: ideas, inspirations from human experience
- Actors:
  - camera owner
  - group of friends
- Outputs:
  - decision to take camera onto ski-slope
  - structured set of questions and locations for interviews

Create Media Asset

- Media assets are captured, generated or transformed
  - Photos taken at unspecified moments at holiday locations
  - Synchronized audio video of interviewees responding to fixed questions at many locations
- Inputs:
  - decision to take camera onto ski-slope;
  - structured set of questions and locations for interviews
- Actors:
  - (video) camera, editing suite
- Outputs:
  - images, videos

Annotate

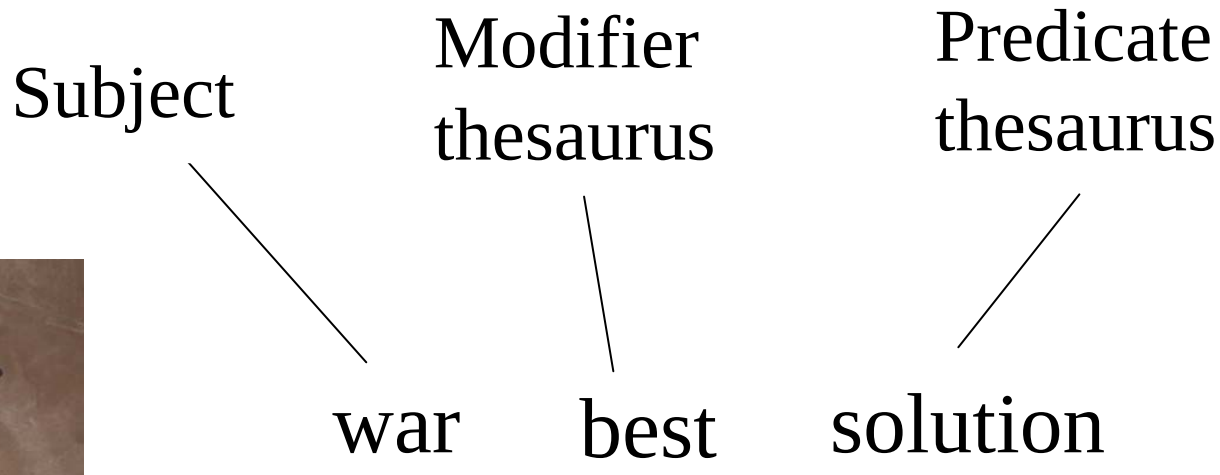
- Annotation is associated with asset
- Inputs:
  - photo, video, existing annotation
  - optional thesaurus of terms
- Actors:
  - human, feature analysis program
- Outputs:
  - Complex structure associating annotations with images, videos

Q: “What do you think of the Afghanistan war?”

Speaker: Female, Caucasian...

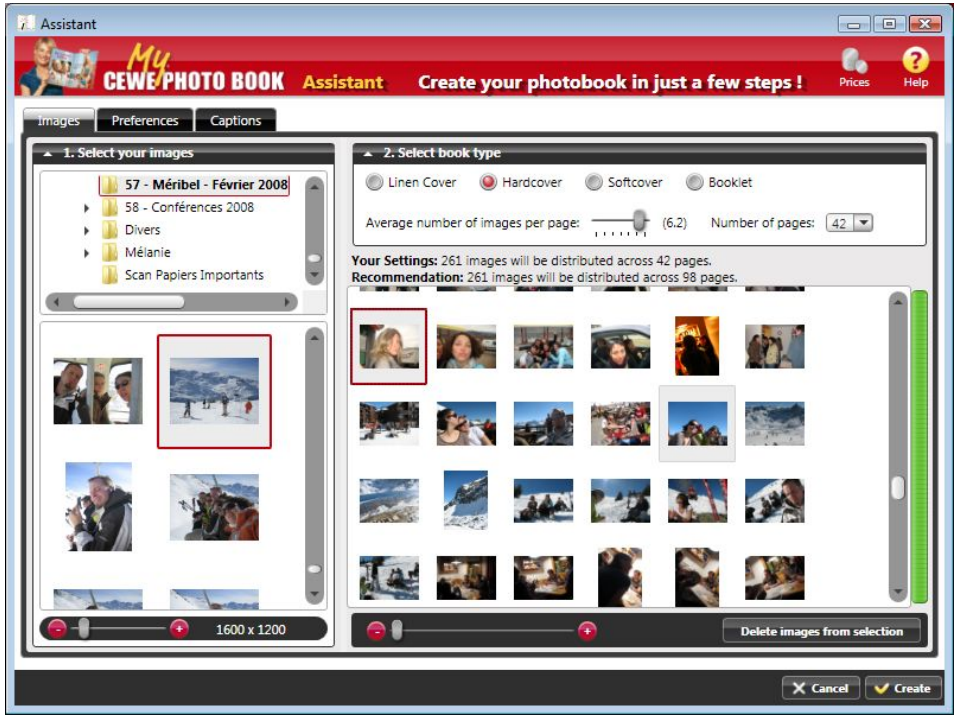
Semantic Annotate

- Annotation uses existing controlled vocabularies
  - *Subject matter annotations of your photos (COMM, XMP)*
  - *Rhetorical annotations in Vox Populi*



Package

- Process artifacts are packed logically or physically
- Useful for storing collections of media after capturing...
- ... before selecting subset for further stages



Query

- User retrieves a set of process artifacts based on a user-specified query
- Inputs:
  - user query, in terms of annotations or by example
  - collection(s) of assets
- Actors:
  - human
- Output:
  - subset of assets plus annotations (in no order)

Construct Message

- Author specifies the message they wish to convey
  - *Our holiday was sporty, great weather and fun*
  - *Create clash about whether war is a good thing*
- Inputs: ideas, decisions, available assets
- Actors:
  - author
- Outputs:
  - the message that should be conveyed by the assets

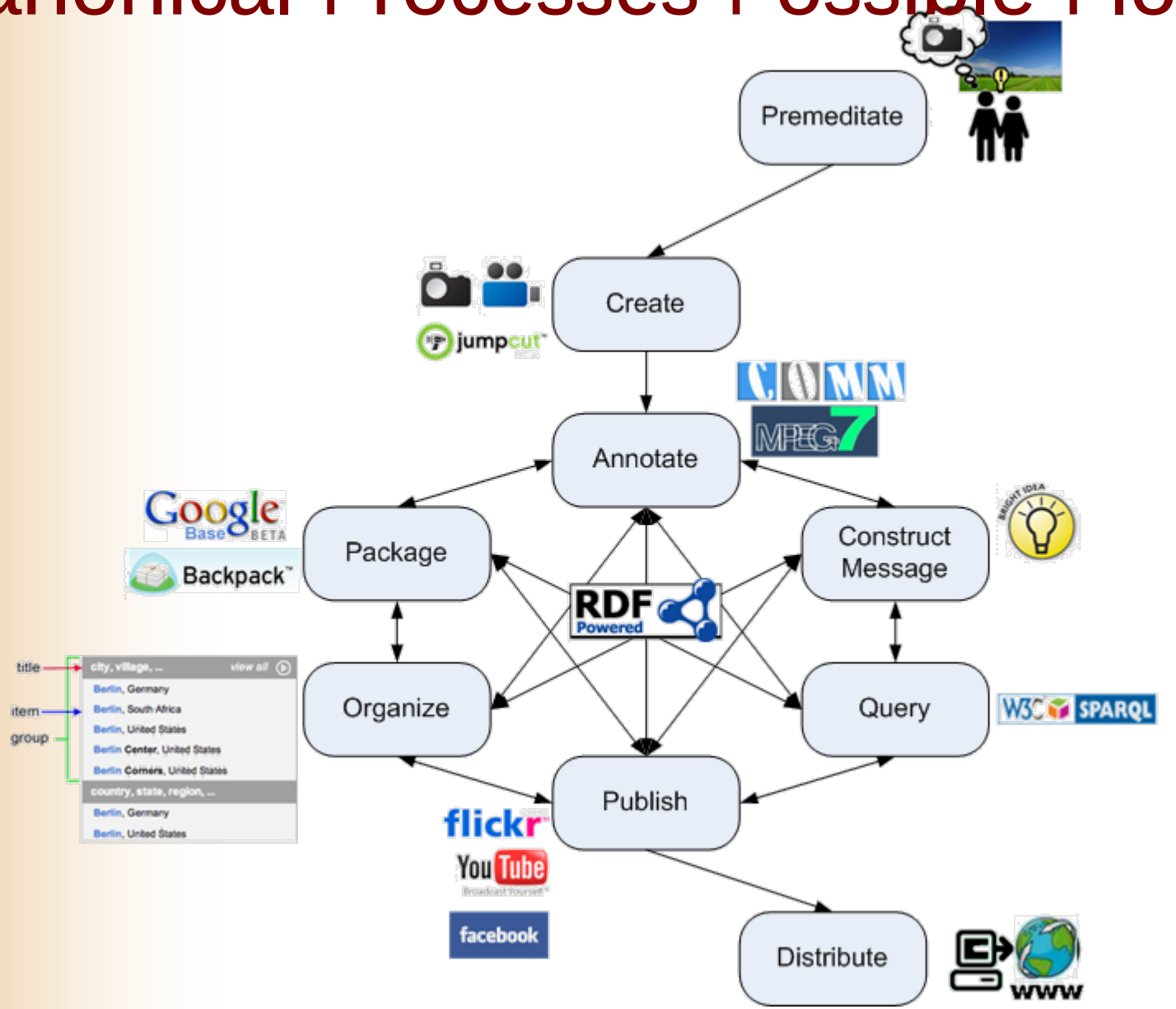
Organize

- Process where process artifacts are organized according to the message
  - *Organize a number of 2-page layouts in a photobook*
  - *Use semantic graph to select related video clips to form linear presentation of parts of argument structure*
- Inputs: set of assets and annotations (e.g. output from query process)
- Actors:
  - human or machine
- Outputs:
  - document structure with recommended groupings and orderings for assets

Publish and Distribute

- Process where final content and user interface is created
- Process where final interaction between end-users and produced media occurs
  - *Ship the photobook to your home address*
  - *Get the online version of a personalized documentary*

Canonical Processes Possible Flow

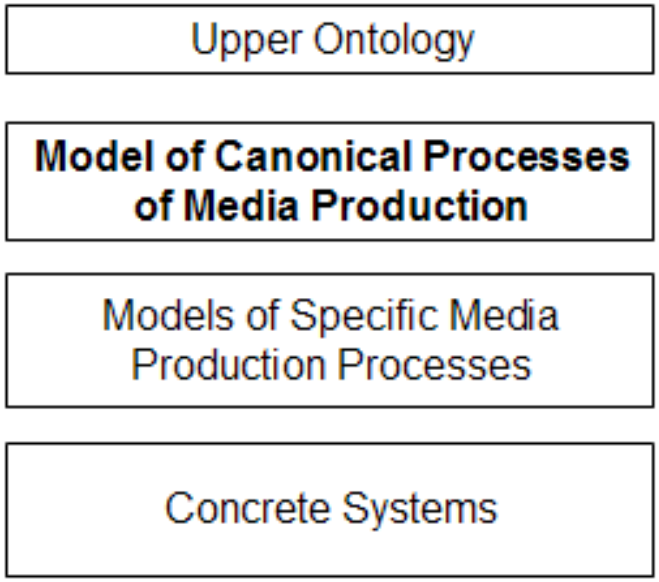


Sum Up

- Community agreement, not “yet another model”
- Large proportion of the functionality provided by multimedia applications can be described in terms of this model
- Initial step towards the definition of open web-based data structures for describing and sharing semantically annotated media assets

Discussion

- Frequently asked questions
  - Complex processes
  - Interaction
  - Complex artifacts and annotations can be annotated
- Towards a more rigorous formalization of model
  - Relationship to foundational ontologies
  - Semantics of Annotations



Literature

- Lynda Hardman: *Canonical Processes of Media Production*. In Proceedings of the ACM Workshop on Multimedia for Human Communication - From Capture to Convey (MHC 05), November 2005.
- Special Issue on Canonical Processes of Media Production http://www.springerlink.com/content/j0l4g337581652t1/ http://www.cwi.nl/~media/projects/canonical/
- Lynda Hardman, Zeljko Obrenovic, Frank Nack, Brigitte Kerhervé and Kurt Piersol: *Canonical Processes of Semantically Annotated Media Production*. In Multimedia Systems Journal, 2008 (*to appear*)
- Philipp Sandhaus, Sabine Thieme and Susanne Boll: *Canonical Processes in Photo Book Production*. In Multimedia Systems Journal, 2008 (*to appear*)
- Stefano Bocconi, Frank Nack and Lynda Hardman: *Automatic generation of matter-of-opinion video documentaries*. In Journal of Web Semantics, 6(2), p139-150, 2008.

