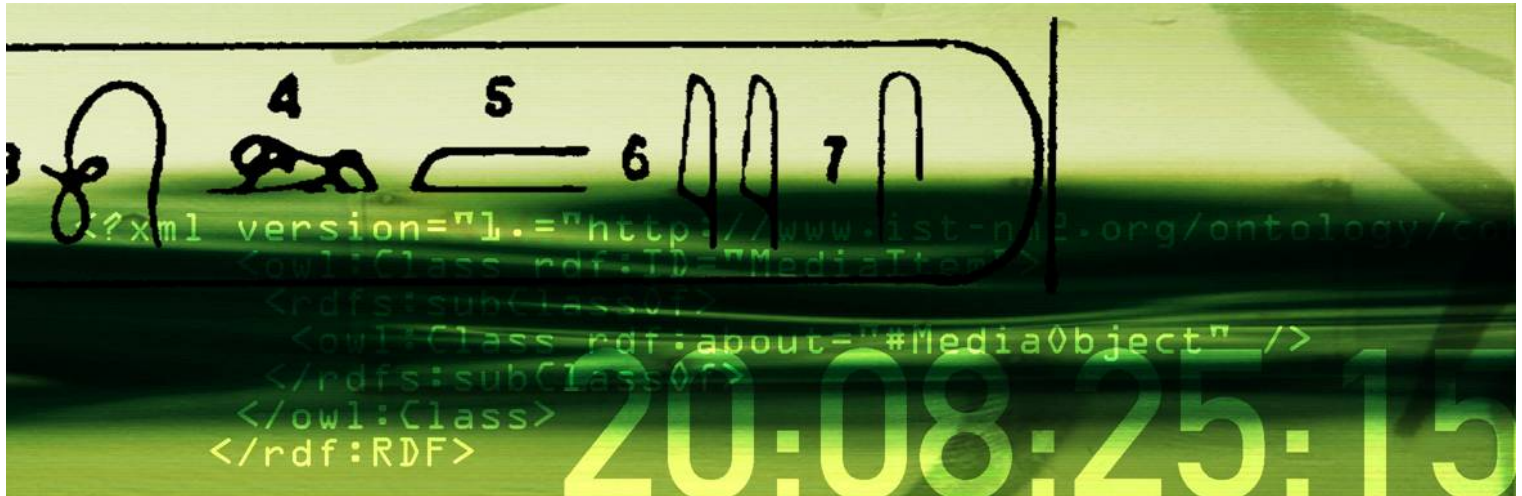


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## Why Real-World Multimedia Assets Fail to Enter the Semantic Web

Tobias Bürger, Michael Hausenblas

*Semantic Authoring, Annotation and Knowledge Markup Workshop (SAAKM)*

2007-10-28



# Agenda

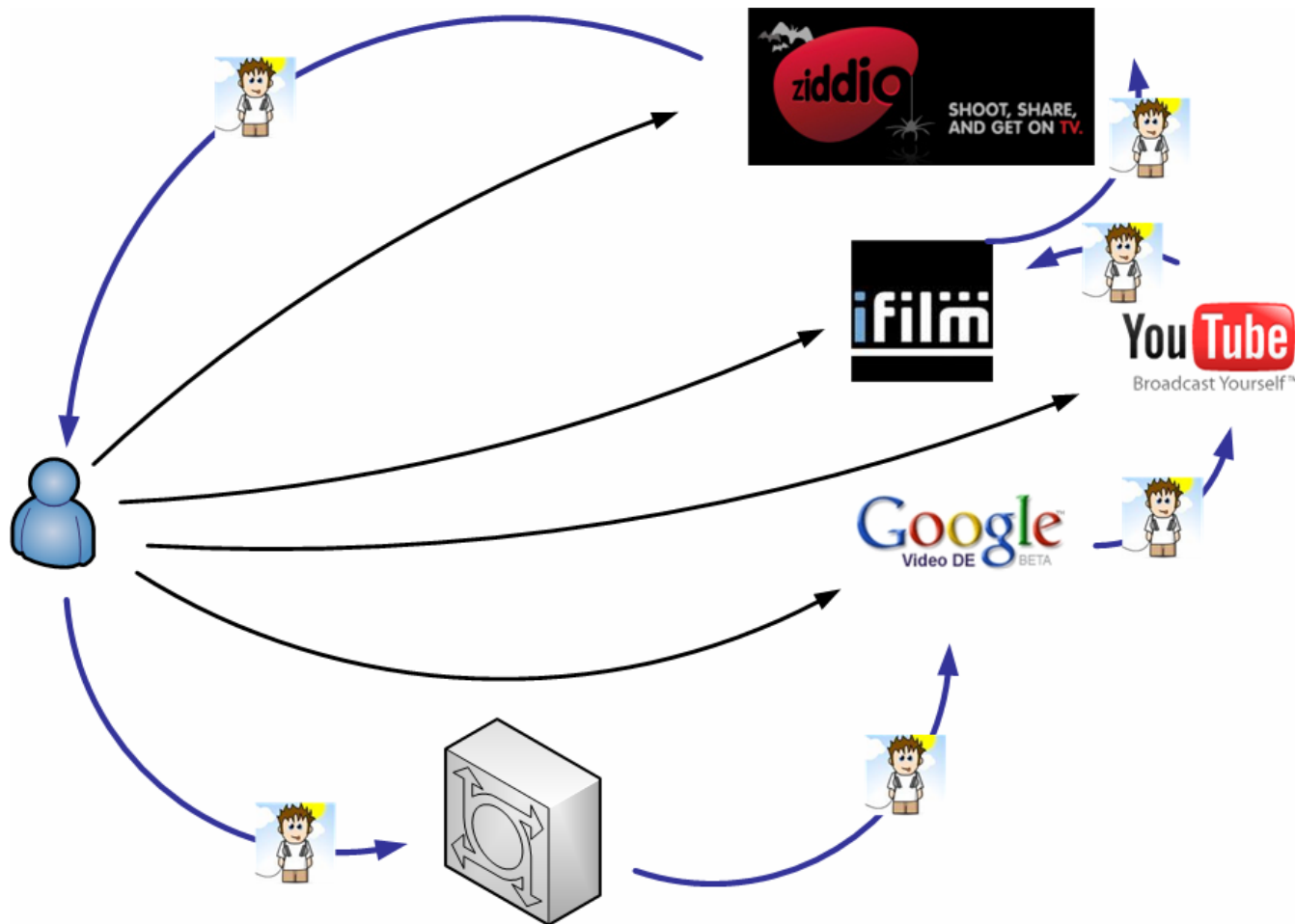
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- Real-World Multimedia Assets
- Multimedia Asset Descriptions
- Environment Analysis: The Semantic Web
- Formal Descriptions of Multimedia Assets
- Conclusions



