Web 2.0

Lecture 7: Annotations

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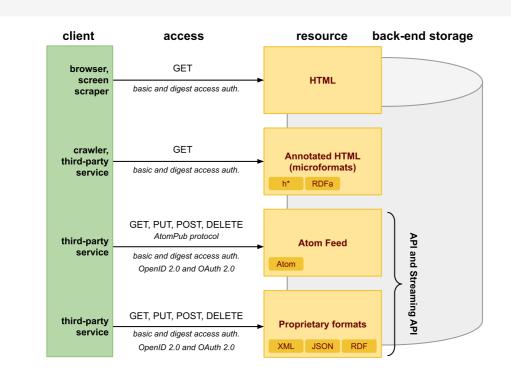




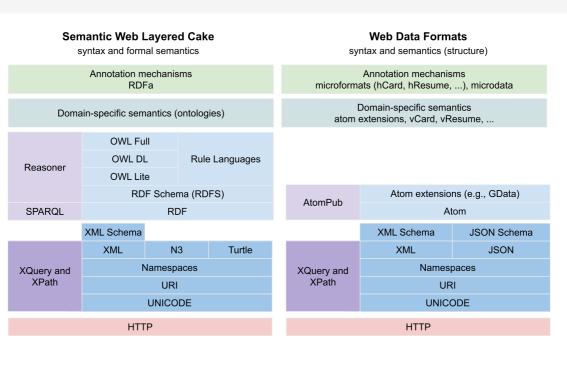


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Data on the Web



Data Syntax, Structure and Semantics



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- Microformats
- Microdata

Overview

- RDF and RDFa
- OpenGraph Protocol

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Microformats

What is a microformat

- How to embed data in HTML, XHTML, Atom, and XML
 - → data: vCard, vResume, vRecipe
 - → micorformat: hCard, hResume, hRecipe
- Browsers display HTML, machines process data
- Microformat vs. POSH format
 - → POSH is same as microformat but data is not a standard format

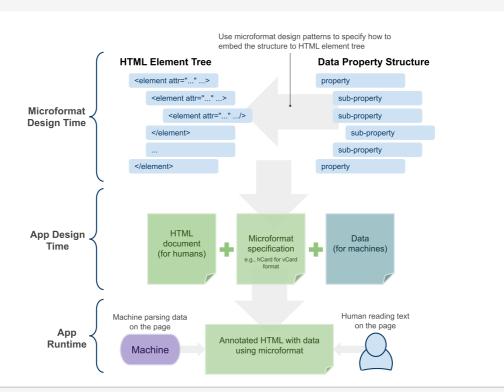
Difference to Atom feeds

- Microformats require only a single HTML document
 - → clients run GET to retrieve all data (human readable and machine readable)
- No significant increase of the size of document
- No requirements on data representation
 - → can be in any representation
 - → should be defined in a well-established format spec
 - \rightarrow a microformat spec needs to be defined for every data

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Microformats Usage



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Principles

- Design Patterns
 - How to embed data in HTML elements or elements' attributes
 - Applied for a particular microformat specification
- Follow semantics of (X)HTML elements
 - Use the most appropriate semantic HTML element
 - \rightarrow if not available, use or <div>
- XHTML Metadata Profiles (XMDP)
 - Definition of metadata of a microformat in (X)HTML page
 - Machine and human readable, not a Web standard
 - Uses profile attribute on <head> element
 - Is deprecated in HTML5
 - Is an analogy to a namespace but not really a namespace!
 - See specification

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vCard Example

Describes contact information

```
PROPERTY:value1;value2;...;valueN
PROPERTY:SUBPROPERTY1="value";...SUBPROPERTY2="value";...

BEGIN:VCARD
VERSION:4.0
N:Vitvar;Tomas;Ing.;Doc.;PhD
FN: Doc. Ing. Tomas Vitvar, Ph.D.
ORG:Czech Technical University in Prague
TITLE:Associate Professor
PHOTO:http://vitvar.com/img/tomvit-portrait.jpg
TEL;TYPE="work,voice";VALUE=uri:tel:+420-2-334-334
TEL;TYPE="work,voice";VALUE=uri:tel:+420-2-443-554
ADR;TYPE=work;LABEL="Thákurova 6, Praha 6, Czech Republic"
:;;Thákurova 6;Praha 6;Czech Republic
EMAIL:tomas.vitvar@fit.cvut.cz
END:VCARD
```