Agenda

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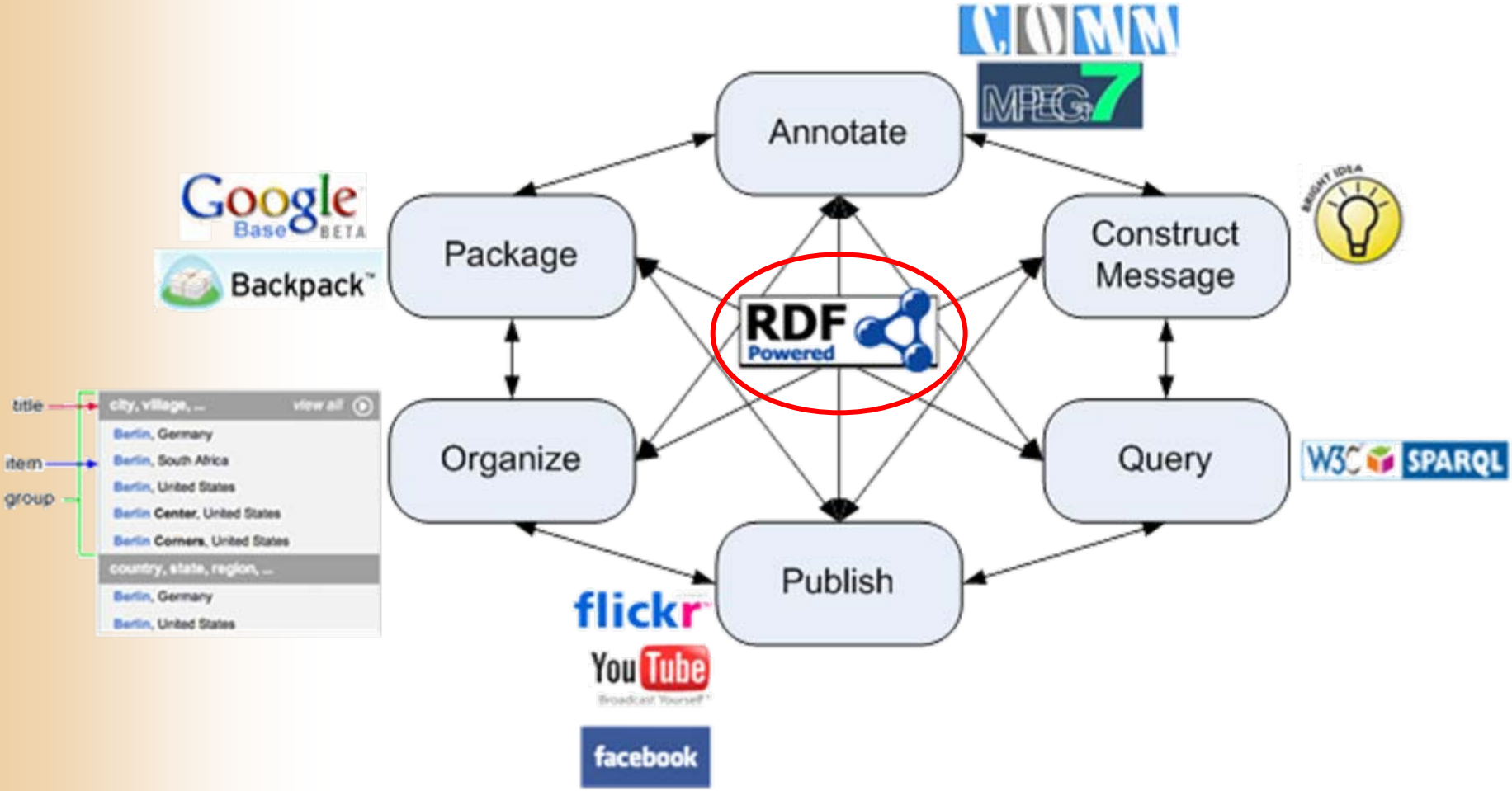
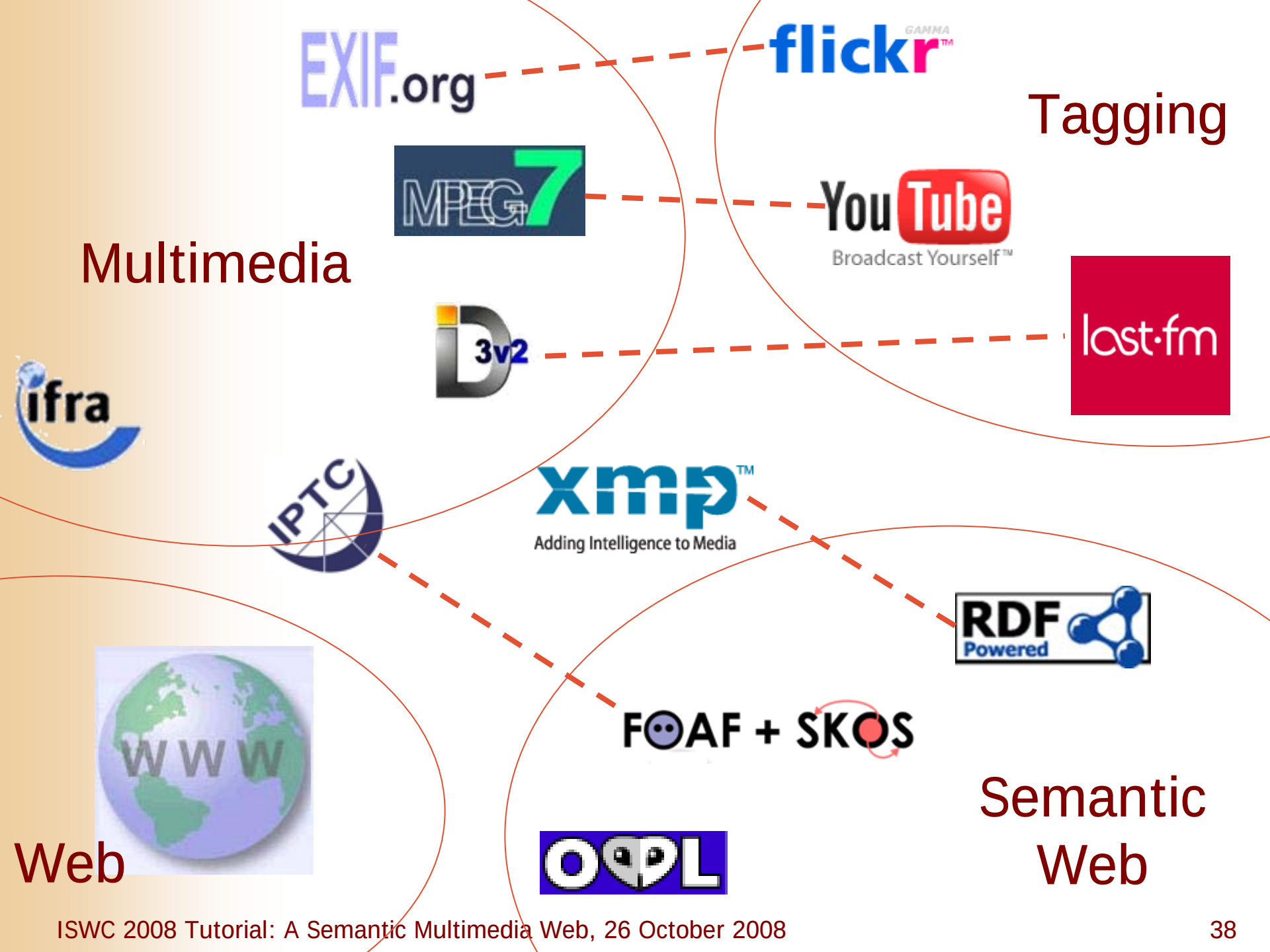
   - CeWe Color Photo Book creation application
   - Vox Populi argumentative video sequences generation system
   - *The Canonical Processes of Media Production*
2. Semantic Annotation of Multimedia Content
   - Multimedia metadata formats: use cases and requirements
   - Multimedia metadata interoperability issues
   - MPEG-7 based ontologies
   - *COMM: A Core Ontology for MultiMedia*
3. Semantic Search and Presentation of Multimedia Content
   - Link your data!
   - *Searching and Browsing Multimedia Semantic Datasets with Cliopatria*

The Importance of the Annotations

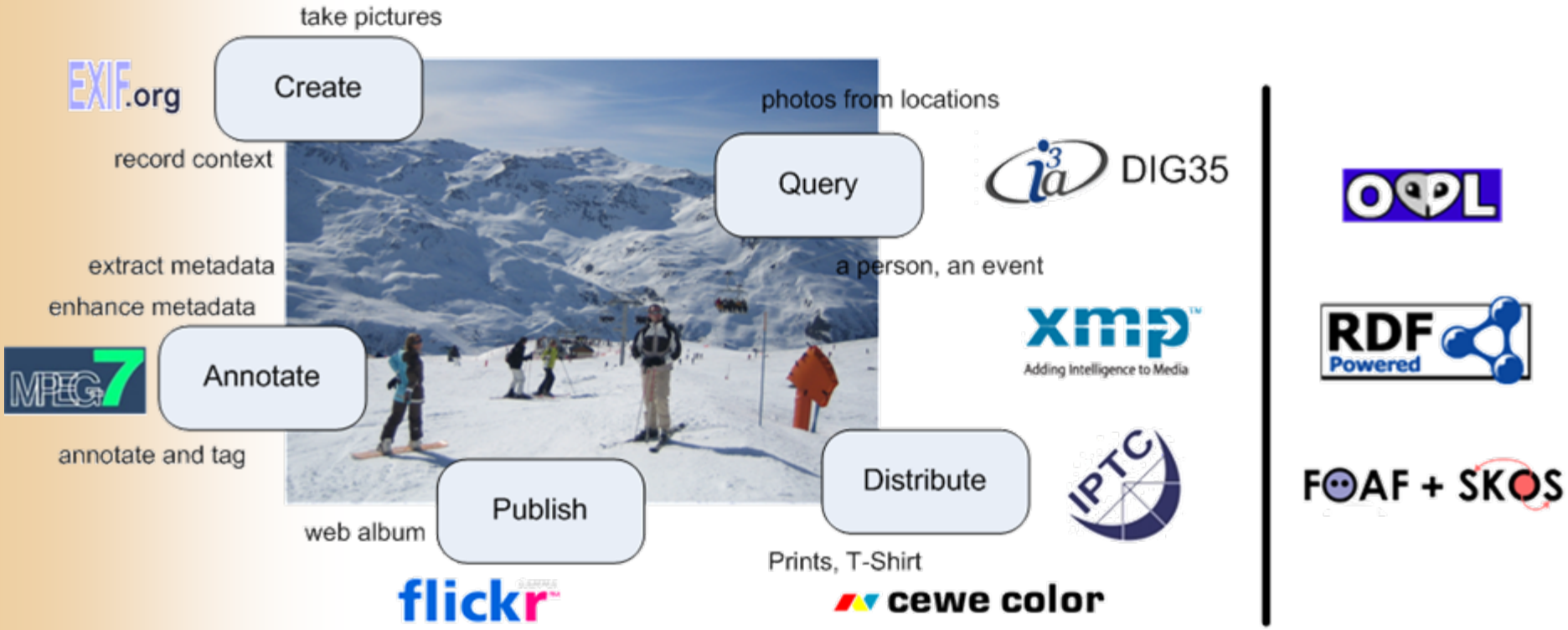



EXIF.org
flickr
Tagging
MPEG7
YouTube
Broadcast Yourself™
Multimedia
last·fm
ifra
IPTC
xmp
Adding Intelligence to Media
RDF Powered
FOAF + SKOS
WWW
Web
Semantic Web

W3C Multimedia Semantics XG

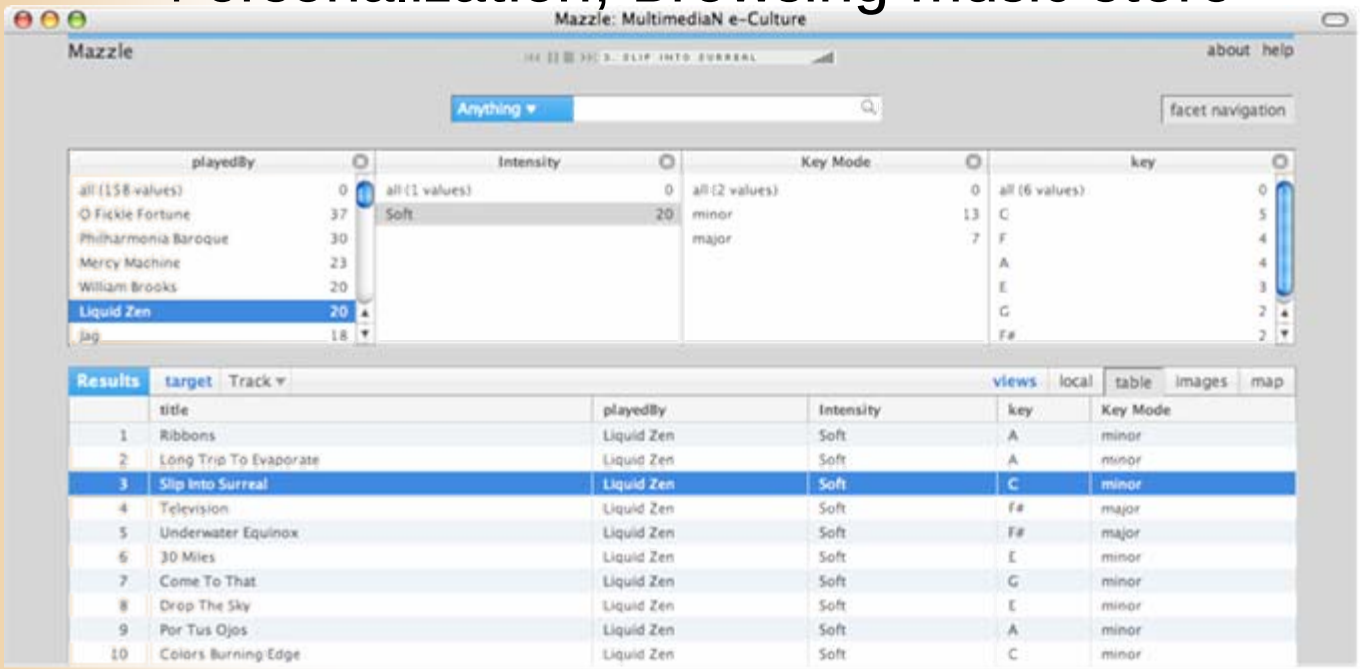
Managing Personal Photos

- Interoperable Image Metadata
  - Combining EXIF, MPEG-7, IPTC and DIG35 metadata using RDF and OWL schemas

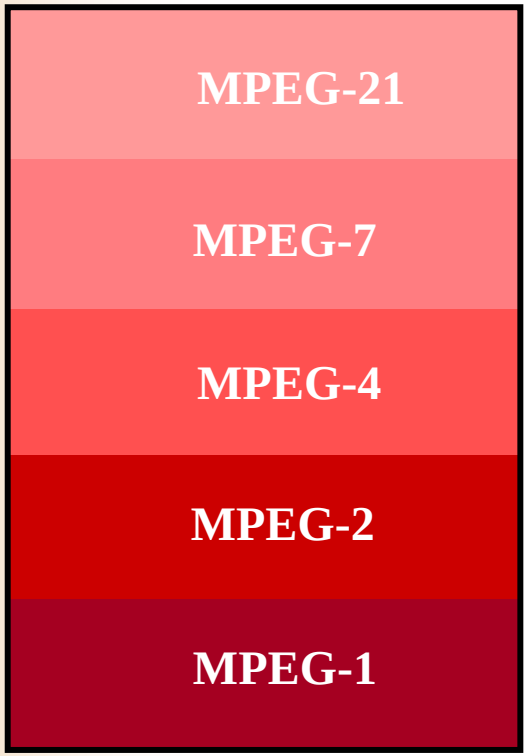


Facetting Music Songs

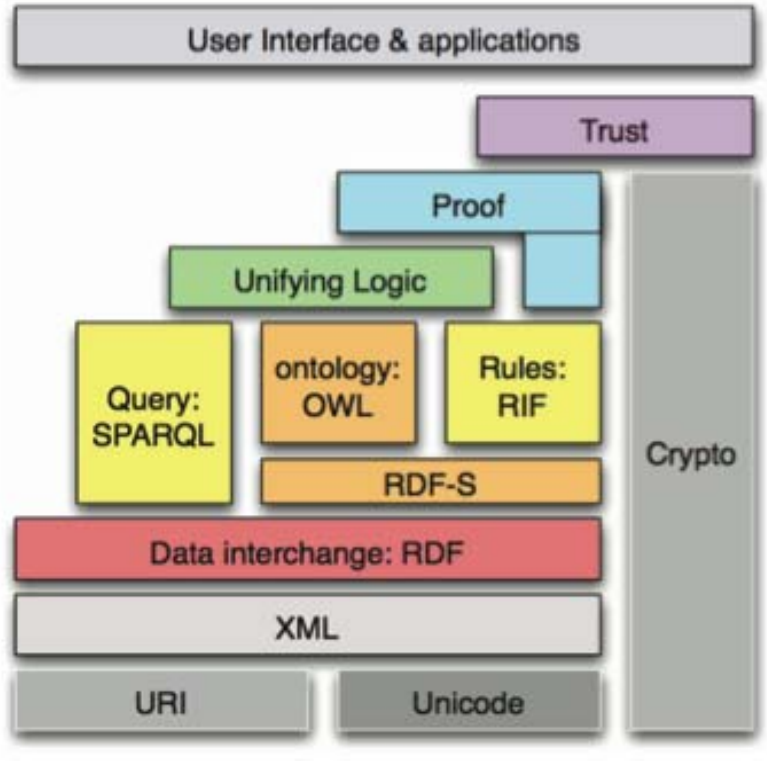
- Interoperable Music and Social Metadata
  - ID3 Tags + low-level features extraction + lastFM recommendations + FOAF profiles + ...
  - Auto-construction of playlist (similar bit rate), Personalization, Browsing music store



Multimedia: Description methods



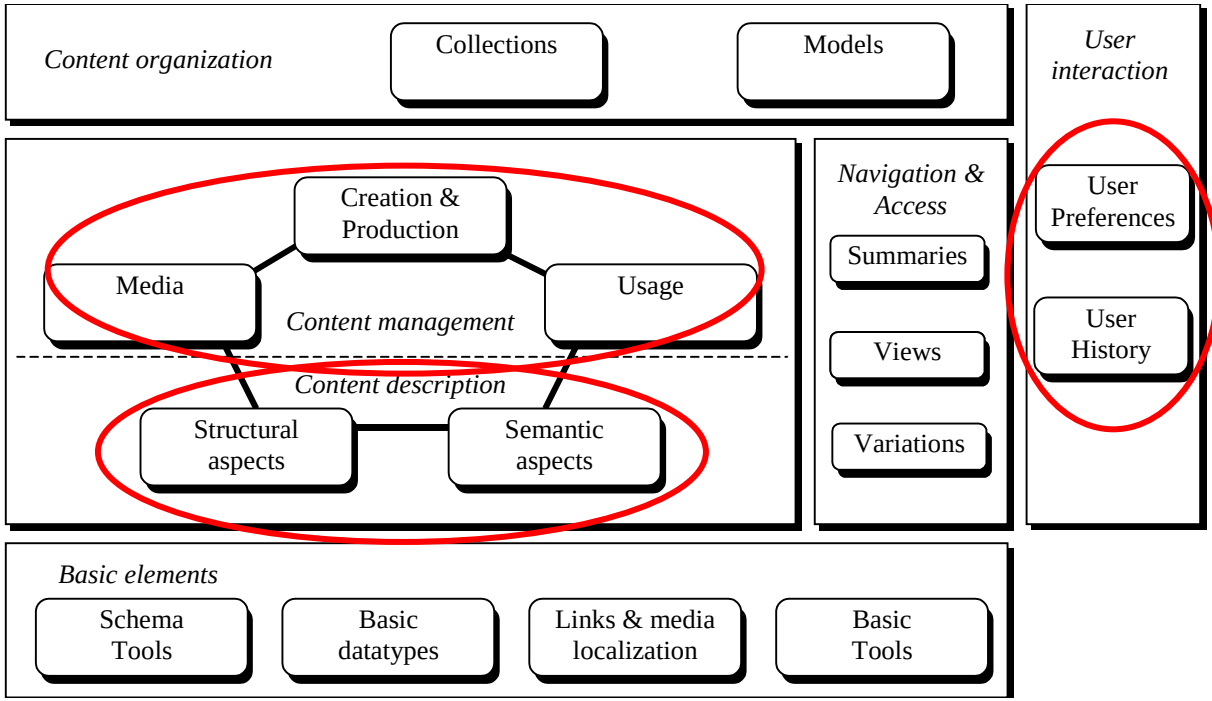
ISO



W3C

MPEG-7: a multimedia description language?