# Motivation

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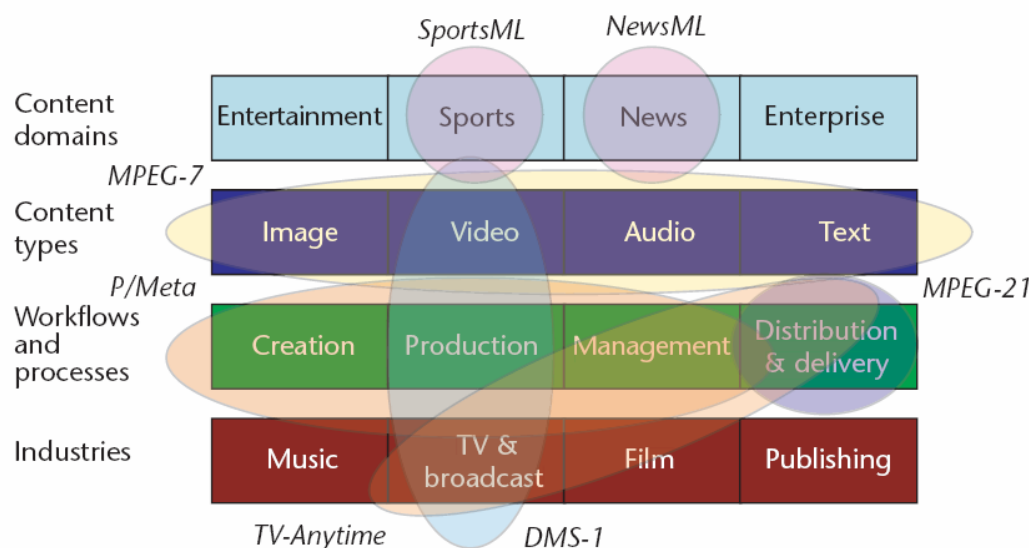




# Real-World Multimedia Assets

- **Multimedia content**
  - modalities (audio, visual, etc.)
  - temporal aspects (segments, parallel stream, etc.)
  - spatial aspects (objects, layout, etc.)
- **Metadata**
  - type (administrative, low-level feature, domain semantics, etc.)
  - scope (global, fine-grained, etc.)

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[Smith, 2006]

