

Web 2.0

Lecture 10: Annotations

doc. Ing. Tomáš Vitvar, Ph.D.

tomas@vitvar.com • @TomasVitvar • <http://vitvar.com>



Czech Technical University in Prague

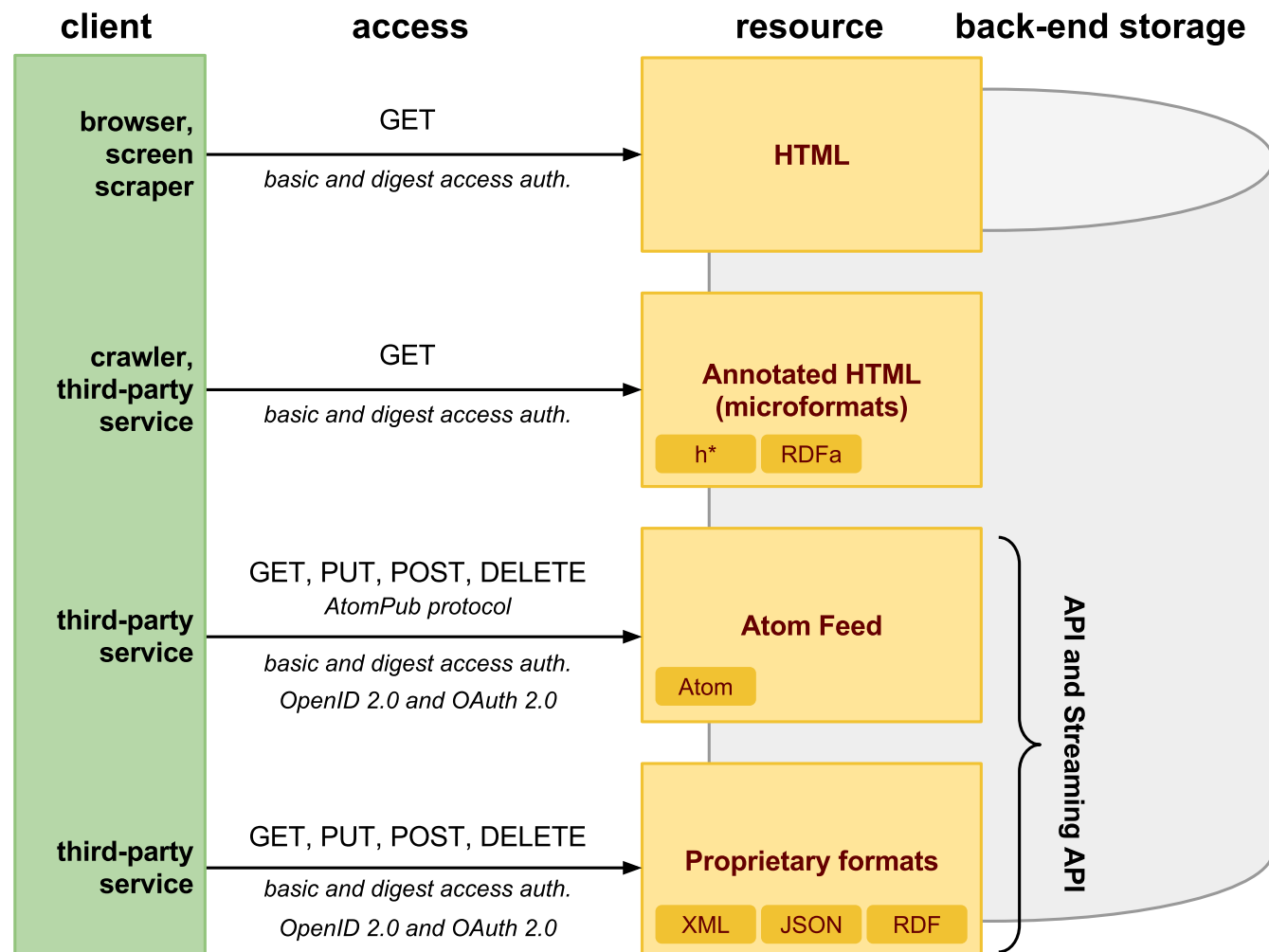
Faculty of Information Technologies • Software and Web Engineering • <http://vitvar.com/courses/w20>