- ISO standard since December of 2001
- Main components:
  - Descriptors (Ds) and Description Schemes (DSs)
  - DDL (XML Schema + extensions)
- Concern all types of media



Part 5 – MDS
Multimedia Description Schemes

MPEG-7 and the Semantic Web

- MDS Upper Layer represented in RDFS
  - 2001: Hunter
  - Later on: link to the ABC upper ontology
- MDS fully represented in OWL-DL
  - 2004: Tsinaraki et al., DS-MIRF model
- MPEG-7 fully represented in OWL-DL
  - 2005: Garcia and Celma, Rhizomik model
  - Fully automatic translation of the whole standard
- MDS and Visual parts represented in OWL-DL
  - 2007: Arndt et al., COMM model
  - Re-engineering MPEG-7 using DOLCE design patterns

Requirements [aceMedia, MMSEM XG]

- MPEG-7 compliance
  - Support most descriptors (decomposition, visual, audio)
- Syntactic and Semantic interoperability
  - Shared and formal semantics represented in a Web language (OWL, RDF/XML, RDFa, etc.)
- Separation of concerns
  - Domain knowledge versus multimedia specific information
- Modularity
  - Enable customization of multimedia ontology
- Extensibility
  - Enable inclusion of further descriptors (non MPEG-7)

MPEG-7 Based Ontologies

	Hunter	DS-MIRF	Rhizomik	COMM
Foundational Ontologies	ABC	None	None	DOLCE
Complexity	OWL-Full	OWL-DL	OWL-DL	OWL-DL
Coverage	MDS+Visual	MDS+CS	All	MDS+Visual
Applications	Digital Libraries	Digital Libraries	Digital Rights	MM Analysis

Common Scenario

The "Big Three" at the Yalta Conference (Wikipedia)

Common Scenario: Tagging Approach

Reg1

The "Big Three" at the Yalta Conference (Wikipedia)

- Localize a region
  - Draw a bounding box, a circle around a shape
- Annotate the content
  - Interpret the content
  - Tag: Winston Churchill, UK Prime Minister, Allied Forces, WWII

Common Scenario: SW Approach

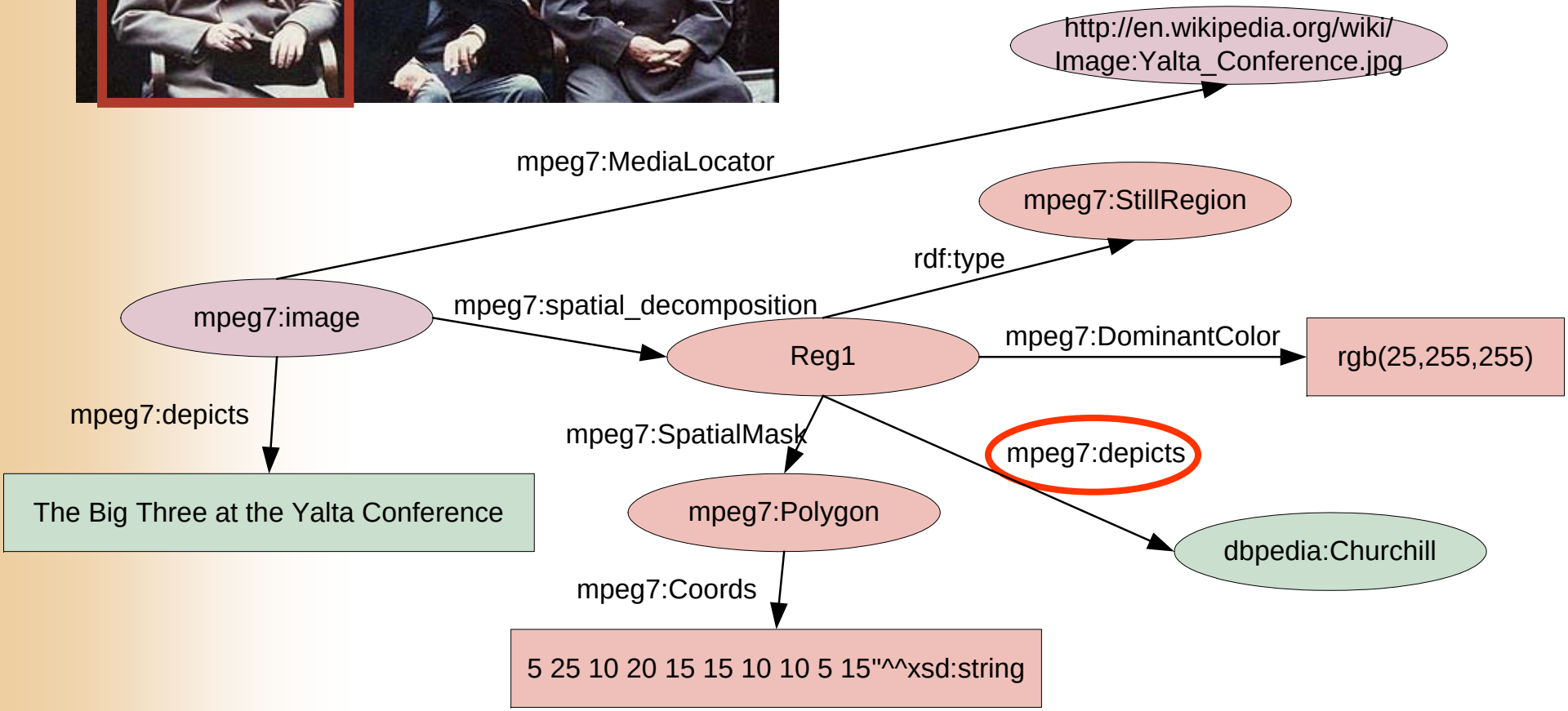
Reg1

The "Big Three" at the Yalta Conference (Wikipedia)

- Localize a region
  - Draw a bounding box, a circle around a shape
- Annotate the content
  - Interpret the content
  - Link to knowledge on the Web

```
:Reg1 foaf:depicts dbpedia:Winston_Churchill
dbpedia:Winston_Churchill skos:altLabel
        "Sir Winston Leonard Spencer-Churchill"
dbpedia:Winston_Churchill rdf:type foaf:Person
```

Hunter's MPEG-7 Ontology



DS-MIRF MPEG-7 Ontology

http://en.wikipedia.org/wiki/Image:Yalta_Conference.jpg

mpeg7:MediaURI

mpeg7:MediaLocator

mpeg7:StillRegion

rdf:type

mpeg7:image

mpeg7:SpatialDecomposition

Reg1

dbpedia:Churchill

mpeg7:RelatedMaterial

mpeg7:CreationInformation

mpeg7:SpatialMask

mpeg7:Creation

mpeg7:SubRegion

mpeg7:Polygon

mpeg7:Coords

mpeg7:Title

mpeg7:dim

The Big Three at the Yalta Conference

contentString

5 25 10 20 15 15 10 10 5 15"^^xsd:string

Rhizomik MPEG-7 Ontology

http://en.wikipedia.org/wiki/Image:Yalta_Conference.jpg

mpeg7:MediaLocator

mpeg7:SegmentType

rdf:type

mpeg7:image

mpeg7:spatial_decomposition

Reg1

dbpedia:Churchill

mpeg7:Semantic

mpeg7:CreationInformation

mpeg7:SpatialMask

mpeg7:SubRegion

mpeg7:Polygon

mpeg7:Coords

mpeg7:Title

mpeg7:dim

The Big Three at the Yalta Conference

5 25 10 20 15 15 10 10 5 15"^^xsd:string

COMM: Fragment Identification

Comparison

- Link with domain semantics
  - Hunter: ABC model + `mpeg7:depicts` relationship
  - DS-MIRF: Domain ontologies needs to subclass the general MPEG-7 categories
  - Rhizomik: Use the `mpeg7:semantic` relationship
  - COMM: Semantic Annotation pattern
- MPEG-7 coverage
  - Hunter: extension of the MPEG-7 visual descriptors
  - COMM:
    - Formalization of the context of the annotation
    - Representation of the method (algorithm) that provides the annotation

Comparison

- Modeling Decisions:
  - DS-MIRF and Rhizomik: 1-to-1 translation from MPEG-7 to OWL/RDF
  - Hunter: Simplification and link to the ABC upper model
  - COMM: NO 1-to-1 translation
    - Need for patterns: use DOLCE, a well designed foundational ontology as a modeling basis
- Scalability:

	Hunter	DS-MIRF	Rhizomik	COMM
Triples	11	27	20	19

Core Ontology on Multimedia - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils ?

http://comm.semanticweb.org/

Search News RDFa Highlight Raphael Troncy Mélanie CWI K-Space NewsML FP7, Call 3 W3C Conférences Planet RDF ramm.x (RDFa-deploy... ShapeShift.TV

Google Rechercher Mes favoris PageRank Traduire Envoyer à Paramètres

COMM core ontology for multimedia

Home | Ontology | Examples | Java API | Papers

Summary

Semantic descriptions of non-textual media available on the web can be used to facilitate retrieval and presentation of media assets and documents containing them. While technologies for multimedia semantic descriptions already exist, there is as yet no formal description of a high quality multimedia ontology that is compatible with existing (semantic) web technologies. We propose COMM - A Core Ontology for Multimedia based on both the MPEG-7 standard and the DOLCE foundational ontology.

The research is partially supported by the European Commission under contracts:

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- FP6-026978, X-Media Integrated Project.

People

- Thomas Franz
- Steffen Staab
- Raphaël Troncy
- Richard Arndt

Terminé

Scenario: Image

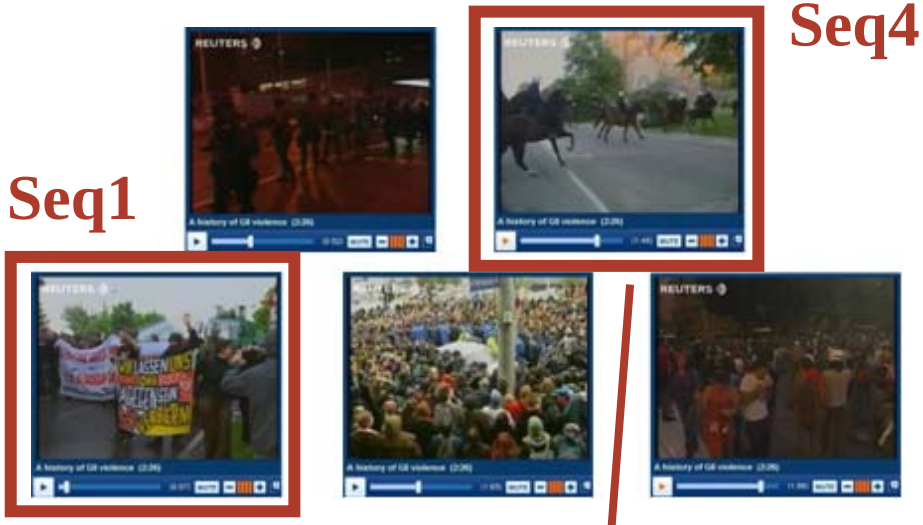
Reg1

The "Big Three" at the Yalta Conference (Wikipedia)

- Localize a region (bounding box)
- Annotate the content (interpretation)
  - Tag: Winston Churchill, UK Prime Minister, Allied Forces, WWII
  - Link to knowledge on the Web

```
:Reg1 foaf:depicts dbpedia:Winston_Churchill
dbpedia:Winston_Churchill skos:altLabel
       "Sir Winston Leonard Spencer-Churchill"
dbpedia:Winston_Churchill rdf:type foaf:Person
```

Scenario: Video



A history of G8 violence (video)
(© Reuters)

- Localize a region
- Annotate the content
  - Tag: G8 Summit, Heiligendamn, 2007
  - Link to knowledge on the Web

EU Summit, Gothenburg, 2001

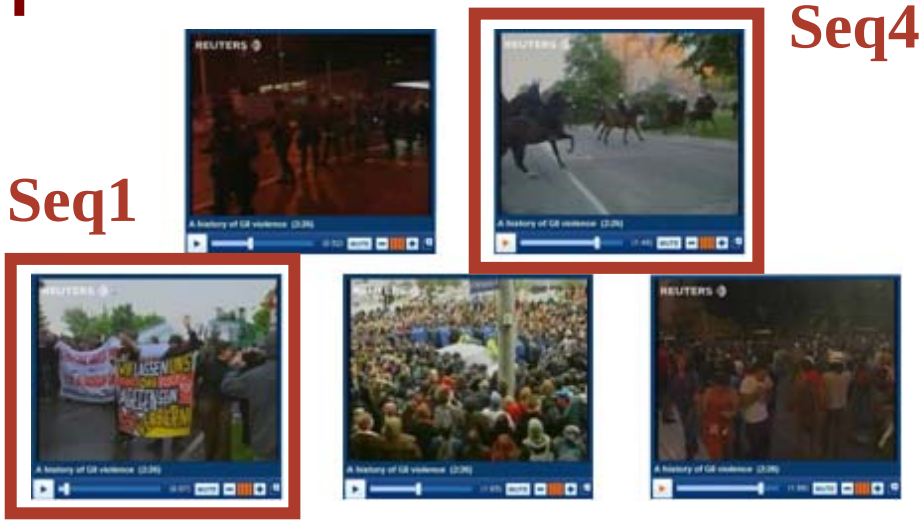
```
:Seq1 foaf:depicts dbpedia:34th_G8_Summit
:Seq4 foaf:depicts dbpedia:EU_Summit
geo:Heilegendamn skos:broader geo:Germany
```