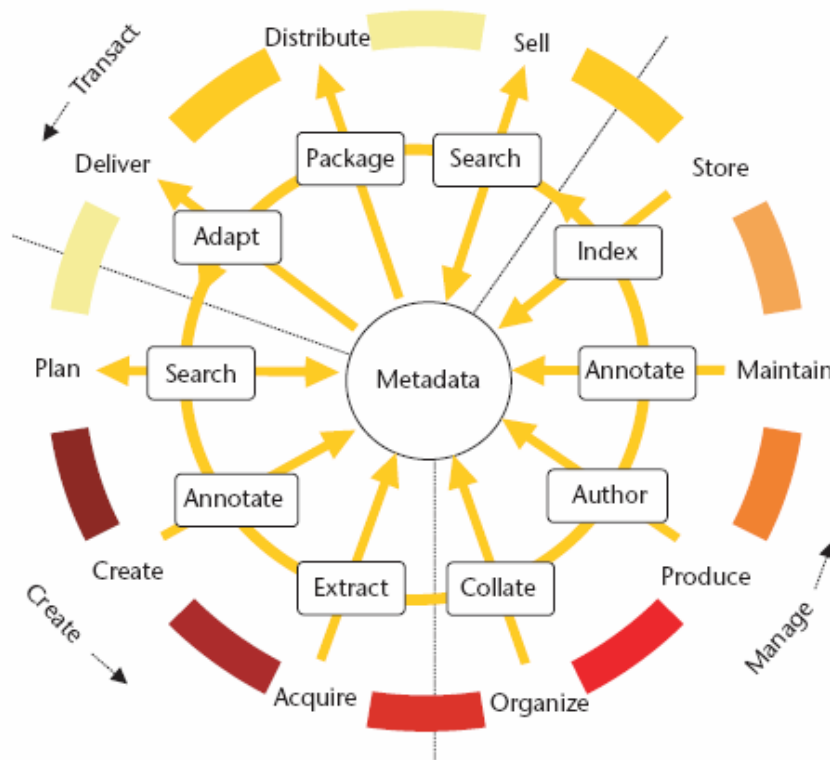


# Real-World Multimedia Assets

## ■ Workflows

- Creation (authoring, interaction design, etc.)
- Consumption (IPR, deployment, transport, etc.)

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[Smith, 2006]



# Real-World Multimedia Assets

- Issues
  - Media understanding (analysis, semantics, etc.)
  - Quality and availability (professional vs. user generated content)
  - Management of large collections (scalability vs. fine grained descriptions)
  - Metadata available for search, summary, etc.?



# Real-World Multimedia Assets

- Applications
  - [Joost](#), [YouTube](#), [Flickr](#), [Last.fm](#), etc.
  - [iFilm](#), [VideoRonk](#), etc.
  - [Twine](#), [MySpace](#), etc.
  - Blogs, Wikipedia, etc.
- Activities
  - W3C
    - [Multimedia Annotation on the Semantic Web TF](#) (SWBPD WG)
    - [Multimedia Semantics XG](#)
    - upcoming: Video WG (→ CfP [workshop](#))
  - Projects (EU and national)
    - aceMedia ([harmonisation of multimedia ontology](#))
    - [SALERO](#)
    - [GRISINO](#)
    - [NM2](#)
    - [K-Space](#)
    - [Live](#)



# Real-World Multimedia Asset Descriptions: Examples

Name	URI	Media Type	MPR <sup>(1)</sup>	FD <sup>(2)</sup>
Flickr	<a href="http://flickr.com/">http://flickr.com/</a>	still images	3,03%	3
YouTube	<a href="http://www.youtube.com">http://www.youtube.com</a>	video	0,52%	1
Last.fm	<a href="http://www.last.fm/">http://www.last.fm/</a>	audio	1,03%	2

(1) MPR ... Size of Metadata Payload [in Bytes]/Total Document Size [in Byte]

(2) FD ... Number of Different Metadata Formats in Use



# Real-World Multimedia Asset Descriptions: Examples

flickr.com/single photo (detailed information)

```

<meta name="keywords" content="photography, digital photography, cameraphones, camera, hobby
photography, photo, digital camera, compactflash, smartmedia, cameras, canon, nikon, olympus,
fujifilm">
<meta name="description" content="Flickr is almost certainly the best online photo management
and sharing application in the world. Show off your favorite photos to the world, securely and
privately show photos to your friends and family, or blog the photos you take with a
cameraphone.">
<meta http-equiv="imagetoolbar" content="no">
<meta name="viewport" content="width=820" />
<rdf:RDF xmlns="http://web.resource.org/cc/" xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
  <Work rdf:about="">
    <dc:title>Ranya in Venice</dc:title>
    <dc:date>2007</dc:date>
    <dc:description></dc:description>
    <dc:creator><Agent><dc:title>mhausenblas</dc:title></Agent></dc:creator>
    <dc:rights><Agent><dc:title>mhausenblas</dc:title></Agent></dc:rights>
    <dc:type rdf:resource="http://purl.org/dc/dcmitype/StillImage" />
    <license rdf:resource="http://creativecommons.org/licenses/by/2.0/" />
  </Work>
  <License rdf:about="http://creativecommons.org/licenses/by/2.0/">
    <permits rdf:resource="http://web.resource.org/cc/Reproduction" />
    <permits rdf:resource="http://web.resource.org/cc/Distribution" />
    <requires rdf:resource="http://web.resource.org/cc/Notice" />
    <requires rdf:resource="http://web.resource.org/cc/Attribution" />
    <permits rdf:resource="http://web.resource.org/cc/DerivativeWorks" />
  </License>
</rdf:RDF>
<a href="http://creativecommons.org/licenses/by/2.0/deed.en" rel="license cc:license"
class="Plain">Some rights reserved.</a>