Evropský sociální fond
Praha & EU: Investujeme do vaší budoucnosti

Modified: Thu May 01 2014, 09:51:25
Humla v0.3

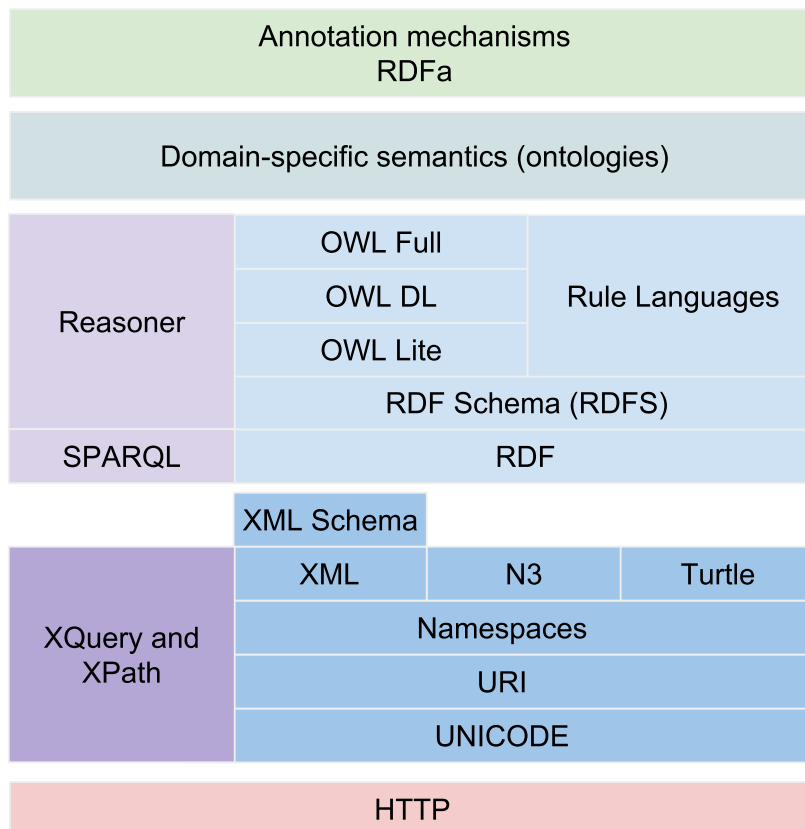
Data on the Web



Data Syntax, Structure and Semantics

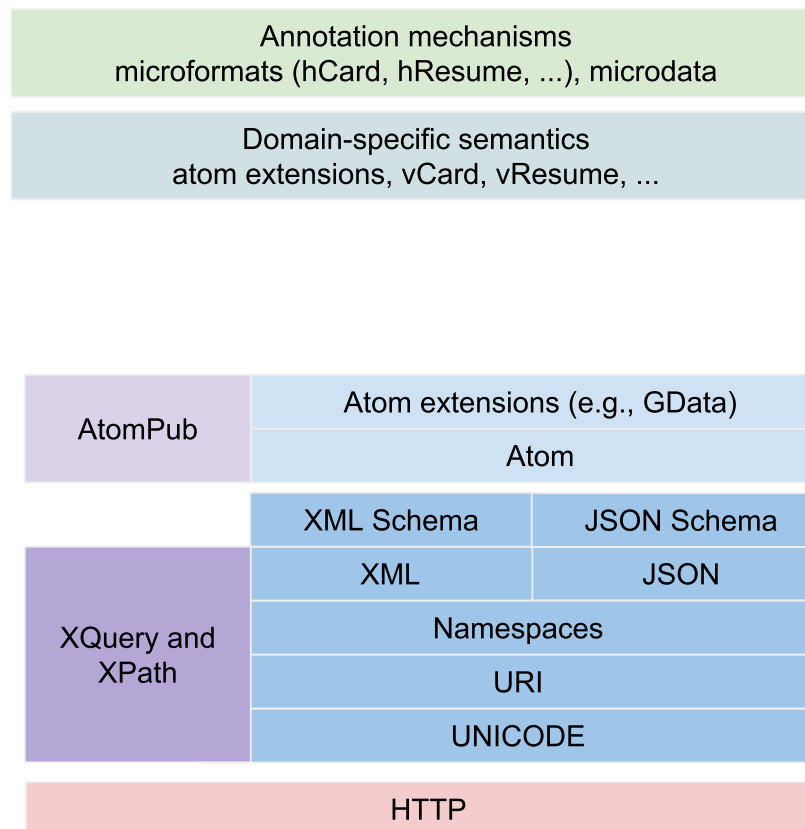
Semantic Web Layered Cake

syntax and formal semantics



Web Data Formats

syntax and semantics (structure)