Research Problem

Reg1

The "Big Three" at the Yalta Conference (Wikipedia)

Seq1 **Seq4**



A history of G8 violence (video) (© Reuters)

- Multimedia objects are complex
  - Compound information objects, fragment identification

⇨ **MPEG-7**

- Semantic annotation
  - Subjective interpretation, context dependent

⇨ **D&S | OIO**

- Linked data principle
  - Open to reuse existing knowledge

⇨ **RDF**

COMM: Design Rationale

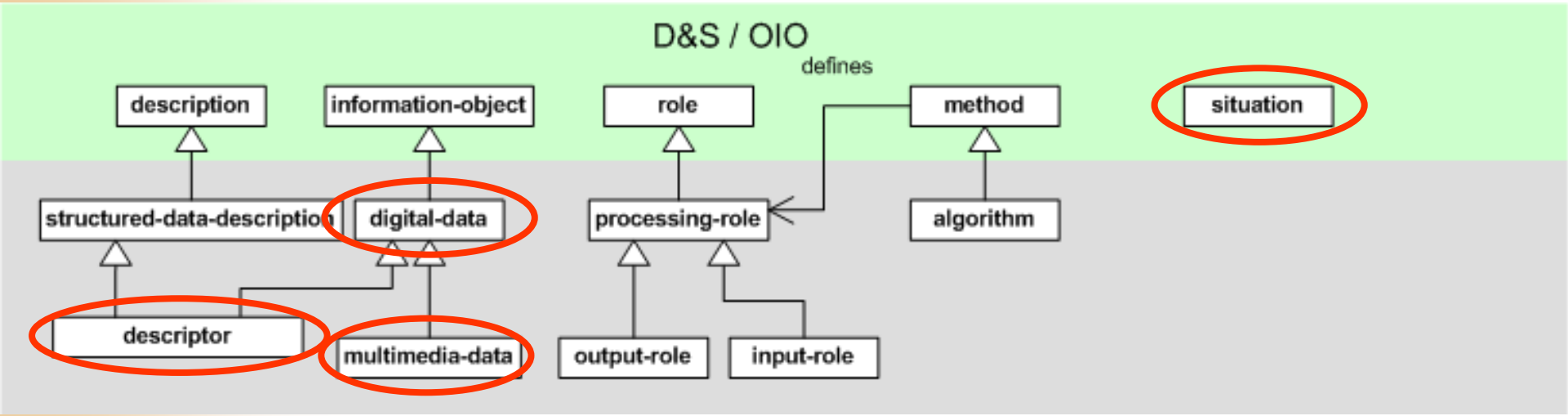
- Approach:
  - NO 1-to-1 translation from MPEG-7 to OWL/RDF
  - Need for patterns: use DOLCE, a well designed foundational ontology as a modeling basis
- Design patterns:
  - Ontology of Information Objects (OIO)
    - Formalization of information exchange
    - Multimedia = complex compound information objects
  - Descriptions and Situations (D&S)
    - Formalization of context
    - Multimedia = contextual interpretation (situation)
- Define **multimedia patterns** that translate MPEG-7 in the DOLCE vocabulary

COMM: Core Functionalities

- Most important MPEG-7 functionalities:
  - **Decomposition** of multimedia content into segments
  - **Annotation** of segments with metadata
    - Administrative metadata: creation & production
    - Content-based metadata: audio/visual descriptors
    - Semantic metadata: interface with domain specific ontologies

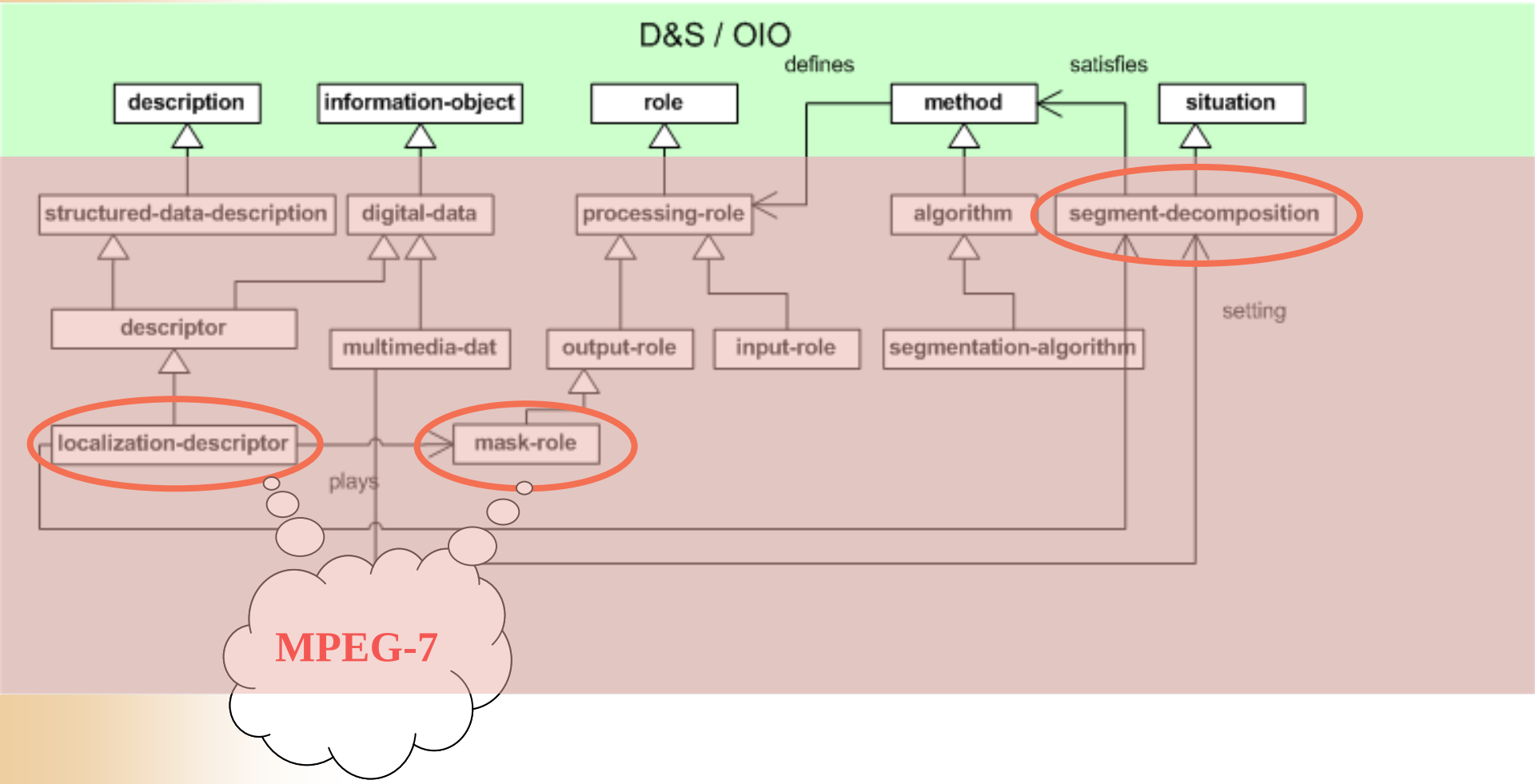
⇨ Note that all are subjective and context dependent situations

COMM: D&S / OIO Patterns

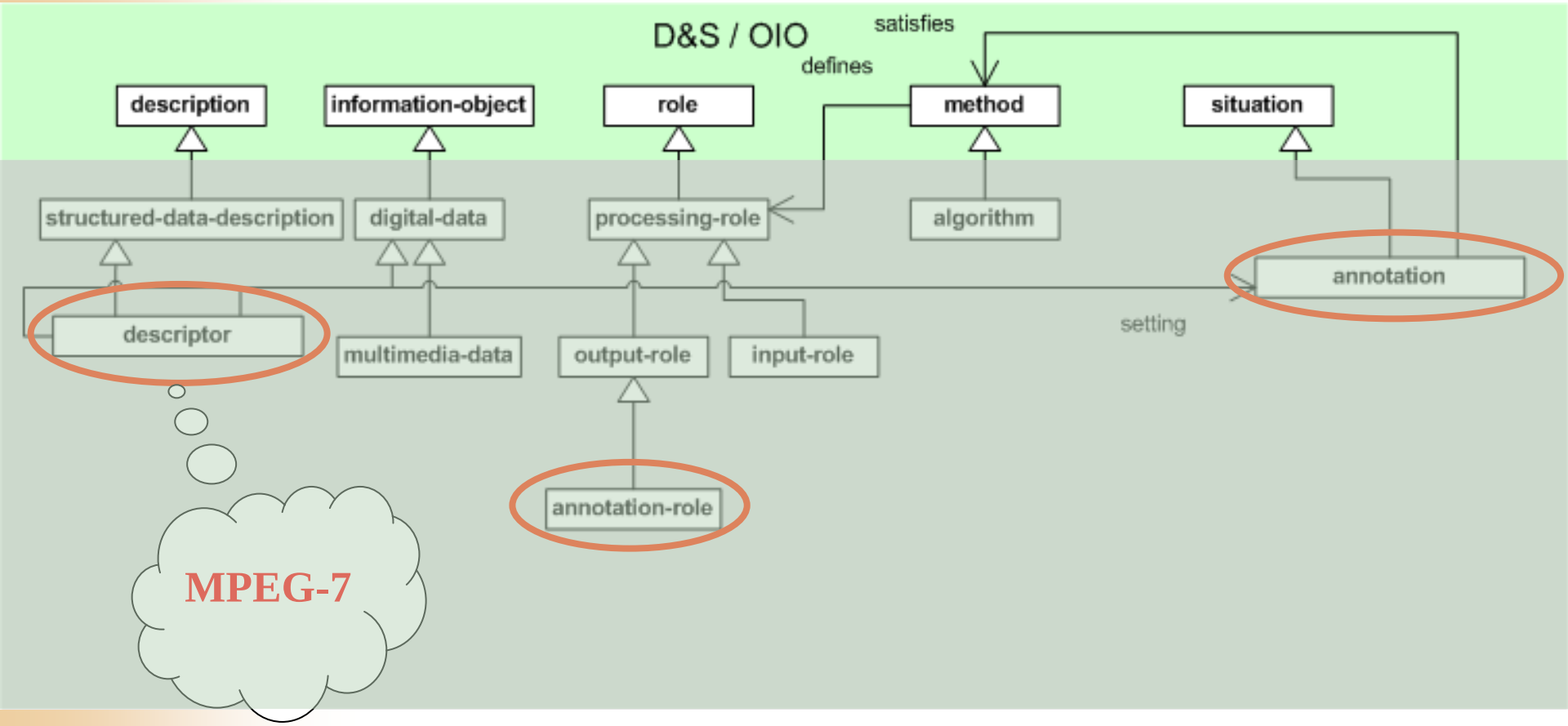


- Definition of design patterns for **decomposition** and **annotation** based on D&S and OIO
  - MPEG-7 describes digital data (*multimedia information objects*) with digital data (*annotation*)
  - *Digital data* entities are information objects
  - Decompositions and annotations are *situations* that satisfy the rules of a method or algorithm