```



# Real-World Multimedia Asset Descriptions: Examples

last.fm/user page

```
<meta name="description" content="Listen to estranhocore's personal radio station (21,159 tracks played). estranhocore's top artists: The Beatles, Metallica, Today Is the Day, Beastie Boys, Japanische Kampfhörspiele, Anal Cunt. Favourite tags are grindcore, experimental, Sludge. Get your own music profile at Last.fm, the world's largest social music platform."/>
<meta name="microid" content="mailto+http:shal:6f9c4ae6b78f75737d315afc7a74f72fdab04bfa"/>
<p class="first">
    <strong class="fn">Felipe</strong>
    <span class="adr"><a href="/place/Brazil" class="country-name">Brazil</a></span>
</p>
<a href="/user/Zach216/" title="Zach216" class="author vcard"><strong class="userIcon"><span class="fn">Zach216</span> said:</strong></a>
<a href="/user/Belletti/" title="Belletti" class="author vcard"><strong class="userIcon"><span class="fn">Belletti</span> said:</strong></a>
<a href="/user/Synchro%21/" title="Synchro!" class="author vcard"><strong class="userIcon"><span class="fn">Synchro!</span> said:</strong></a>
<a href="/user/Belletti/" title="Belletti" class="author vcard"><strong class="userIcon"><span class="fn">Belletti</span> said:</strong></a>
```



# Multimedia Asset Descriptions: Requirements

- **Representational Issues** (syntax, data model, formal grounding, etc.)
- **Extensibility & Reusability**
- **Multimedia Characteristics and Linking** (granularity, linking, etc.)
- **Authoring & Consumption** (engineering, tools, deployment)
- **Performance & Scalability**



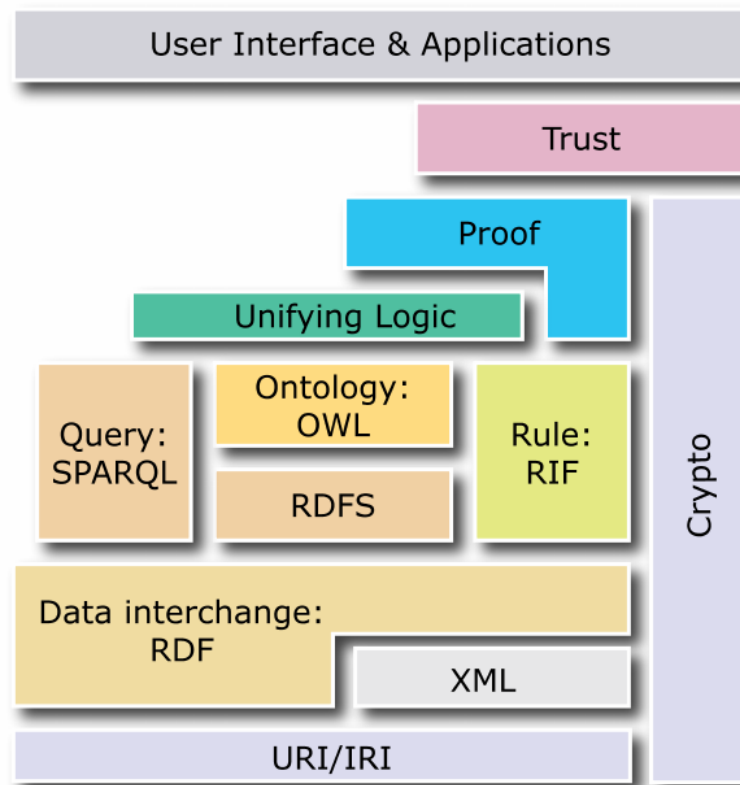
# Environment Analysis: The Semantic Web

- The Semantic Web is a highly distributed system; the identification of resources is based on URIs ([http-range 14 issue](#), [declaration vs. usage](#))
- There is no single, central “registry”; data and metadata are under control of a lot of distinct individuals (companies, standardisation bodies, private, etc.)
- Fundamental building blocks are (named) relations between data allowing the automatic interchange of data;
- Contributor inhabit it; each participant may play different roles at once: consuming content and contributing via comments, links, etc.



# Environment Analysis: The Semantic Web

- Existing standards
  - RDF, the common data model (incl. serialisations such as RDF/XML, RDFa, N3, etc.)
  - SPARQL, GRDDL for access/query
  - RDF(S), OWL or SKOS to classify content, and
  - OWL, WSML, or RIF for describing logical relationships



W3C Semantic Web Stack [<http://w3.org/2001/sw/>]