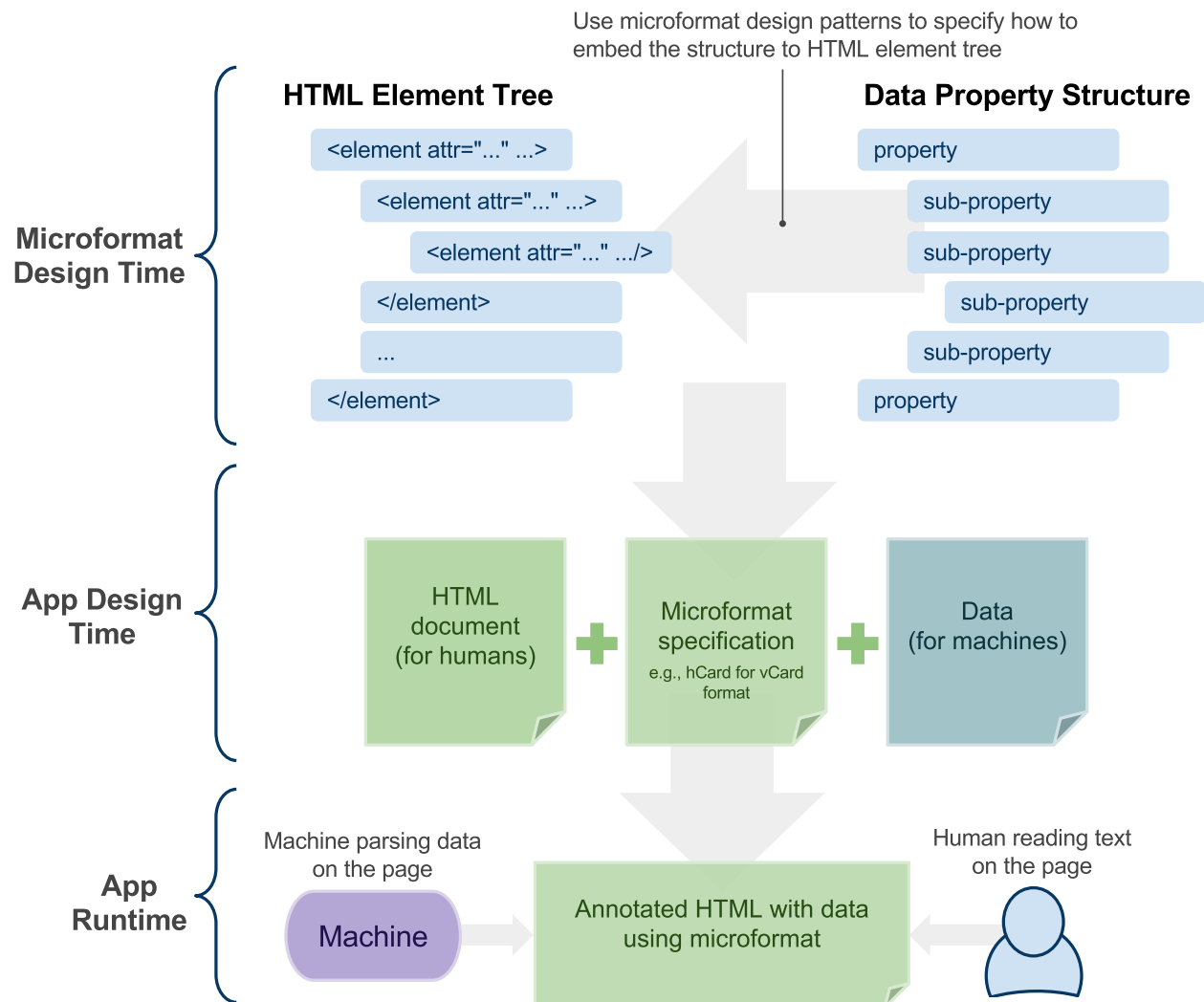
Overview

- **Microformats**
- Microdata
- RDF and RDFa
- OpenGraph Protocol

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*
 - *a microformat spec needs to be defined for every data*