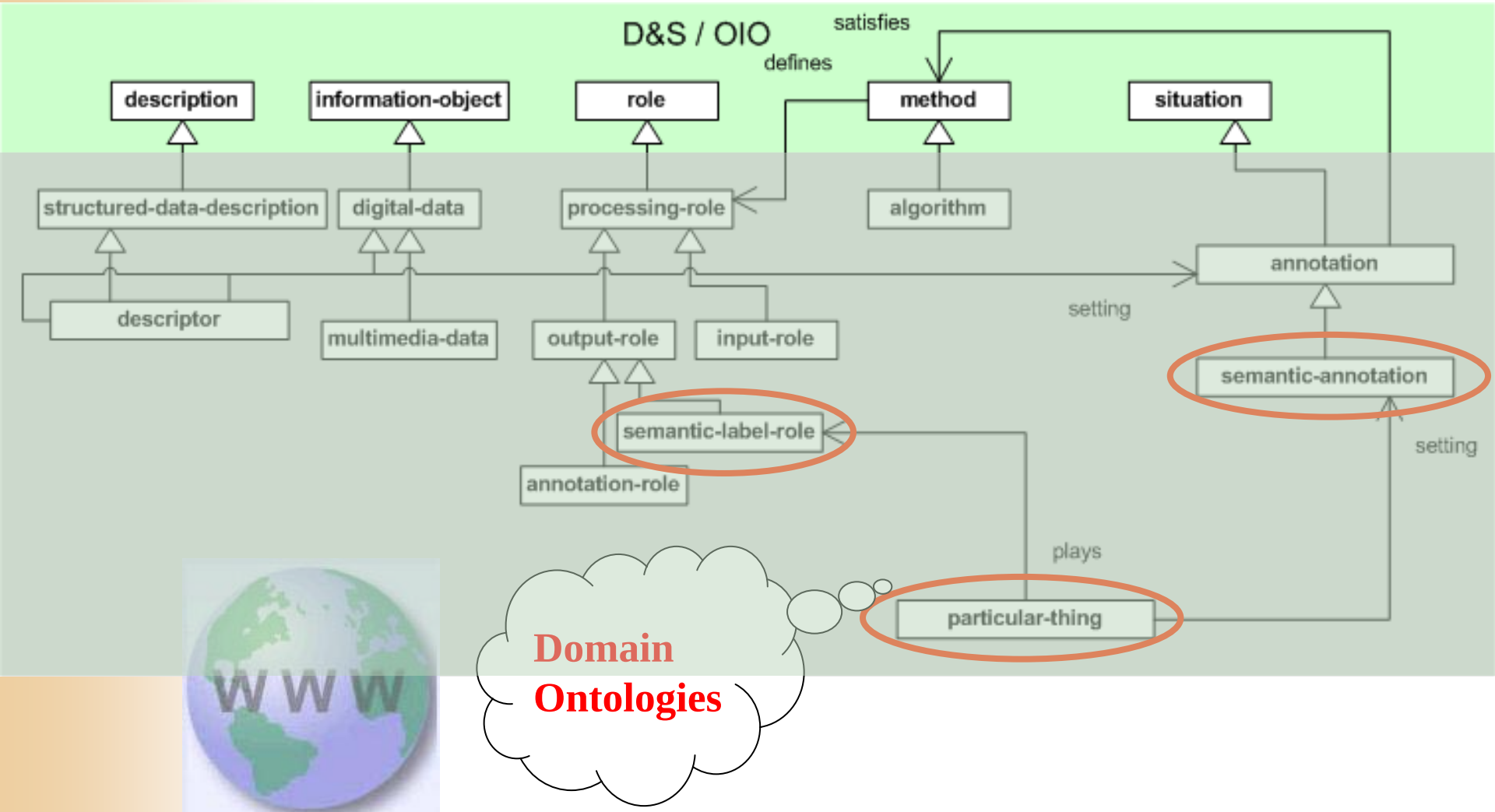
COMM: Decomposition Pattern



COMM: Annotation Pattern



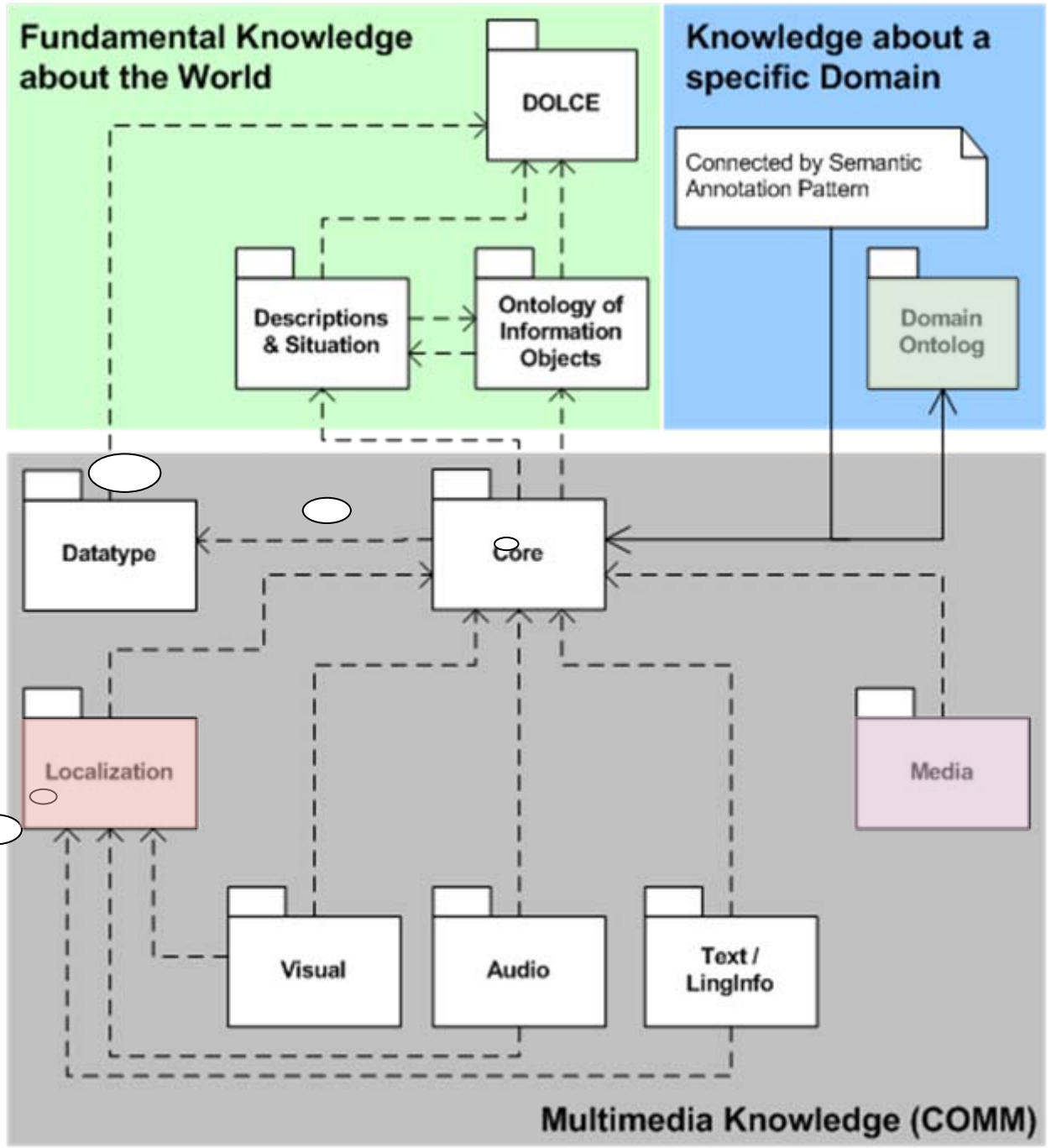
COMM: Semantic Pattern



COMM: Modules

Annotation Pattern

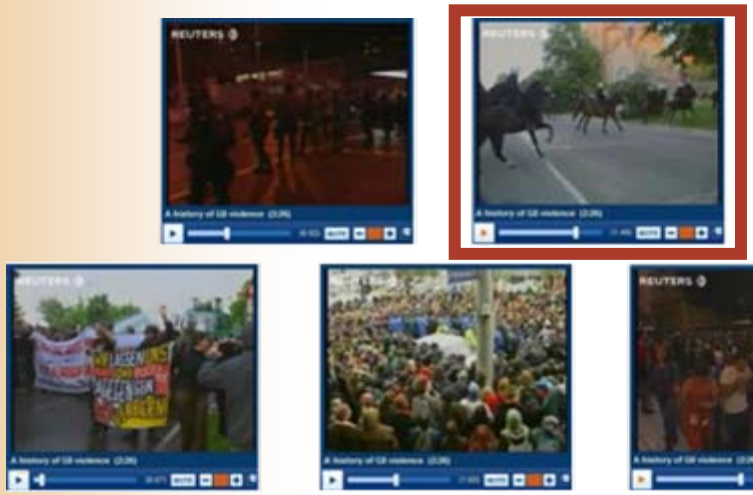
Decomposition Pattern



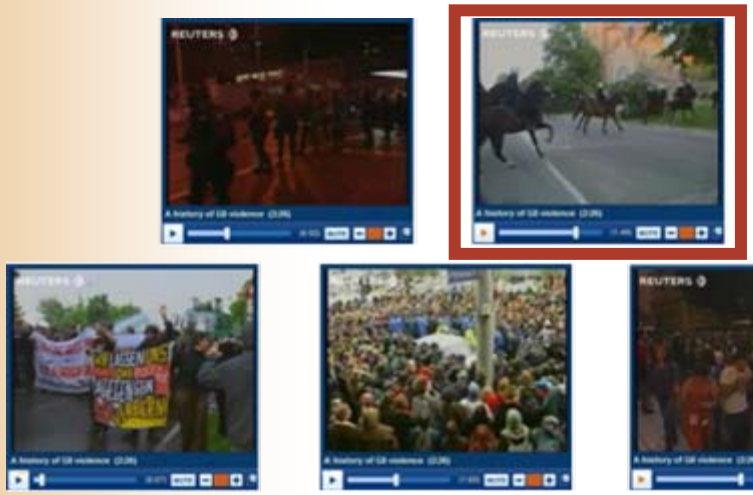
Example 1: Fragment Identification

Example 1: Region Annotation

Example 2: Fragment Identification



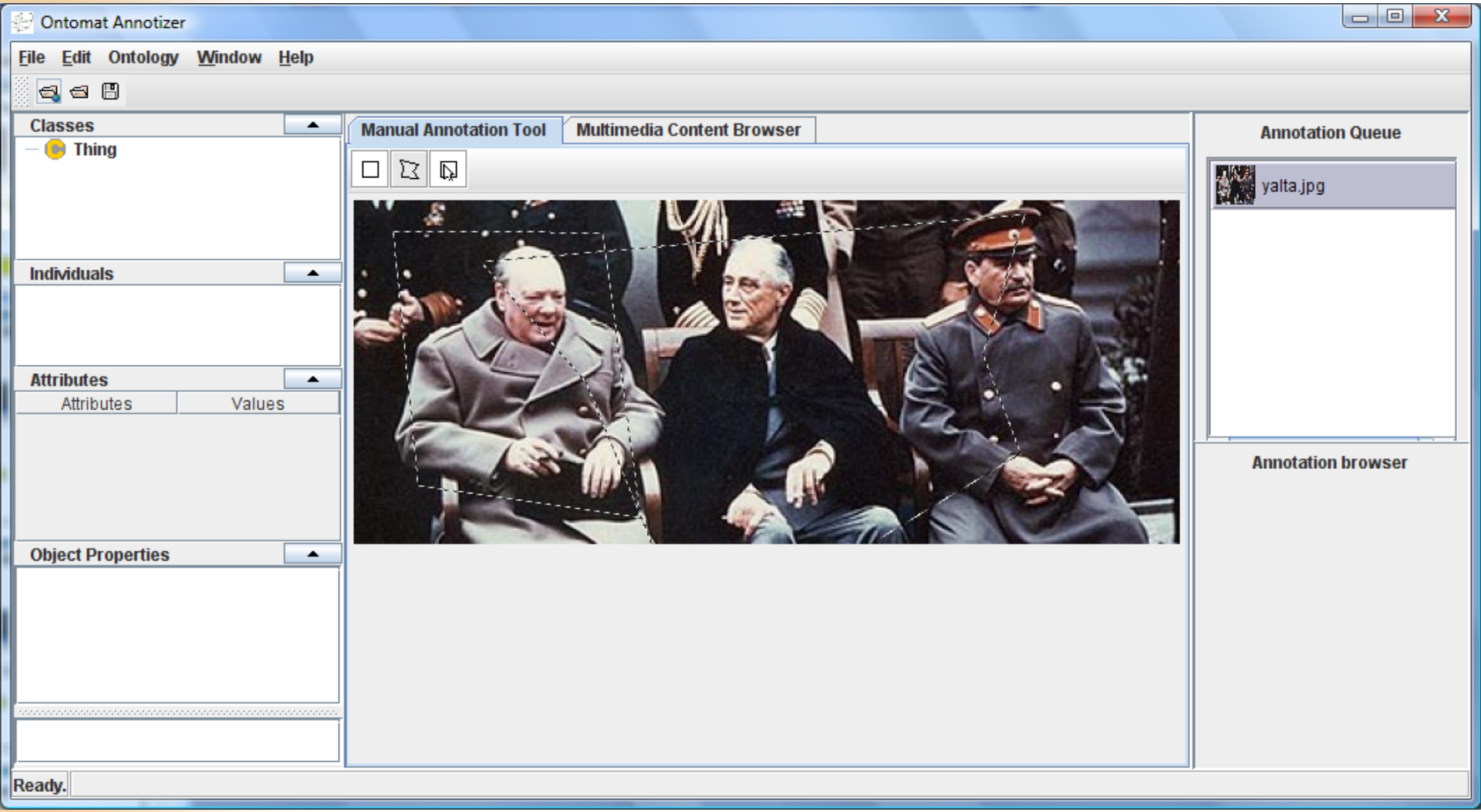
Example 2: Sequence Annotation



Implementation

- COMM fully formalized in OWL DL
  - Rich axiomatization, consistency check (Fact++v1.1.5)
  - OWL 2.0: qualified cardinality restrictions for number restrictions of MPEG-7 low-level descriptors
- JAVA API available
  - MPEG-7 class interface for the construction of meta-data at runtime

KAT Annotation Tool

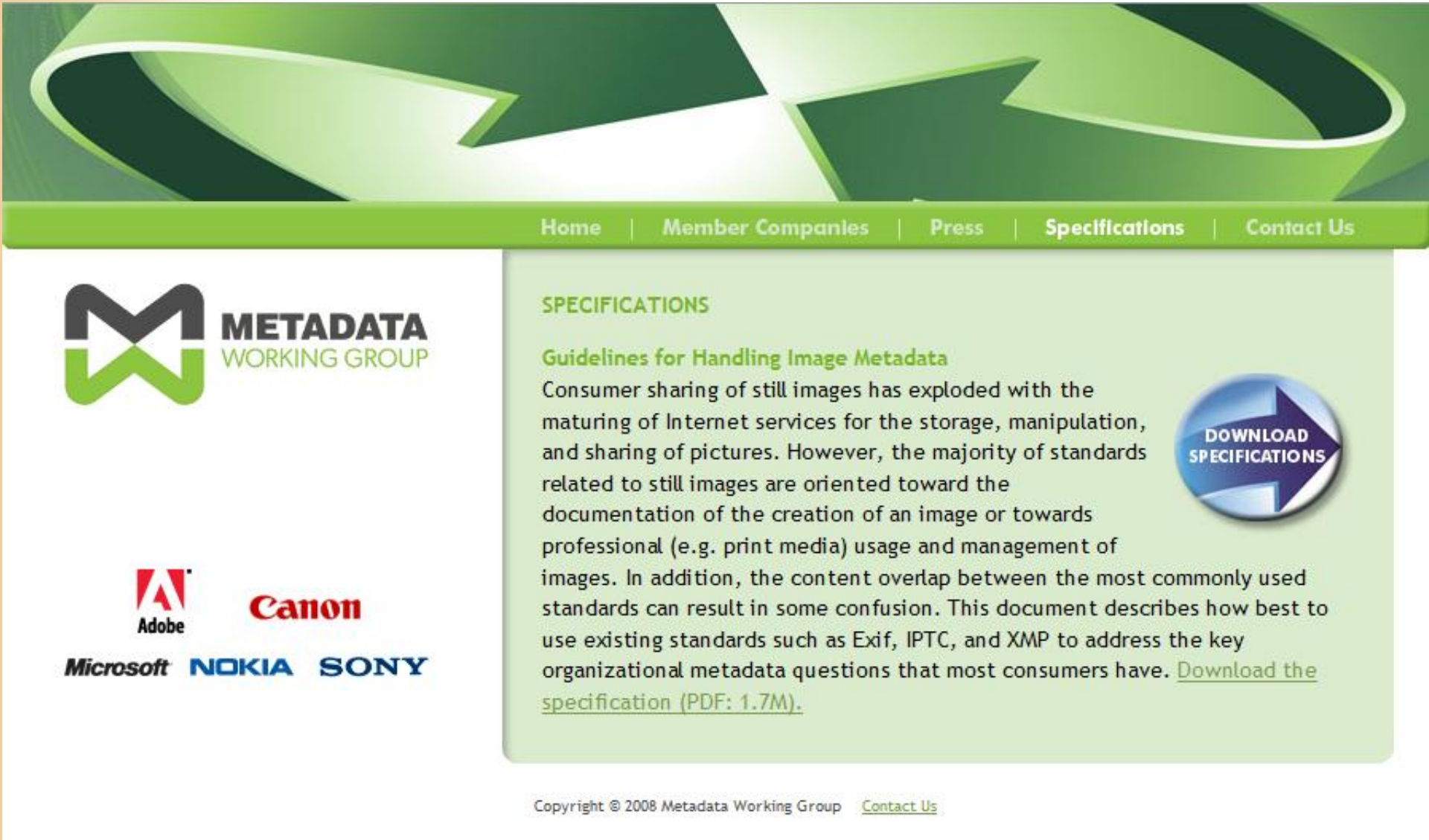


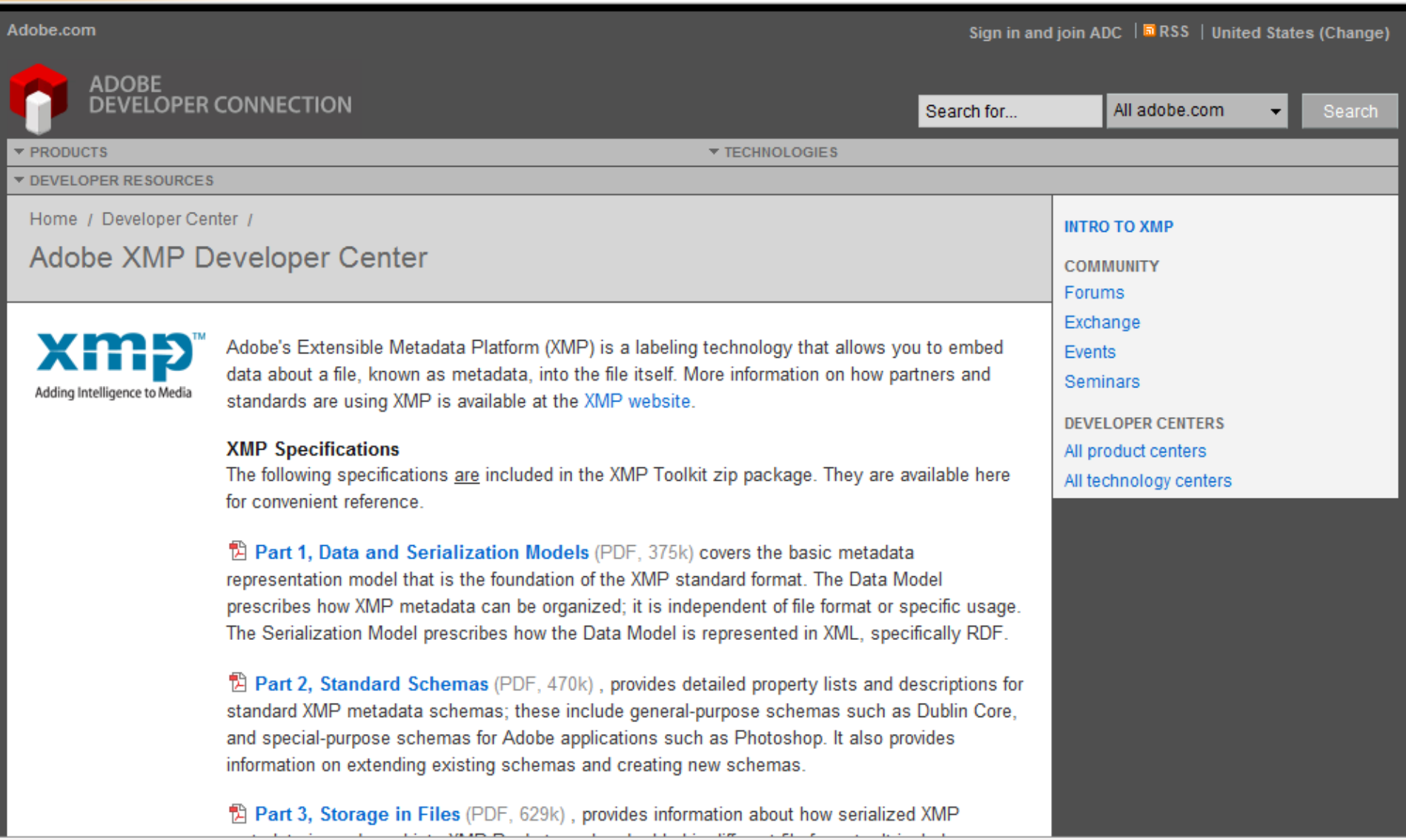
Evaluation

- Applied Domains
  - Knowledge management for multimedia documents
  - Driving multimedia analysis process
  - Generate new interfaces for browsing multimedia content
- Scalability
  - 4 minutes video,
    TRECVid metadata expressed in COMM
    - 250 K statements
  - Reasoning in large scale applications