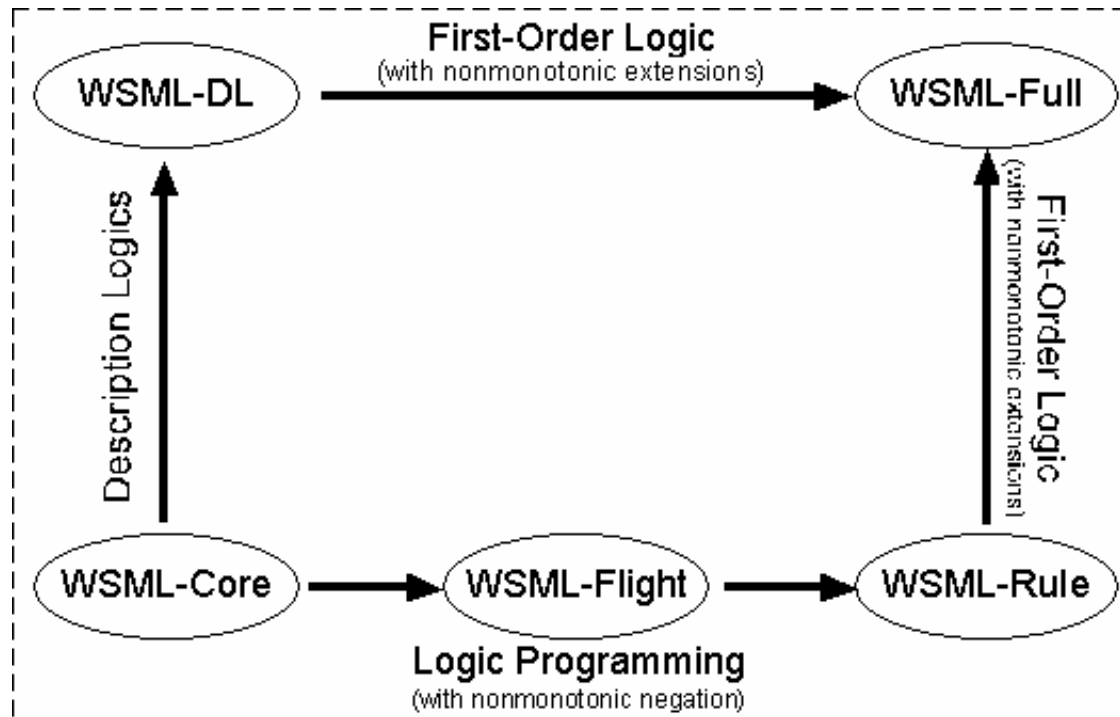


# Formal Descriptions of Multimedia Assets

- **Ontology Languages**
  - Common OL: RDF-S, OWL (upcoming [1.1](#)), WSML
  - Layering Issues (semantics, etc.)
  - Expressiveness, reasoning, etc.
- **Rules**
  - Horn rules
  - PROLOG
  - SWRL, RuleML
  - RIF



- Family of Web Service description and Ontology specification languages according to the WSMO (Web Service Modeling Ontology) model
- Different variants with different logical expressiveness, different language paradigms
- Human readable syntax
- XML and RDF exchange syntax
- Mapping between OWL and WSML



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<http://www.wsmo.org/wsml/>



# Formal Descriptions of Multimedia Assets

Requirement	OWL 1.1 + RIF	WSML-/ OWL- Flight
Formal Description	++	++
Layering of Descriptions	+	+
Interoperability	++	+
Granularity	-	-
Trust & IPR issues	-	-
Functional Descriptions	-	*
Engineering Support	++	+
Datatype Support	+	++