Microformats Usage



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 [↗](#)*
 - *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 XHTML Metadata Profiles [↗](#) specification*

vCard Example

- Describes contact information
 - **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*

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)*

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"**)*
 - *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**
 - *sub-properties of **N** property (by a whitespace or a comma)*
 - *see a complete specification in hCard Microformat Specification [🔗](#)*

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*
 - *lack of compatibility with RDF/RDFa*
 - *See [Microformats and RDF/RDFa compatibility](#) for details.*

Uptake and some statistics

- Two billion pages annotated with hCard
- Google Rich Snippets
 - *Content indexing with microformats, microdata, RDFa*
 - *see Google Rich Snippets* [↗](#)
 - *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 Microformats support in Firefox 3* [↗](#)
- Facebook
 - *hCalendar and hCard for events*
 - *see Microformats in Facebook* [↗](#)

Overview

- Microformats
- **Microdata**
- RDF and RDFa
- OpenGraph Protocol

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*
 - *e.g., Event, Organization, Person, Product, Review*
 - *Created and supported by Google, Microsoft, Yahoo!*
 - *have RDF representation too*
 - *data formats not directly based on formats such as vCard, vCalendar, they define its own "simple" vocabulary*

Global Attributes

- Attributes on any HTML element
- **Itemscope**
 - *identifies an element which descendants contain some properties*
- **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*
- **Itemref**
 - *a reference to other item within the same document*

Example

- Non-annotated HTML text
- Annotated HTML text with microdata

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 without breaking conformance of tools*
- Standards-based
 - *Microdata is a standard part of HTML5 effort*
 - *Microformats is an "ad-hoc" group of enthusiastic 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

RDF

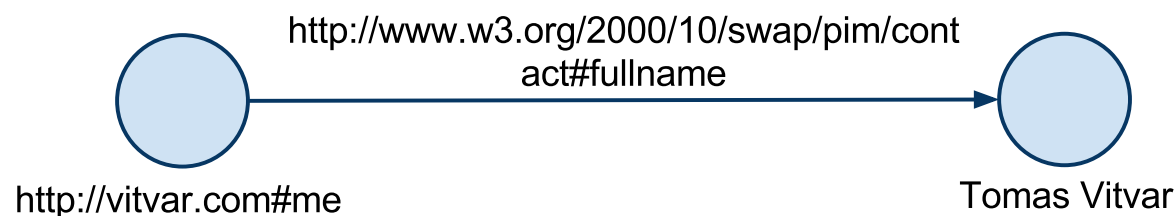
- Resource Description Framework (RDF)
 - *Resource* – as defined in Web architecture
 - usually anything that can be conveyed electronically
 - plus abstract concepts that have no representation
 - *RDF is at the bottom of Semantic Web stack of languages*
- References
 - *W3C Recommendations:*
 - *RDF Suite of W3C Recommendations* [↗](#),
 - *RDF Primer* [↗](#)

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 has name with value Tomas Vitvar (→ Tomas Vitvar is a person), this person has mailbox with value tomas@vitvar.com (→ tomas@vitvar.com is a mailbox), etc.*
BUT this person lives?, works?, was born?, ... in a city Innsbruck
- Need for a language to describe statements
→ Resource Description Framework