Making Music Out Of The Social Noise

Metadata Working Group




Adobe.com
Sign in and join ADC | RSS | United States (Change)
ADOBE
DEVELOPER CONNECTION
Search for...
All adobe.com
Search
PRODUCTS
TECHNOLOGIES
DEVELOPER RESOURCES
Home / Developer Center /
Adobe XMP Developer Center
Adding Intelligence to Media
Adobe's Extensible Metadata Platform (XMP) is a labeling technology that allows you to embed data about a file, known as metadata, into the file itself. More information on how partners and standards are using XMP is available at the XMP website.
XMP Specifications
The following specifications are included in the XMP Toolkit zip package. They are available here for convenient reference.
Part 1, Data and Serialization Models (PDF, 375k) covers the basic metadata representation model that is the foundation of the XMP standard format. The Data Model prescribes how XMP metadata can be organized; it is independent of file format or specific usage. The Serialization Model prescribes how the Data Model is represented in XML, specifically RDF.
Part 2, Standard Schemas (PDF, 470k) , provides detailed property lists and descriptions for standard XMP metadata schemas; these include general-purpose schemas such as Dublin Core, and special-purpose schemas for Adobe applications such as Photoshop. It also provides information on extending existing schemas and creating new schemas.
Part 3, Storage in Files (PDF, 629k) , provides information about how serialized XMP
INTRO TO XMP
COMMUNITY
Forums
Exchange
Events
Seminars
DEVELOPER CENTERS
All product centers
All technology centers

W3C Media Annotations WG

W3C Media Annotations WG
http://www.w3.org/2008/WebVideo/Annotations/

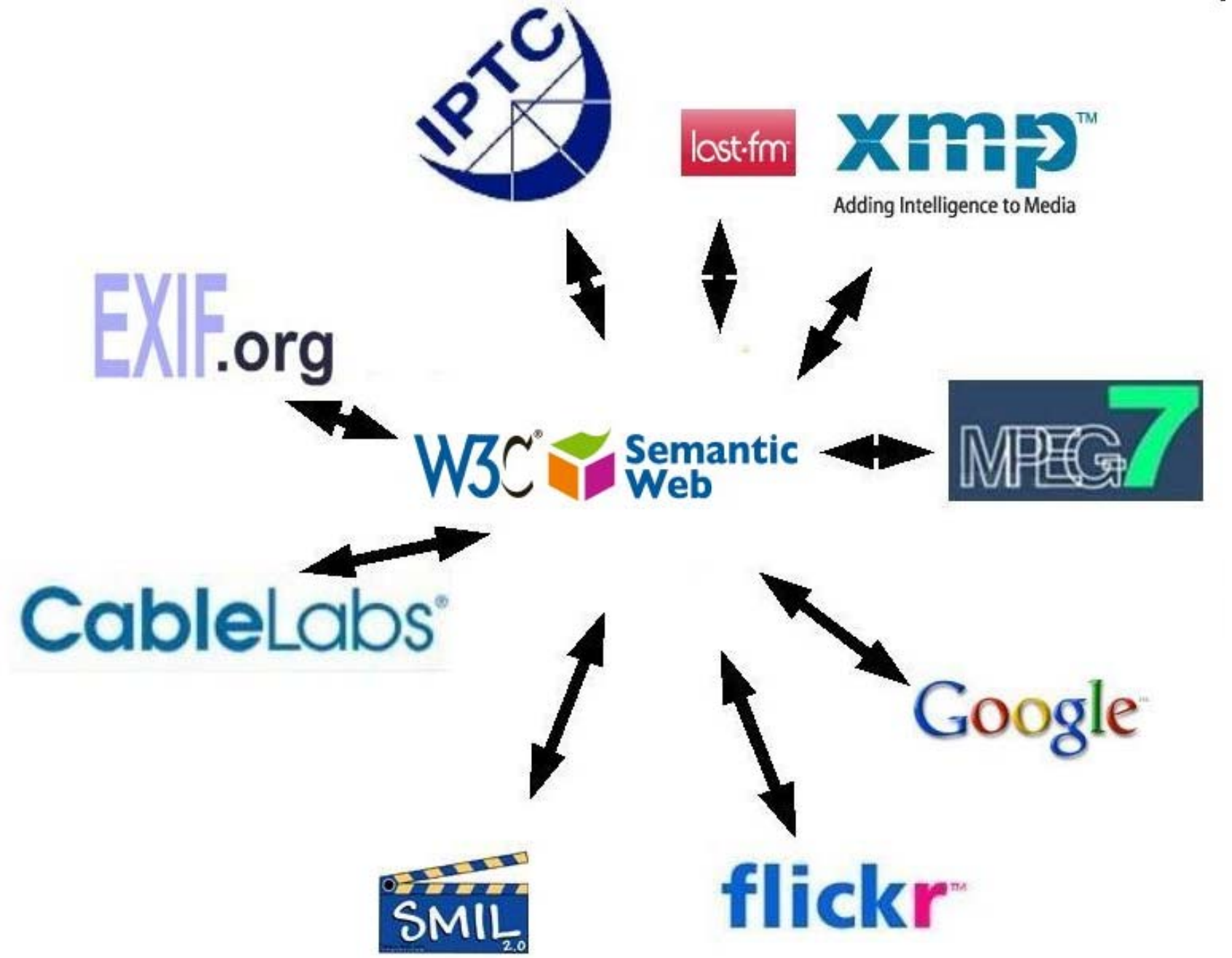
Media Annotations Working Group
Video, Audio, Images

Mission · Administrative information · Drafts · Issues · Meeting records · Drafts · Wiki · Schedule · Discussion lists

Mission

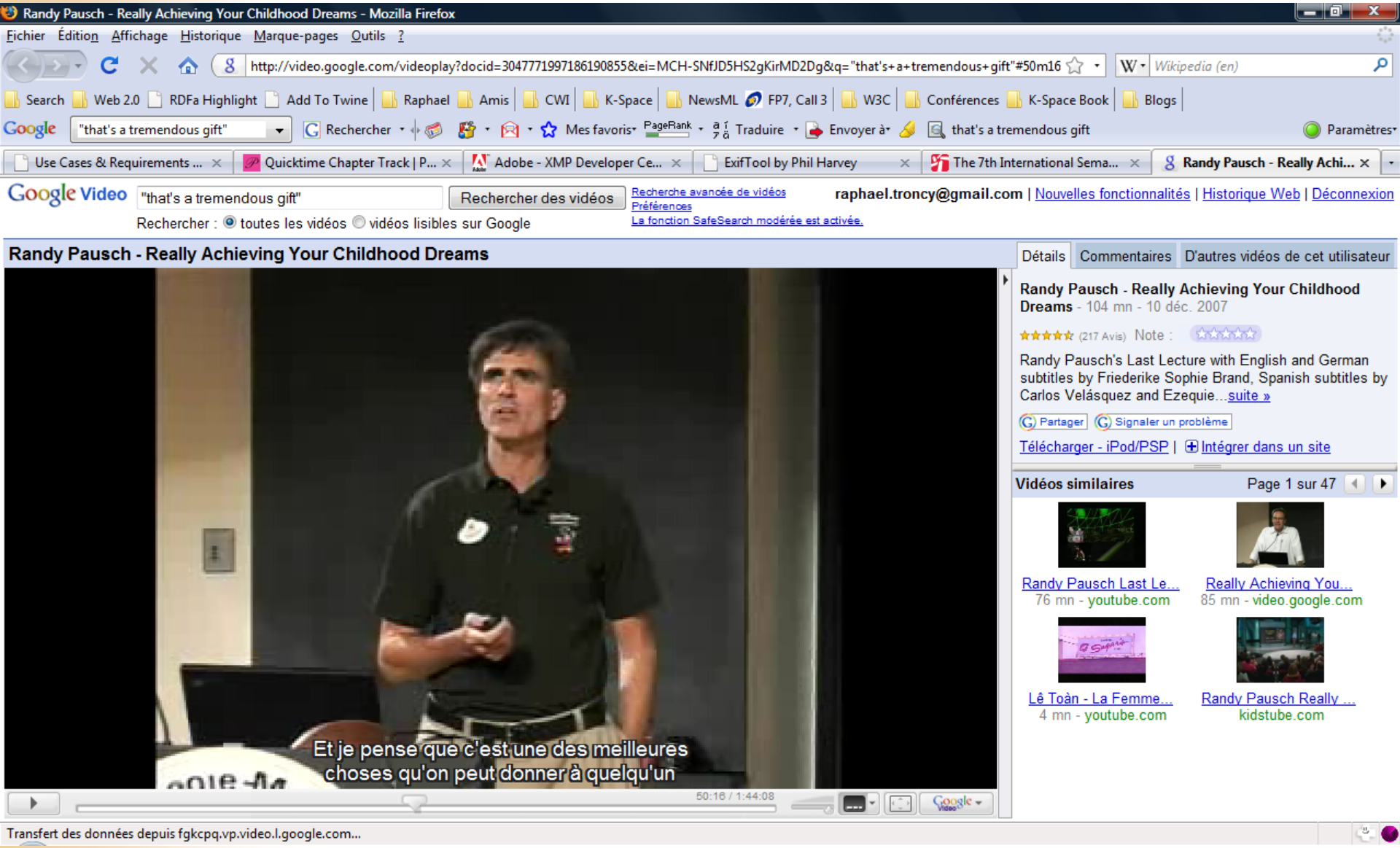
The **mission** of the Media Annotations Working Group, part of the Video in the Web Activity, is to provide an ontology designed to facilitate cross-community data integration of information related to media objects in the Web, such as video, audio and images.

See also: charter and liaisons to non-W3C groups


IPTC
last·fm
xmp
Adding Intelligence to Media
EXIF.org
W3C
Semantic Web
MPEG 7
CableLabs
Google
SMIL 2.0
flickr

W3C Media Fragments WG

YouTube Videos Fragments



Literature

- Michael Hausenblas *et al.*: Multimedia Vocabularies on the Semantic Web. W3C Multimedia Semantics Incubator Group Report (XGR), 24 July 2007.
- Raphaël Troncy, Jacco van Ossenbruggen, Jeff Z. Pan and Giorgos Stamou. Image Annotation on the Semantic Web. W3C Multimedia Semantics Incubator Group Report (XGR), 14 August 2007.
- Vassilis Tzouvaras, Raphaël Troncy and Jeff Z. Pan. Multimedia Annotation Interoperability Framework. W3C Multimedia Semantics Incubator Group Report Editor's Draft, 14 August 2007.
- Richard Arndt, Raphaël Troncy, Steffen Staab, Lynda Hardman and Miroslav Vacura: *COMM: Designing a Well-Founded Multimedia Ontology for the Web*. In 6th International Semantic Web Conference (ISWC'2007), Busan, Korea, November 11-15, 2007.
- Raphaël Troncy, Oscar Celma, Suzanne Little, Roberto Garcia, Chrisa Tsinaraki: *MPEG-7 based Multimedia Ontologies: Interoperability Support or Interoperability Issue?* In 1st Workshop on Multimedia Annotation and Retrieval enabled by Shared Ontologies (MAReSO'2007), Genoa, Italy, December 2007.

Agenda

1. Understanding Multimedia Applications Workflow
   - CeWe Color Photo Book creation application
   - Vox Populi argumentative video sequences generation system
   - *The Canonical Processes of Media Production*
2. Semantic Annotation of Multimedia Content
   - Multimedia metadata formats: use cases and requirements
   - Multimedia metadata interoperability issues
   - MPEG-7 based ontologies
   - *COMM: A Core Ontology for MultiMedia*
3. Semantic Search and Presentation of Multimedia Content
   - Link your data!
   - *Searching and Browsing Multimedia Semantic Datasets with Cliopatria*

A Giant Graph Open to the World

```
<rdf:Description
 rdf:about="Ganesh.jpg">
   <dc:title>An image of the
 Elephant Ganesh</dc:title>
   <dc:creator>
 Raphaël Troncy</dc:creator>
</rdf:Description>
```