# Formal Descriptions of Multimedia Assets

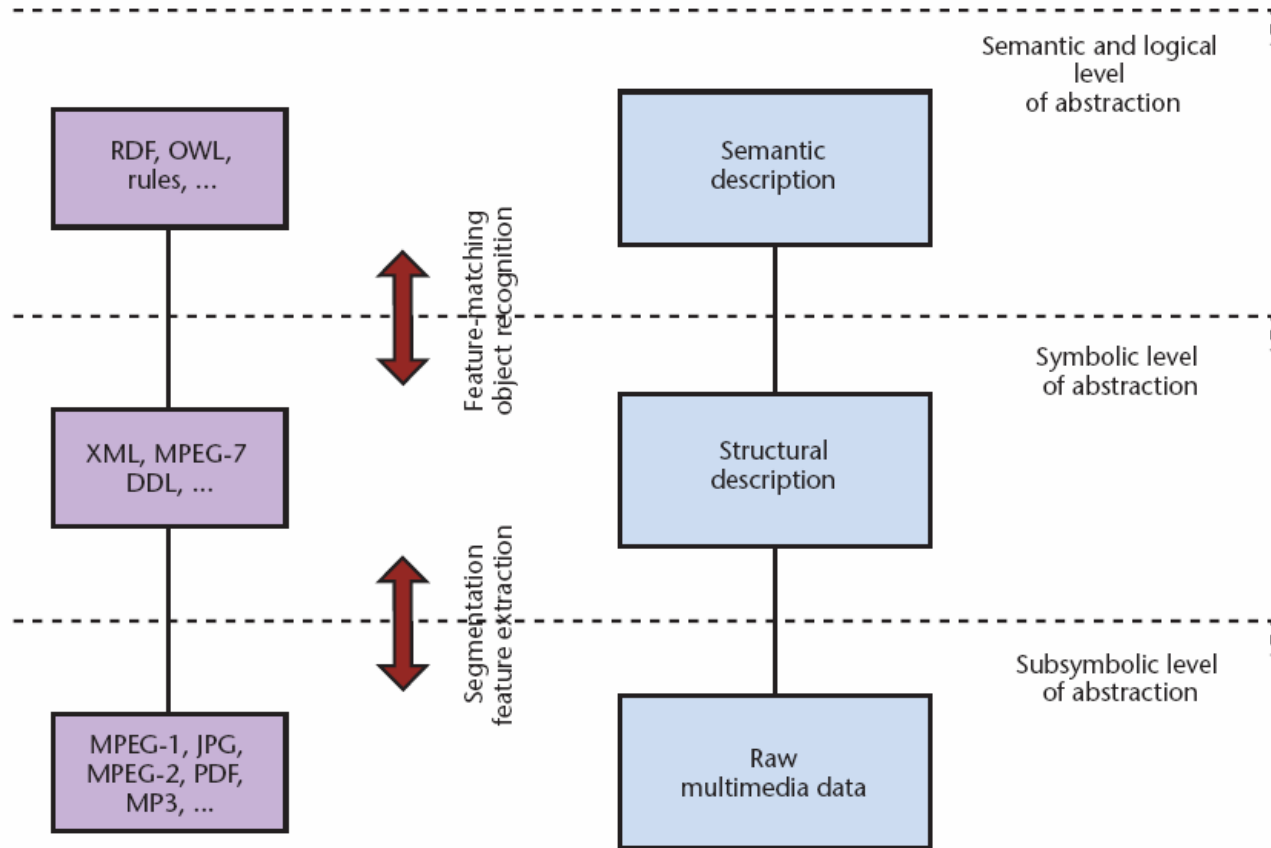
---

- **Formal Description**
- **Layering of Descriptions**
- **Interoperability**
- Granularity
- Trust and IPR
- Functional Descriptions
- Engineering Support
- Data Type Support



# Formality and Layering of Descriptions

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[Stamou2006]



# Formal Descriptions

---

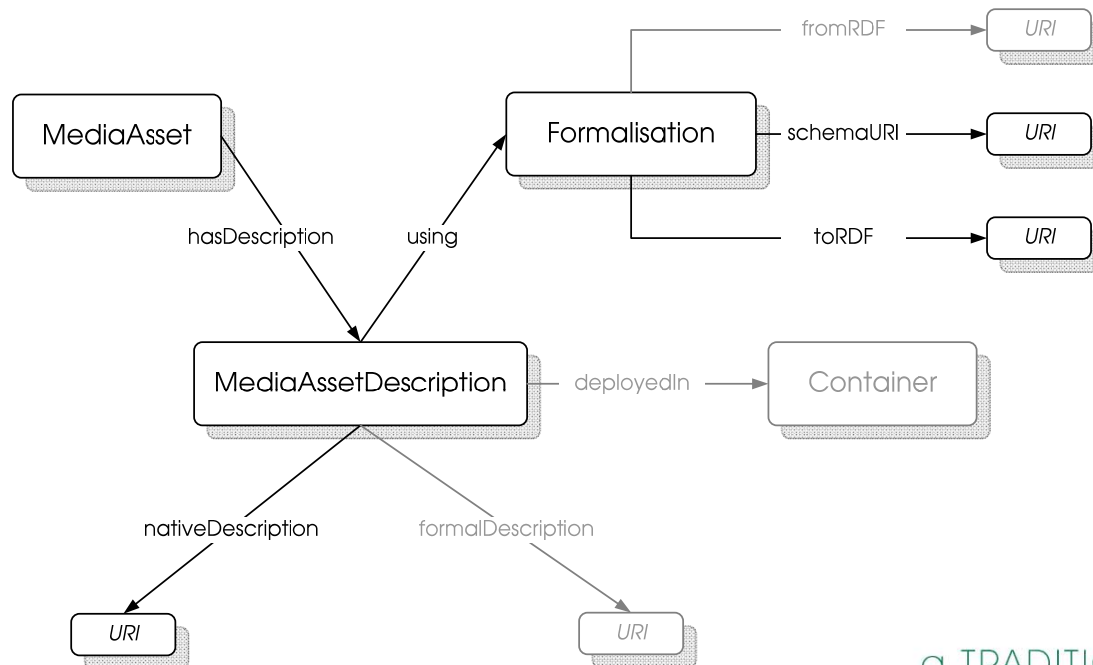
- DL-based languages offer a **rich set of constructors** for defining concepts and relations alike
- Certain **asymmetric** (cf. concept constructor vs. relation constructors) situation
- both OWL and WSML are sound, powerful languages but **WSML** has a more **accurate layering framework**



# Layering of Descriptions

- Deployment issues using XML-based metadata (such as MPEG-7) with RDF-based systems
- Proposal: Use **RDFa for deployment** and a **light-weight vocabulary** describing the formalisation process → *RDFa-deployed Multimedia Metadata ([ramm.x](http://ramm.x))*