- -N-a structured representation of the name (person/organization)
- − FN − formatted name string
- **− ORG** − name of the organization and associated units
- − TITLE − *job title, functional position*
- LABEL Addressing label

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Design Patterns Rules

class-design-pattern

- semantic meaning indicated on HTML content by class attribute

value-class-pattern

- embedding data structure when a property has subproperties (vCard fragment is TEL;TYPE=WORK:+43 554 554 556)

 sometimes value needs to be split into multiple pieces as follows (note that dialing +430554554556 is not valid)

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Design Patterns Rules (cont.)

include-pattern

- to include a subset of data from one area of a page to the other area of the same page (same data to be reused by multiple microformats)
- cannot be used to include content from other URLs!
- Example, a verbose hCard on a page:

- Reviews on the same page:

(parser replaces the whole <a> element including its content)

hCard Microformat Example

• hCard profile, options:

- Example specific rules
 - vCard properties that do not make sense for hCard
 - → e.g., NAME, PROFILE, SOURCE, PRODID, VERSION
 - → publishers should not use them, parses should ignore them
 - -if fn == org (i.e, class="fn org")
 - \rightarrow hCard is a contact for a company, organization or a place
 - → N (person's name) property should not be used or be the empty string
 - if fn != org AND fn contains two words
 - → fn *is split into* given-name *and* last-name
 - \rightarrow sub-properties of N peoperty (by a whitespace or a comma)
 - see a complete specification in

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Known Issues

- Name conflicts and scalability
 - More microformats on a page may cause naming conflicts
 - → no namespace support, microformats do not scale
 - → functionality of tools may break when data formats change
- No formal semantics, no reasoning support
 - How important is it?
 - Semantics defined in XMDP profiles
 - → no formal basis though machine processable
 - \rightarrow lack of compatibility with RDF/RDFa
 - \rightarrow See for details.

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Uptake and some statistics

- Two billion pages annotated with hCard
- Google Rich Snippets
 - Content indexing with microformats, microdata, RDFa
 - \rightarrow see
 - \rightarrow 94% of the rich snippets data uses microformats

Pizza Pizzas Recipe: Alton Brown: Food Network

www.foodnetwork.com → Recipes → Italian

★★★★ 229 reviews - 24 hrs 45 mins

Food Network invites you to try this Pizza Pizzas recipe from Alton Brown.

- Firefox 3
 - Native API to parse and process microformats in JavaScript
 - see
- Facebook
 - hCalendar and hCard for events
 - see

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Overview

- Microformats
- Microdata
- RDF and RDFa
- OpenGraph Protocol

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Microdata

- Part of HTML5 specification
 - Google is the main driver (rich snippets support)
 - spec includes:
 - → Microdata vocabularies
 - → Microdata Global Attributes
 - see W3C working draft
- Idea similar to microformats, but
 - items (collection of properties) have ids (URIs)
 - Microdata vocabulary, a formal description of terms
 - → http://schema.org is becoming a standard
 - \rightarrow e.g., Event, Organization, Person, Product, Review
 - → Created and supported by Google, Microsoft, Yahoo!
 - \rightarrow have RDF representation too
 - data formats not directly based on formats such as vCard, vCalendar, they define its own "simple" vocabulary

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Global Attributes

- Attributes on any HTML element
- Itemscope
 - identifies an element which descendants contain some properties
 - 1 | <div itemscope>...<div>
- Itemtype
 - pointer to a vocabulary that describes the item and its properties http://www.data-vocabulary.org/Person/
- Itemid
 - global identifier of the item (URI)
 - such as a book's ISBN in urn schema, urn:isbn:0-330-34032-8
- Itemprop
 - a term from the vocabulary which value is in the element's content
 - 1 | Johny
- Itemref
 - a reference to other item within the same document
 - 1 | <div itemscope itemref="myprofile"/>

Example

Non-annotated HTML text

Annotated HTML text with microdata

```
<p
```

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Microformats vs. Microdata

Scalability

- Microformats specs are complicated because of specific rules tailored for vCard, vResume, etc.
- Microdata can be easily extensible, when new property occur they can be added witout breaking conformance of tools