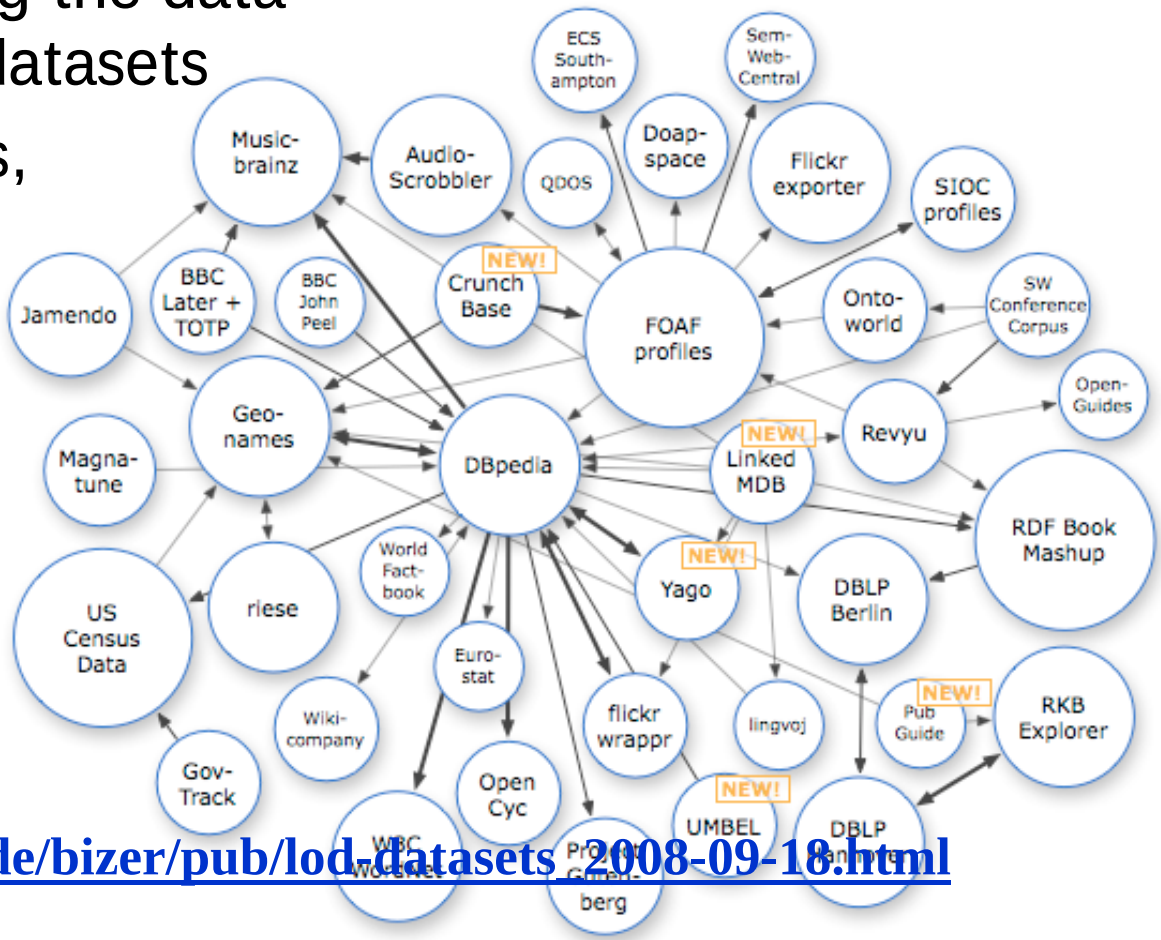
- Annotate the content (interpretation)
  Elephant, Ganesh, Thailande, Holidays, Chiang Mai
- Link to knowledge on the Web

```
:img foaf:depicts dbpedia:Ganesh
dbpedia:Ganesh rdfs:label "Vinayaka"
dbpedia:Ganesh skos:altlabel "Ganapati"
dbpedia:Ganesh rdf:type wn:synset-Deities-noun-1
dbpedia:Ganesh owl:sameas wn:synset-Ganesh-noun-1
```

Linking Open Data Project

- Expose open datasets in RDF
- Set RDF links among the data items for different datasets
- Over 2 billion triples, 3 millions links (March 2008)
- Many many many more ... now

LINKINGOPENDATA
W3C SWEO Community Project



http://www4.wiwiss.fu-berlin.de/bizer/pub/lod-datasets_2008-09-18.html

DBpedia

- DBpedia is a community effort to:
  - extract structured "infobox" information from Wikipedia
  - interlink DBpedia with other datasets on the Web

UNIVERSITÄT LEIPZIG

DBpedia

Extracting Infobox Data

```
http://en.wikipedia.org/wiki/Calgary
```

```
<http://dbpedia.org/resource/Calgary>
  dbpedia:native_name "Calgary" ;
  dbpedia:altitude "1048" ;
  dbpedia:population_city  "988193" ;
  dbpedia:population_metro "1079310" ;
  mayor_name
       dbpedia:Dave_Bronconnier ;
  governing_body
       dbpedia:Calgary_City_Council ;
 ...
```

- **Altogether 9,100,000 RDF triples extracted from 754,000 infoboxes**

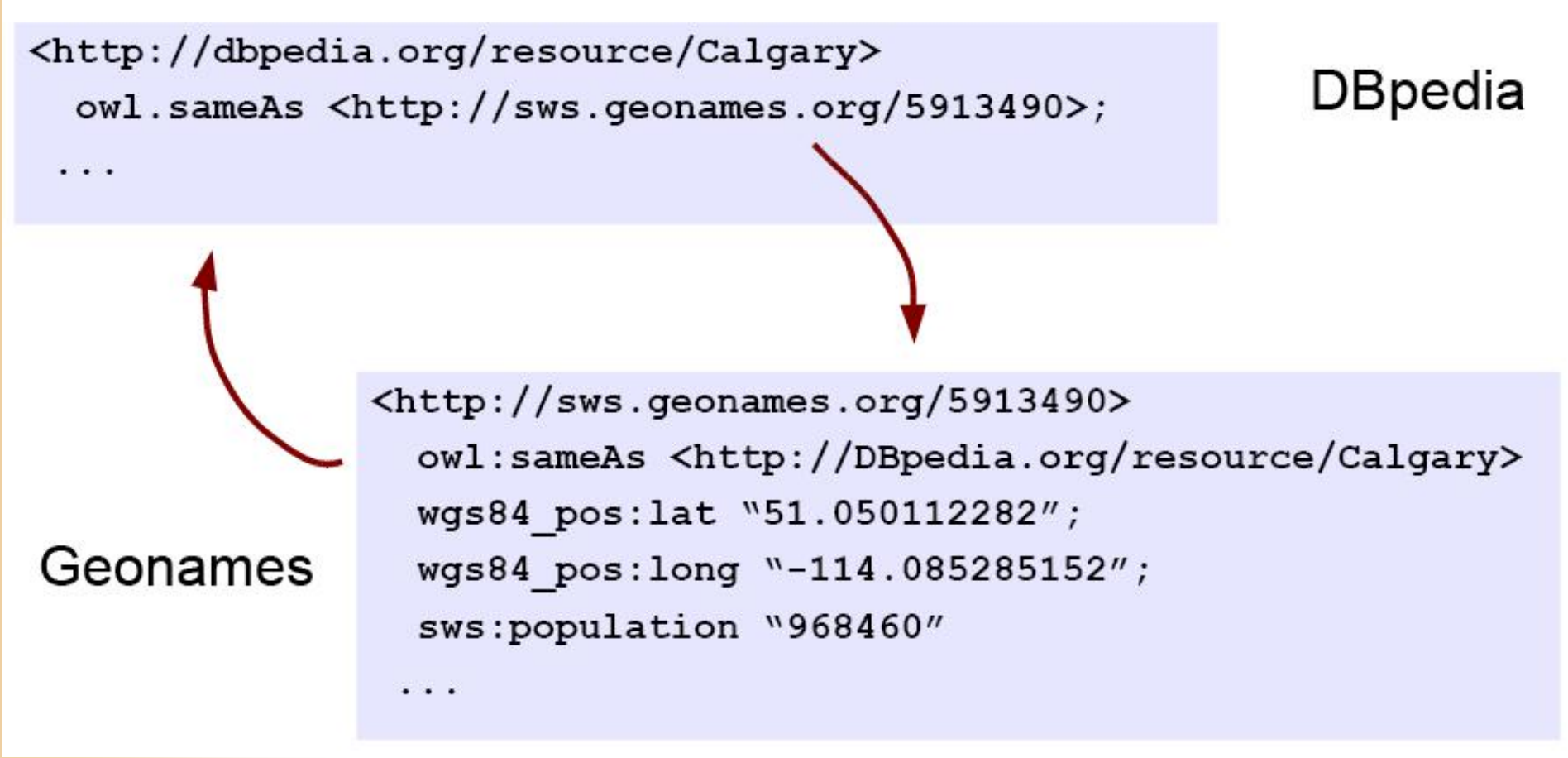
Calgary

Downtown Calgary.

Government	
- Mayor	Dave Bronconnier (Past mayors)
- Governing body	Calgary City Council
- Manager	Owen A. Tobert
Area [1]	
- City	726.50 km² (280.5 sq mi)
- Metro	5,107.43 km² (1,972 sq mi)
Elevation	1,048 m (3,438.3 ft)
Population (2006)[1]	
- City	988,193
- Density	1,360.2/km² (3,522.9/sq mi)
- Metro	1,079,310
- Population rank	3rd
- Metro rank	5th

Christian Bizer et al: DBpedia – Querying Wikipedia Like a Database (May 11, 2007)

Automatic Links Among Open Datasets

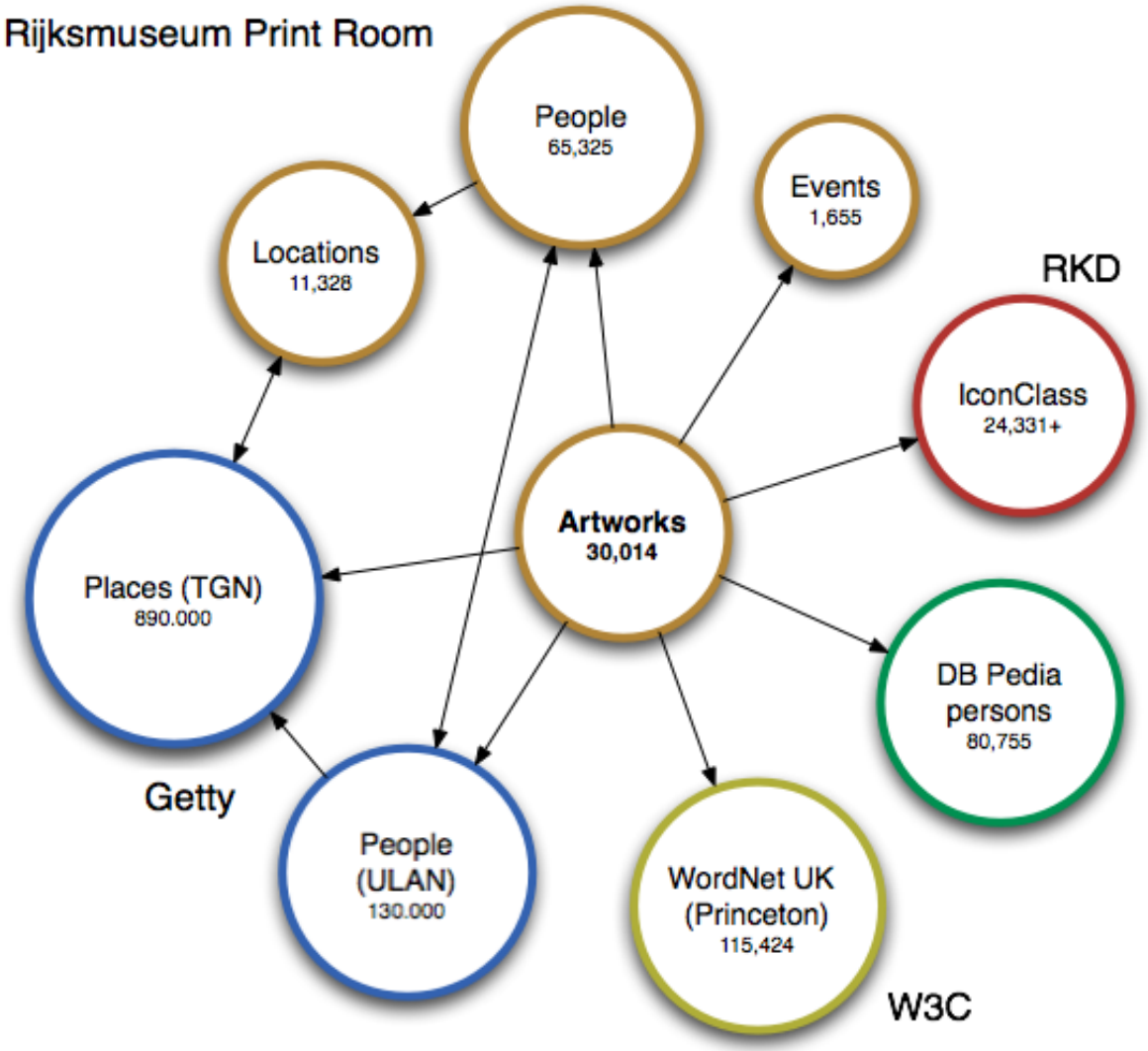


Processors can switch automatically from one to the other …

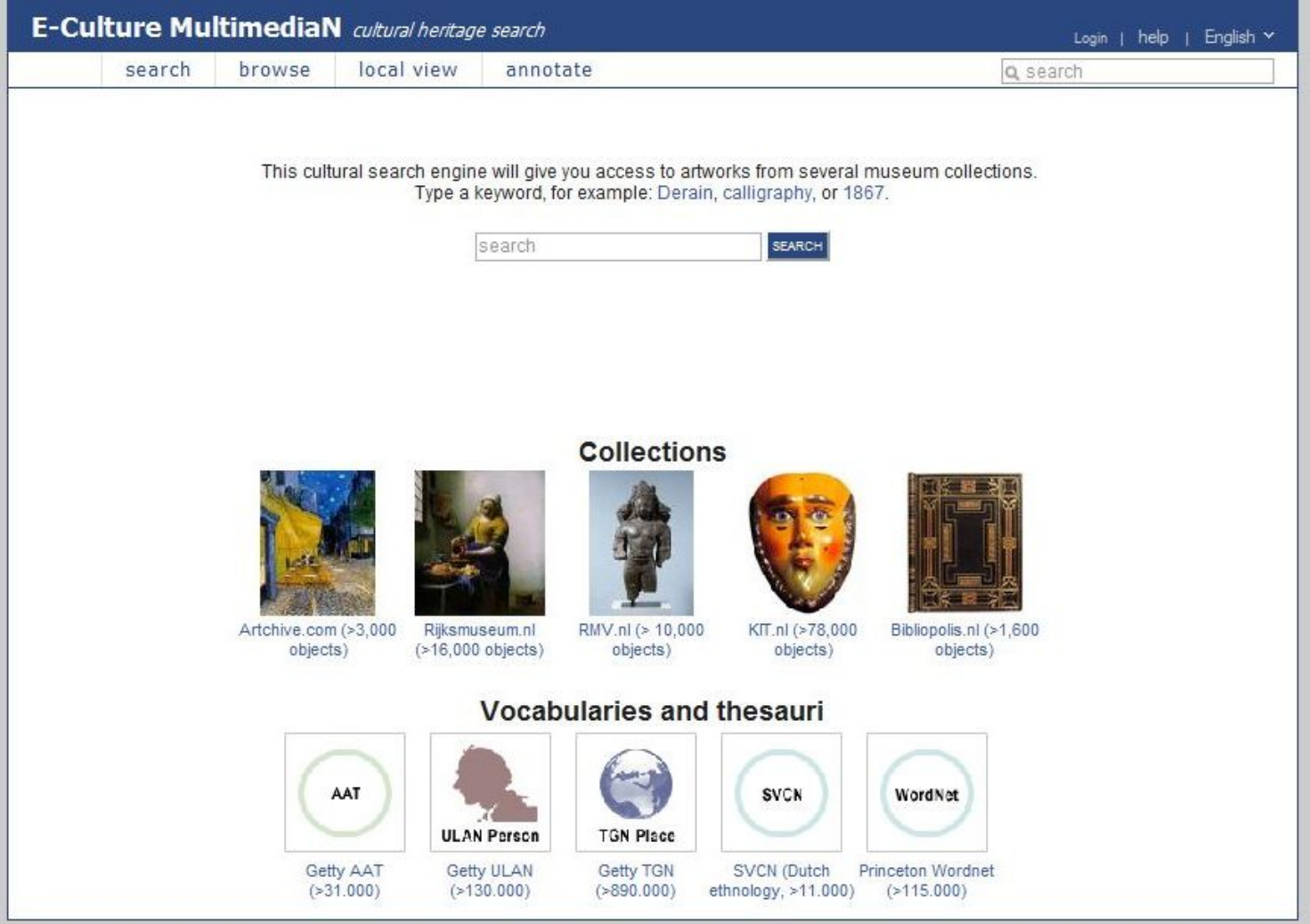
Take Home Message

- Reuse what is there
  - Of course, one could create RDF data manually ...
    ... but that is unrealistic on a large scale
  - Goal is to generate RDF data automatically when possible and "fill in" by hand only when necessary
    - service to get RDF from flickr images
      http://www.kanzaki.com/works/2005/imgdsc/flickr2rdf
    - service to get RDF from XMP
      http://www.ivan-herman.net/cgi-bin/blosxom.cgi/WorkRelated/SemanticWeb/xmpextract.html
- Expose what you make