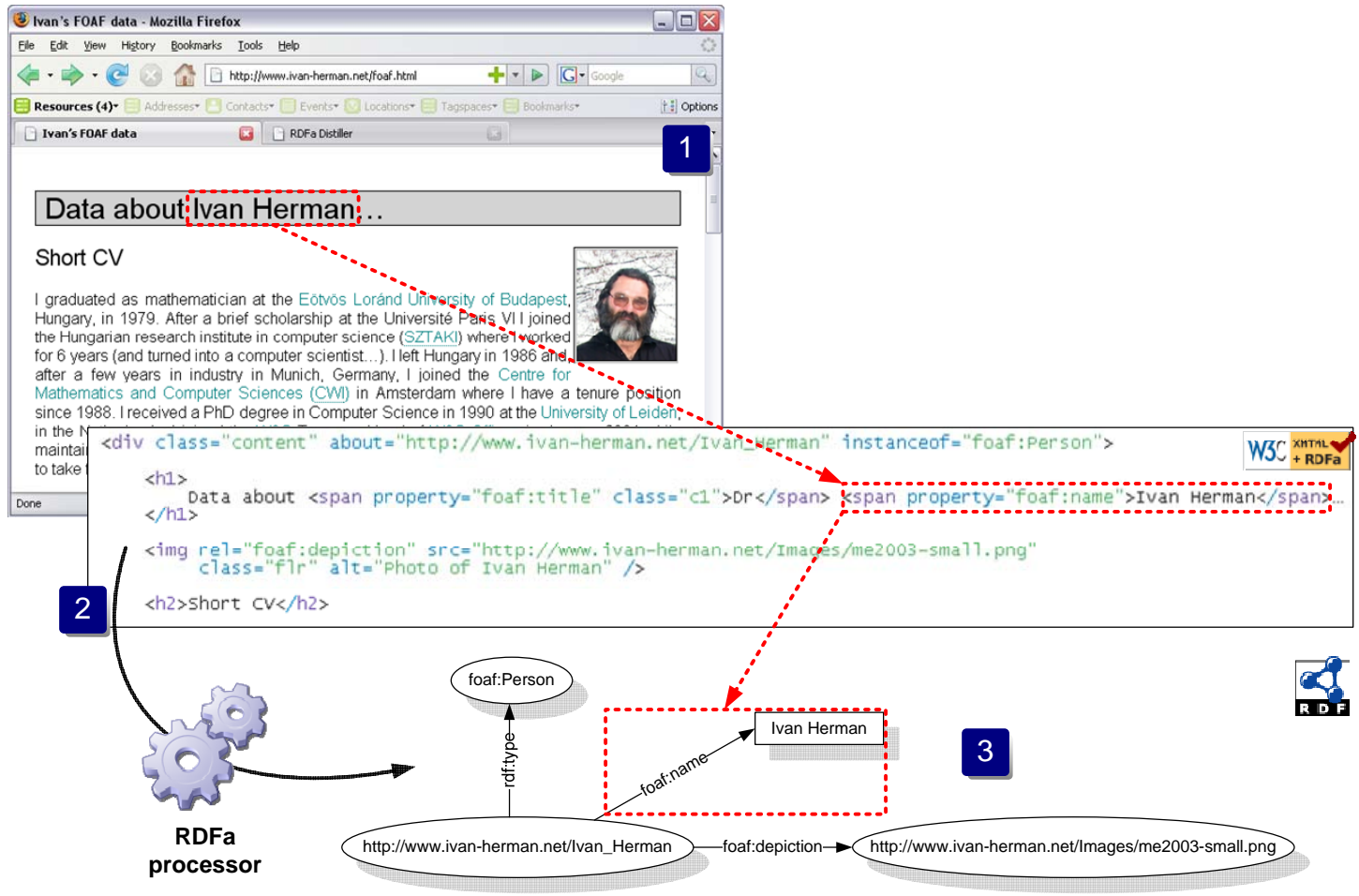
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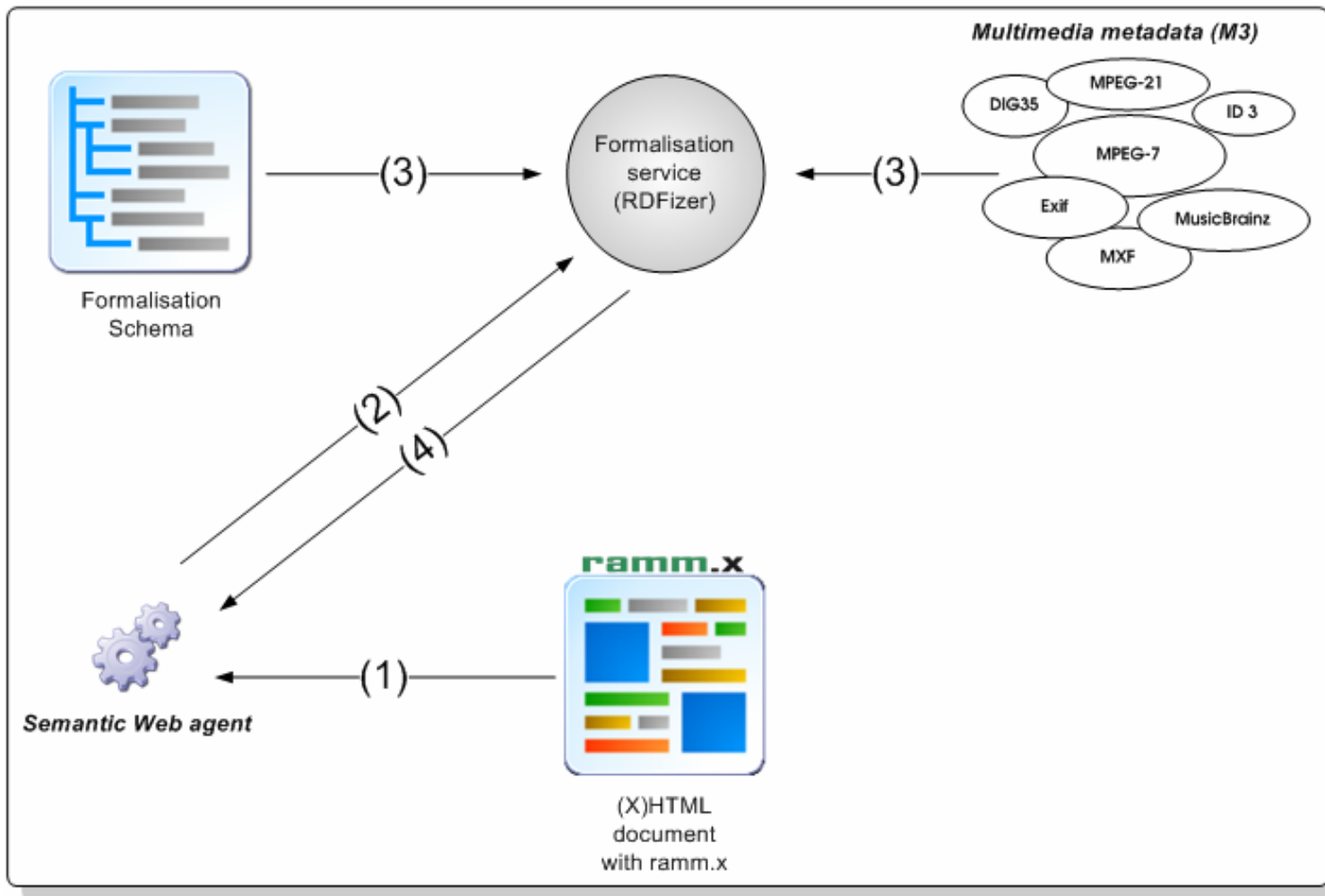
# Layering of Descriptions: ramm.x – RDFa