Standards-based

- Microdata is a standard part of HTML5 effort
- Microformats is an "ad-hoc" group of ethusiastic people, though widely supported
 - → Strength is in underlying well-established formats
- Microdata have links to Semantic Web efforts and Linked Data (via RDF), microformats not

Overview

- Microformats
- Microdata
- RDF and RDFa
 - Structured Property Values
 - Encoding RDF in XML (RDF/XML)
 - RDF-in attributes (RDFa)
- OpenGraph Protocol

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RDF

- Resource Description Framework (RDF)
 - Resource as defined in Web architecture
 - → usually anything that can be conveyed electronically
 - \rightarrow plus abstract concepts that have no representation
 - RDF is at the bottom of Semantic Web stack of languages
- References
 - W3C Recommendations:
 - \longrightarrow
 - \rightarrow

Meaning of Data in XML

• A resource with URI http://www.vitvar.com/data-about-me

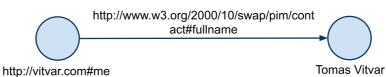
- No explicit meaning of terms
 - person, name, mailbox, ... are terms defined in namespace
 http://example.org/people but there is no URI assigned to them
 this does not work here: http://example.org/people#name
- No explicit meaning of relationships
 - a person <u>has</u> name <u>with value</u> Tomas Vitvar (→ Tomas Vitvar <u>is a person</u>), this person <u>has</u> mailbox <u>with value</u> tomas@vitvar.com (→ tomas@vitvar.com <u>is a mailbox</u>), etc.
 BUT this person lives?, works?, was born?, ... in a city Innsbruck
- Need for a language to describe statements
 - → Resource Description Framework

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RDF Statement

- RDF Tripple: **subject predicate object**
 - a thing the statement describes (subject)
 - a specific property of the object (predicate)
 - a value of the property (subject)

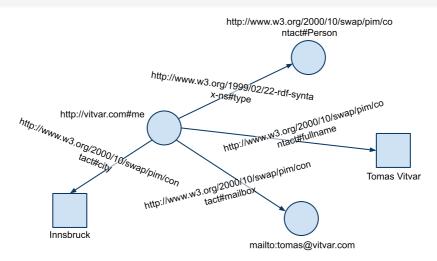


- Representation of statements
 - using a graph notation
 - → nodes are subject and objects (rectangles are literals)
 - \rightarrow arcs are predicates
 - identifiers to identify subject, predicate, object
 - → URI references (URIrefs)
 - machine processable language
 - → RDF serializations in triples, RDF/XML, N3, Turtle notations

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Meaning of Data in RDF



- individuals: Tomas Vitvar identified by http://vitvar.com#me
- kinds of things: Person identified by #Person
 - properties of those things, e.g., mailbox, identified by #mailbox
 - values of those properties, e.g. mailto:tomas@vitvar.com
 - + values of other data types such as strings, integers, dates, etc.

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References in statements

- URI identifies
 - network-accessible things (electronic documents) $\rightarrow URL$
 - things that are not network-accessible, such as human beings
 - abstract concepts that do not physically exist, such as "fullname"
 - RDF uses <u>URI references</u> to identify subjects, predicates, objects
- URI references (or URIref in short)
 - URI with an optional fragment identifier
 - http://www.w3.org/2000/10/swap/pim/contact#fullname
 - RDF resource is anything that can be identified with URIref
 - a set of URIrefs is called a **RDF vocabulary**
- Literals
 - character strings to represent property values
 - can only be assigned to objects in RDF (in other words, objects can be either URIrefs or literals)
 - → they cannot be assigned to subjects or properties
 - two kinds: plain literals and typed literals

RDF Serializations – Triples Notation

- Triples notation
 - list of all triples from RDF graph
 - the full triples notation requires that URI references be written out completely (in angled brackets)
 - very long documents, some URIrefs need to be repeated
 - 1 | <http://www.example.org/index.html> <http://purl.org/dc/elements/1.1/creator>
- Simplicity for examples
 - QNames without angle brackets
 - Common prefixes and namespaces:

```
rdf: http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs: http://www.w3.org/2000/01/rdf-schema#
dc: http://purl.org/dc/elements/1.1/
ex: http://www.example.org/
ext: http://www.example.org/terms
xsd: http://www.w3.org/2001/XMLSchema#
```

example

```
1 | ex:index.html dc:creator "Tomas" . ex:index.html dc:language "en" .
```