Cultural Heritage Data Cloud



Professional Art Annotation with Thesauri from the Web

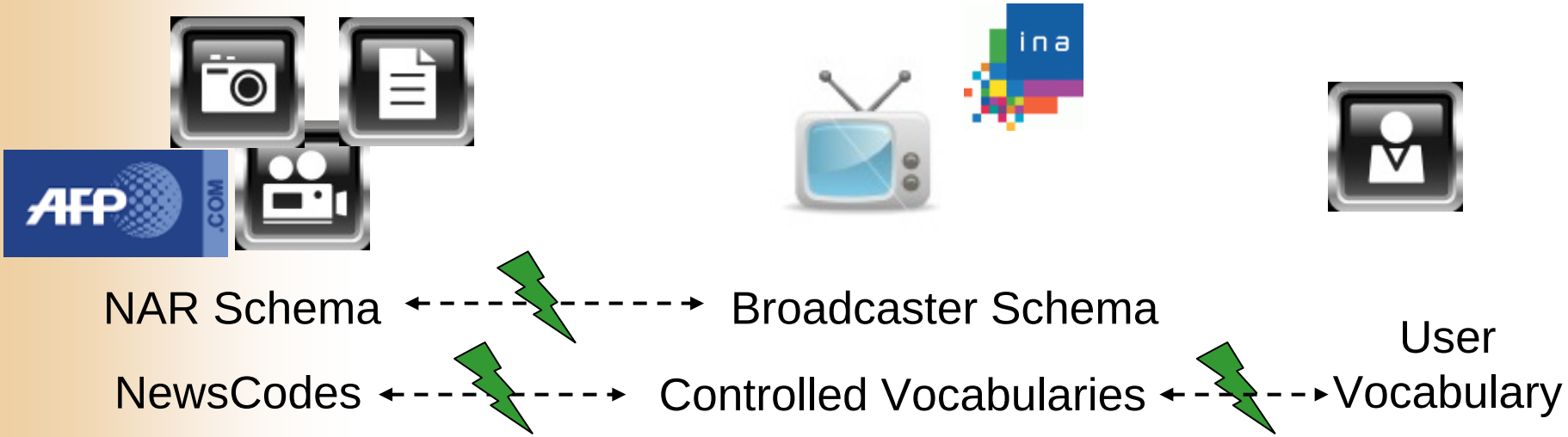

E-Culture MultimediaN cultural heritage search
Login | help | English
search
browse
local view
annotate
search
This cultural search engine will give you access to artworks from several museum collections.
Type a keyword, for example: Derain, calligraphy, or 1867.
search
SEARCH
Collections
Artchive.com (>3,000 objects)
Rijksmuseum.nl (>16,000 objects)
RMV.nl (> 10,000 objects)
KIT.nl (>78,000 objects)
Bibliopolis.nl (>1,600 objects)
Vocabularies and thesauri
AAT
Getty AAT (>31.000)
ULAN Person
Getty ULAN (>130.000)
TGN Place
Getty TGN (>890.000)
SVCN
SVCN (Dutch ethnology, >11.000)
WordNet
Princeton Wordnet (>115.000)
© 2006-2008 E-Culture MultimediaN
Powered by ClioPatria 1.0 alpha 3 (14/04/2008)
W3C RDF

Semantic Browsing of Multimedia News

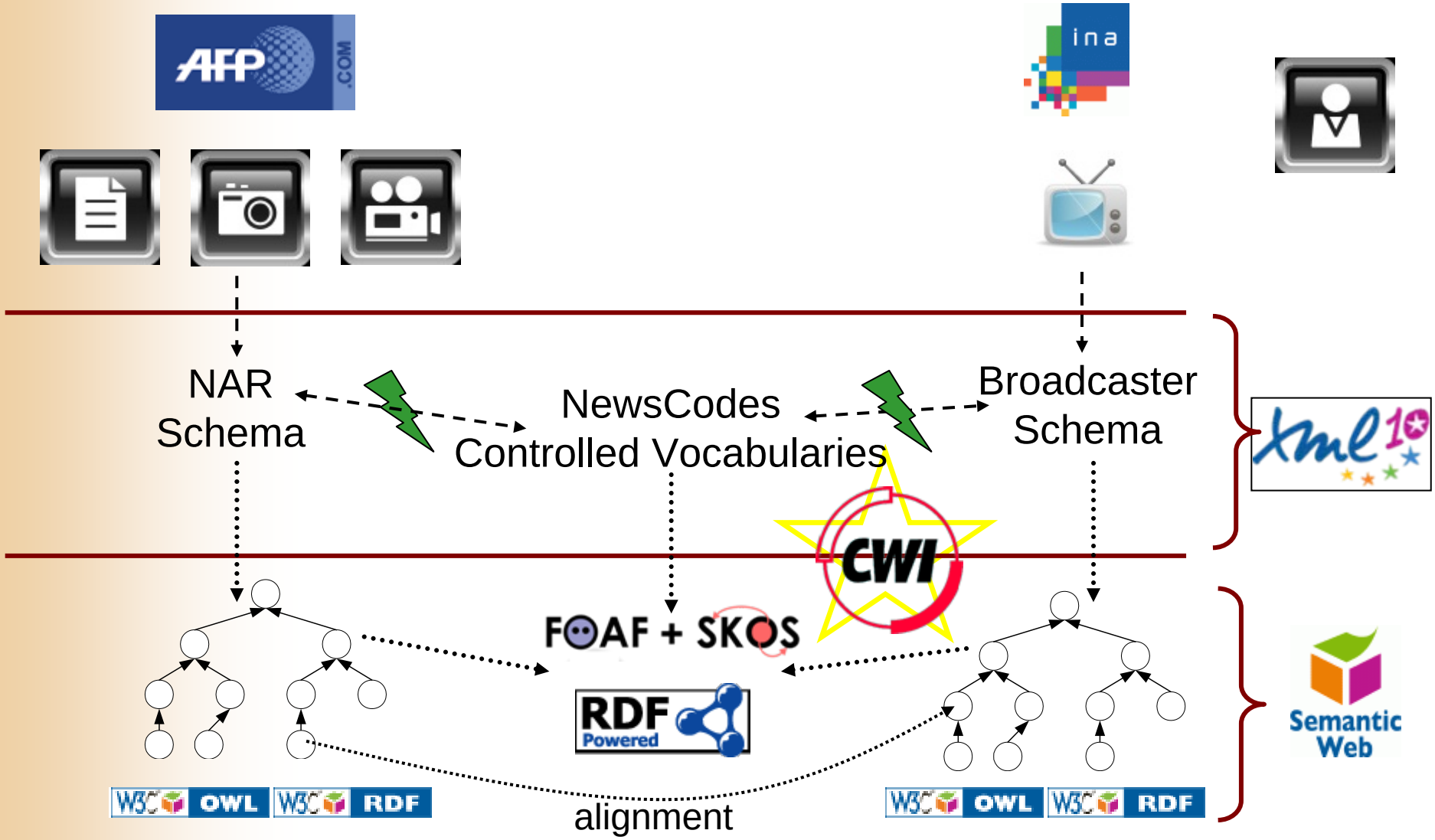
- Goal:
  - Provide en environment for ***searching*** and ***browsing contextualized multimedia news*** information
- Method:
  - Semantic processing of multimedia news items
  - Link news items with knowledge on the web
- Datasets:
  - News stories: Jun/Jul 2006 (en/fr) newsfeed, AFP ± 90,000 items
  - Photos: 2006 football world cup, AFP ± 2,500 items
  - Video: Jun/Jul 2006 TV News (fr), INA ± 30 items

Problems

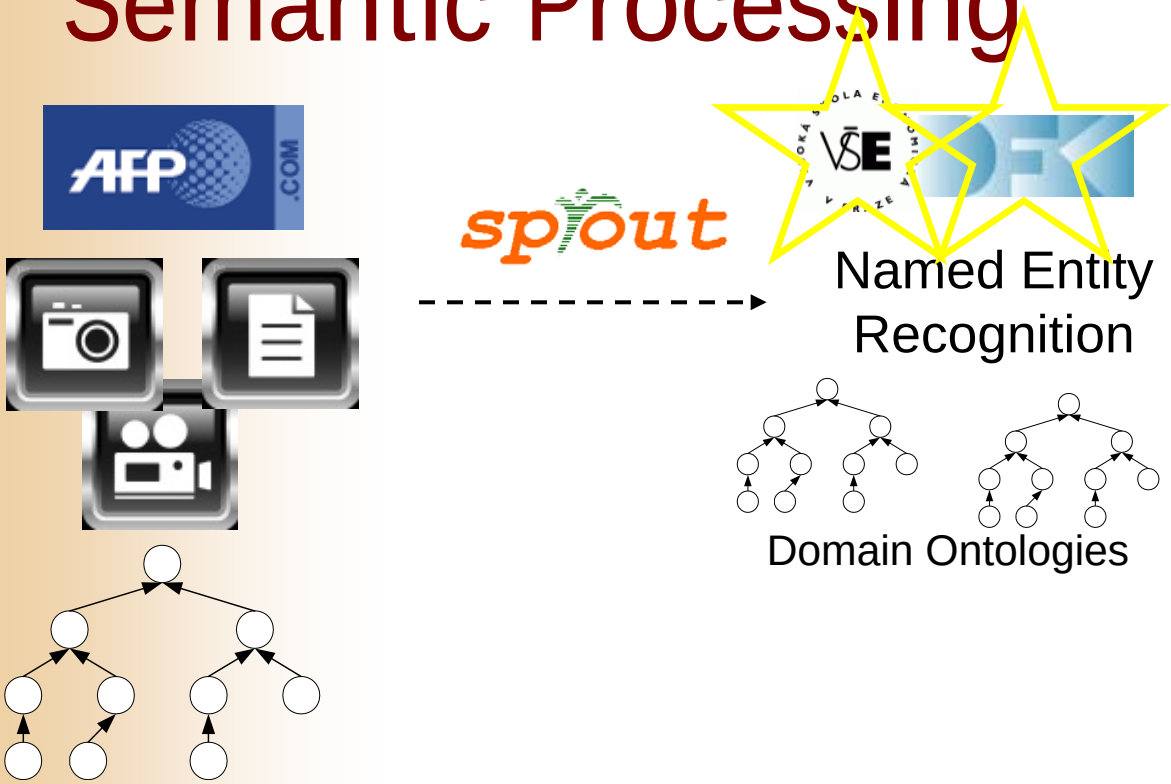
- No integration of media (stories, photo, video)
- Little (or no) context in the news presentation
- Lack of interoperability in the current workflow



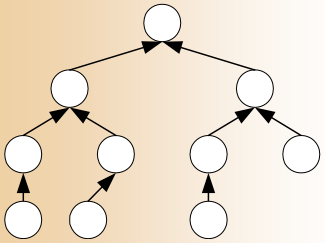
Metadata Conversion



Semantic Processing



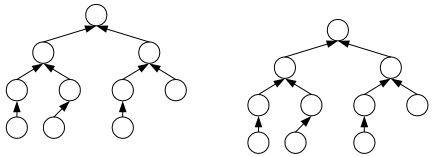
Semantic Processing



NAR Ontology
NewsCodes
Thesaurus

Knowledge Assisted Analysis

Concept Detectors

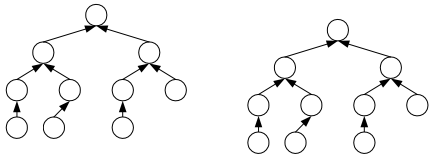


Domain Ontologies

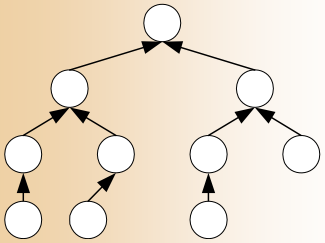
Semantic Processing

Named Entity Recognition

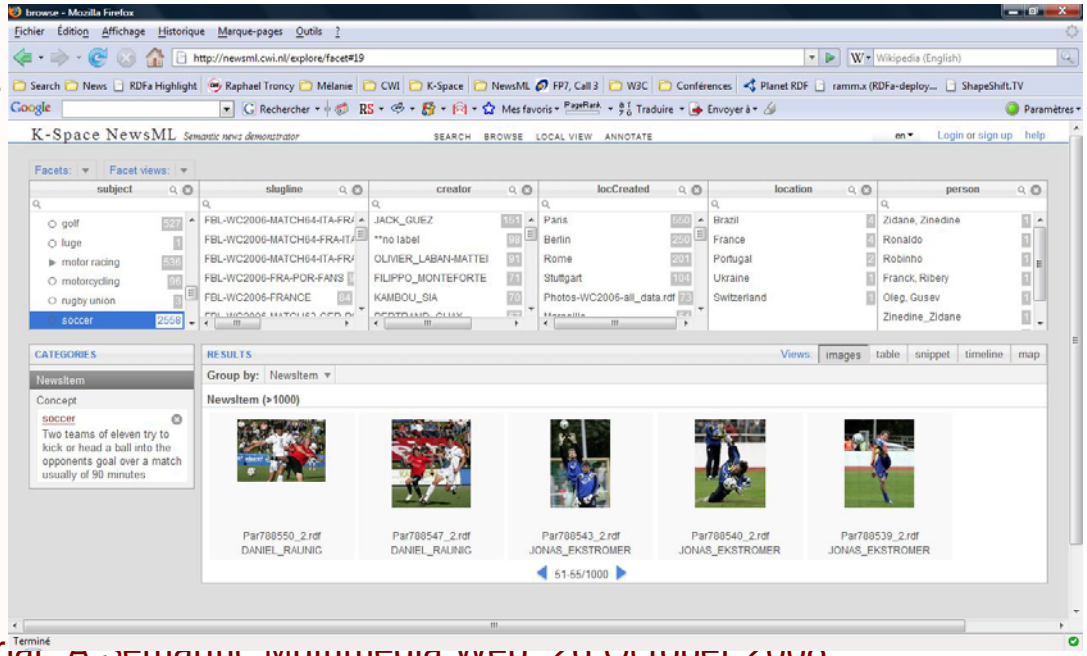
Linked Data



Domain Ontologies



NAR Ontology
NewsCodes
Thesaurus




K-Space NewsML Semantic news demonstrator
Login | help | English
search
browse
local view
annotate
search
This news search engine will give you access to news items kindly provided by AFP
Type a keyword, for example: Amsterdam, Lyon or Zidane
search
SEARCH
AFP
.COM
Powered by ClioPatria 1.0 alpha 2
W3C RDF

Future Work

- Integrate the video browser in the interface
  - Metadata conversion and interoperability
  - Address temporal fragments of the video
  - Visualize videoclips in the interface
- Enrich metadata with visual analysis
  - Apply K-Space concept detectors on visual media
  - Provide new dimensions (facets) for browsing the data
    - Ex: distinguish field images vs stadium and street images with a grass detector for the World Cup dataset
- **Evaluation, Evaluation, Evaluation ...**

Literature

- Michiel Hildebrand, Jacco van Ossenbruggen and Lynda Hardman: */facet: A Browser for Heterogeneous Semantic Web Repositories*. In 5th International Semantic Web Conference (ISWC'2006), pages 272-285, Athens (GA), USA, November 5-9, 2006.
- Raphaël Troncy, Lynda Hardman, Jacco van Ossenbruggen and Michael Hausenblas: *Identifying Spatial and Temporal Media Fragments on the Web*. In W3C Video on the Web Workshop, San Jose (California) and Brussels (Belgium), December 2007.
- W3C Video on the Web Activity, April 2008 http://www.w3.org/2008/01/video-activity.

Thanks for your attention

http://www.cwi.nl/~media/iswc08/