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# Layering of Descriptions: ramm.x processing

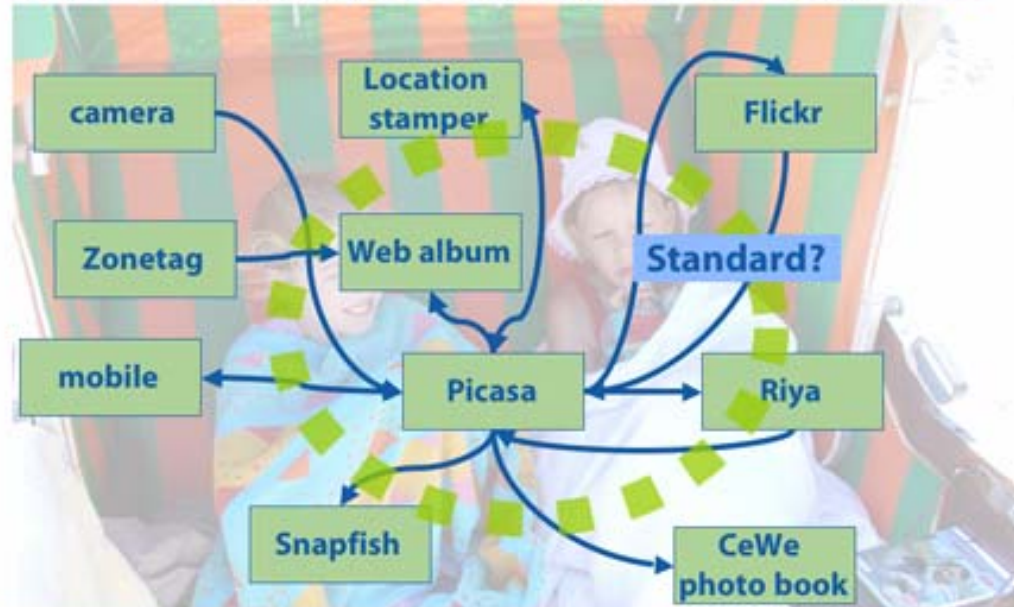


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# Interoperability

## The interoperability problem (not only) in Web 2.0



Credits: Susanne Boll



# Interoperability

- Syntactic Issues (solution: RDF as the common data model)
- Semantic Issues
  - intra-format (e.g. MPEG-7)
  - between different formats
- See also our W3C XG report “[Multimedia Annotation Interoperability Framework](#)”



# Conclusion

- There is a lack of the **critical mass of annotated content** - who is going to do the work (maybe [Luis has an answer](#) ... :) ?
- Current traditional and Web 2.0 based approaches to multimedia annotation are not useful to achieve the goals of the Semantic Web: **Bridging the Semantic Gap**
- **Deployment issues** (ramm.x)



# References

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- [Smith, 2006] Smith, J. R. and Schirling, P. Metadata Standards Roundup. *IEEE MultiMedia*, 13(2), 2006.
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- [Stamou2006] G. Stamou, J. van Ossenbruggen, J. Z. Pan, G. Schreiber, "Multimedia Annotations on the Semantic Web," *IEEE MultiMedia*, 13(1), 2006.