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Kinds of Things

- Property rdf:type
 - defines a type of a resource
 - 1 | ex:me rdf:type ext:Person .
 - corresponds to "is a member of" relationship
 - ext:Person understood as a class
 - → however, RDF language does not define its semantics
 - → RDF Schema language provides additional vocabulary for class semantics

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Overview

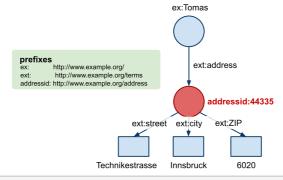
- Microformats
- Microdata
- RDF and RDFa
 - Structured Property Values
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Structured Property Values

- Consider real-world complex structures
 - Tomas works at Technikestrasse 21a, 6020 Innsbruck, Austria
 - One option to describe this using RDF:
 - 1 | ex:Tomas ext:works "Technikestrasse 21a, 6020 Innsbruck, Austria" .
 - But this is not often sufficient, such statements usually need to be recored as a structure, i.e. a street, a city, ZIP, ...
 - ightarrow describe Tomas's **address as a resource** that has a URIref

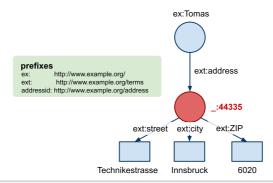


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Blank Nodes

- Does every structure need to have a URIref?
 - When referenced from outside of the graphs yes, otherwise not
- Blank nodes
 - Nodes that do not need to be referenced from outside of the graph
 - No need for URIref, they are only used within the graph
- Blank node identifier
 - local within a graph: _:LocalID, must be unique within the graph
 - two blank nodes in two graphs with the same IDs are not the same!



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Modeling with Blank Nodes

- N-ary relationships
 - In fact, a blank node is a way to model an n-ary relationships
 - A blank node breaks down an n-ary to binary relationships
 - 3-ary relationship between Tomas and (Technikestr, Innsbruck, 6020)
 Tomas Technikestr, Tomas Innsbruck, Tomas 6020
- Unidentified things
 - not always good to use URIs such as e-mails to identify people
 - \rightarrow e-mails may change, disappear, ...
 - → sometimes no need to assign unique ids to people
 - Example
 - → the author of the book is mailto:tomas@vitvar.com, as oposed to it is <u>a person</u> with e-mail mailto:tomas@vitvar.com
 - A person is an **abstract concept** that can be modeled using a blank node

```
ex:book23 ext:author _:author1 .
    _:author1 ext:email <mailto:tomas@vitvar.com .
    _:author1 ext:name "Tomas Vitvar" .
    _:author1 rdf:type ex:person .</pre>
```

Untyped and Typed Literals

- Untyped Literals
 - No information about how to interpret a value of the plain literal
 - a programme must have a knowledge how to interpret the value
 - 1 | ex:person1 ext:age "24" .
- Typed literals
 - pairing a string with a URIref that identifies a particular datatype (xsd: refers to http://www.w3.org/2001/XMLSchema#)
 - 1 | ex:person1 ext:age "24"^^xsd:integer
 - RDF does not define its own data types (except rdf:XMLLiteral)
 - → no need to map external to native ones
 - RDF uses external data types defined in XML Schema
 - → not all are suitable, only basic ones such as string, integer, date

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Basic Rules

- Representation of RDF in XML language
- Example RDF triple

```
- a page index.html was created on August 16, 1999
1 | ex:index.html ext:creation-date "Aug 16, 1999" .
```

- RDF/XML representation
 - We can interpret a RDF statement as:
 a description that is about a <u>subject</u> of the statement
 - XML element (QName) of the description is the **predicate**
 - a value of the element is the **object**

- URIrefs must be written out when in attribute values

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Multiple Statements and Typed Literals

• Example RDF triples

```
ex:index.html ext:creation-date "Aug 16, 1999".

ex:index.html dc:language "en".

ex:index.html ext:rank "3"^^xsd:decimal.

ex:index.html dc:creator <http://www.vitvar.com#me>.
```

RDF/XML representation

```
<?xml version="1.0"?>
     <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"</pre>
         xmlns:ext="http://www.example.org/terms/">
         <rdf:Description rdf:about="http://www.example.org/index.html">
              <ext:creation-date>August 16, 1999</ext:creation-date>
8
              <dc:language>en</dc:language>
9
                rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">
11
                    3</ext:rank>
12
              <dc:creator rdf:resource="http://www.vitvar.com#me"/>
13
         </rdf:Description>
     </rdf:RDF>
14
```

 a description may combine all properties for a single subject but there also can be a description for every subject (such representations are the same)

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Blank Nodes

Example RDF triples

```
1    ex:index.html    ext:editor    _:editor332 .
2    _editor332    ext:name    "Tomas Vitvar" .
3    _editor332    ext:homepage    <a href="http://www.vitvar.com"></a>.
```

RDF/XML representation

```
<?xml version="1.0"?>
   <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
       xmlns:ext="http://www.example.org/terms/">
4
       </rdf:Description>
9
       <rdf:Description rdf:nodeId="editor332">
10
          <ext:name>Tomas Vitvar<ext:name>
11
          <ext:homepage rdf:resource="http://www.vitvar.com"/>
12
       </rdf:Description>
13
   </rdf:RDF>
14
```

- A node with id editor332 can be referenced from within the RDF graph, not outside of the RDF graph

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RDFa

- Embedding RDF data in XHTML
 - XHTML only, is extensible, HTML not
 - → RDFa defines a number of extension attributes
 - Parses may recognize RDFa annotations in HTML too
 - RDFa is generic to embed arbitrary RDF data
 - → however, only standard (commonly agreed) vocabularies make sense
- W3C Recommendations:

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Property and Object Values as Resources

- Creating a property using rel attribute
 - assume, following text is at http://blog.vitvar.com/?p=107

```
Content on this page is licensed under

a xmlns:ext="http://www.example.org/terms"
rel="ext:license"
href="http://creativecommons.org/license/by/3.0">
a Creative Commons License - attribution
</a>
```

- This corresponds to the RDF triple

→ When the subject is not explicitly stated, then the subject is the URL of the XHTML page being described

Property and Object Values as Literals

- Creating a property using property attribute
 - RDFa defines a property extension attribute
 - assume, following text is at http://blog.vitvar.com/?p=107

- This corresponds to the RDF triple

```
1 | <http://blog.vitvar.com/?p=107> dc:creator "Tomas" .
```

- Typed literals
 - RDFa defines a datatype extension attribute

- Alternative content
 - RDFa defines content extension attribute
 - \rightarrow replaces the object value that is in the element's value

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Subject

- Creating a subject using about attribute
 - RDFa defines about extension attribute
 - Let the following text is at http://blog.vitvar.com/?p=107

- This corresponds to the RDF triple
 - 1 | <http://blog.vitvar.com/p/107> dc:creator "Tomas".
- Also possible to use multiple subjects on a single page

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Types and Blank Nodes

- Types
 - RDFa defines typeof extension attribute
 - → corresponds to rdf:type property
- Blank node
 - When annotation has typeof but not about
 - \rightarrow blank node, that is, a node without a subject

- I know Peter who has e-mail petr@novak.cz

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Overview

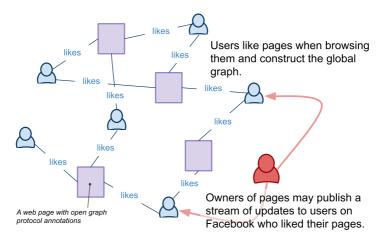
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OpenGraph Protocol

- Global Social Graph
 - important adoption of RDFa, see
 - defines meta-data for pages' description so that it can be easily included in a global graph connecting people and pages through "likes" (a person likes a page)



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Page Annotations

- Open Graph protocol main properties
 - a page is the subject in the RDF triple
 - og:title − *title* of the page
 - og:type − type of the content (e.g., movie)
 - og:image URL of the image for the page
 - og:url a canonical URL of the page to be used as its permanent ID in the graph
- HTML page annotation RDFa example

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Publishing updates

- Ownership
 - Page must be associated with a Facebook application
 - → using fb:app_id meta tag
 - Owners can publish a stream of updates using the
- Getting access

```
curl -F type=client_cred \
curl -F client_id=app_id \
F client_secret=app_secret \
https://graph.facebook.com/oauth/access_token
```

• Publishing updates

```
1    curl -F 'access_token=...' \
2         -F 'message=Hello Likers' \
3         -F 'id=http://www.mydomain.com/great_page.html' \
4         https://graph.facebook.com/feed
```

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