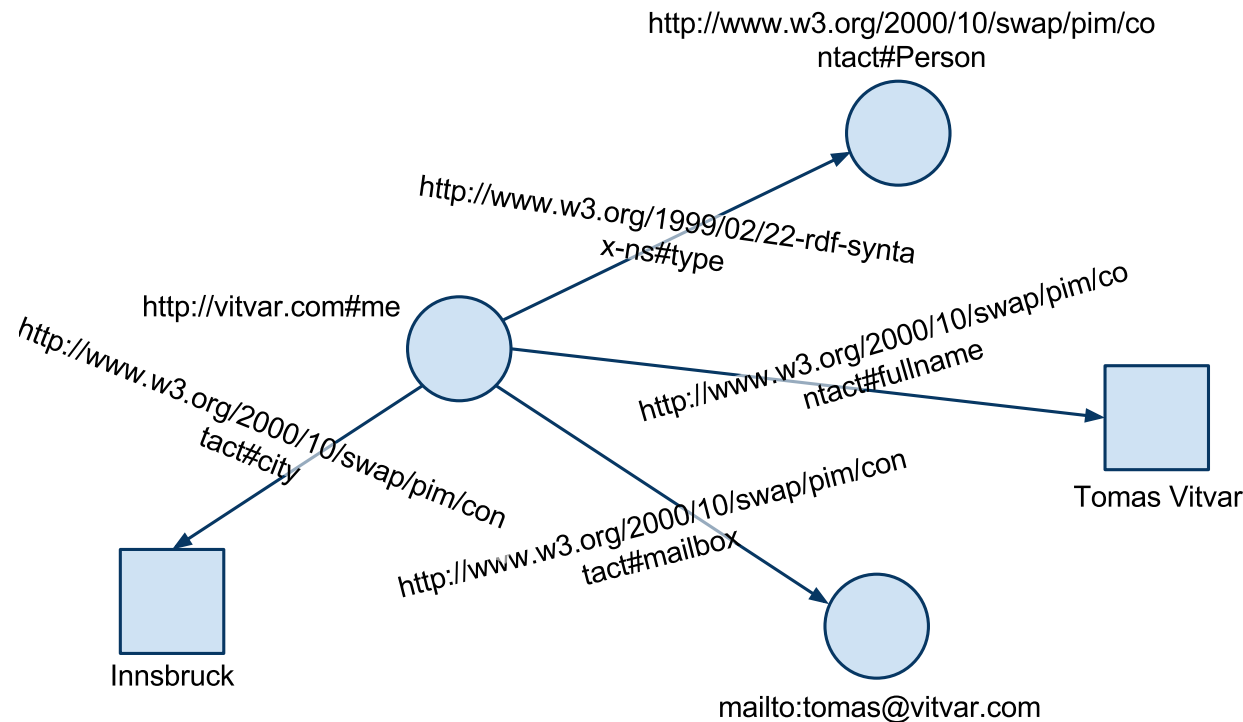
RDF Statement

- 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)*
 - *arcs are predicates*
 - *identifiers to identify subject, predicate, object*
 - *URI references (URIrefs)*
 - *machine processable language*
 - *RDF serializations in triples, RDF/XML, N3, Turtle notations*

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.

References in statements

- URI identifies
 - *network-accessible things (electronic documents) → URL*
 - *things that are not network-accessible, such as human beings*
 - *abstract concepts that do not physically exist, such as "fullname"*
 - ***RDF uses URI references to identify subjects, predicates, objects***
- URI references (or URIs 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 URIs***
 - *a set of URIs 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 URIs 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 URIs need to be repeated*
- Simplicity for examples
 - *QNames without angle brackets*
 - *Common prefixes and namespaces:*
 - *example*

Kinds of Things

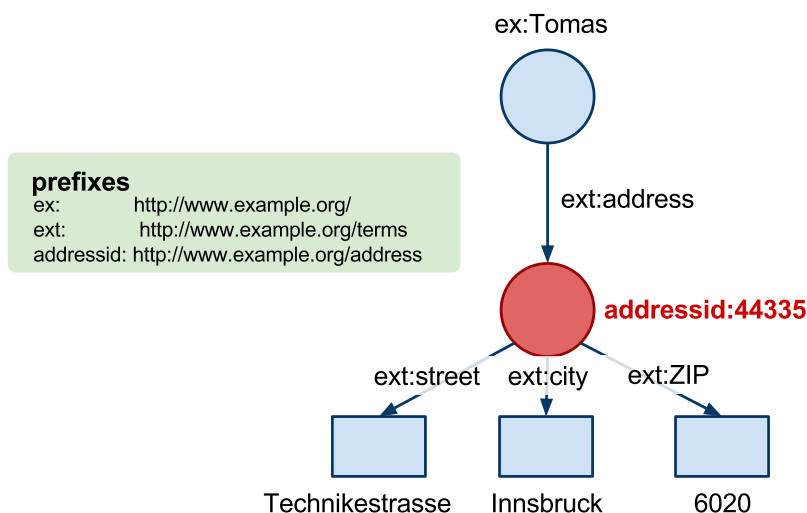
- Property `rdf:type`
 - *defines a type of a resource*
 - *corresponds to "is a member of" relationship*
 - `ext:Person` *understood as a class*
 - *however, RDF language does not define its semantics*
 - *RDF Schema language provides additional vocabulary for class semantics*

Overview

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

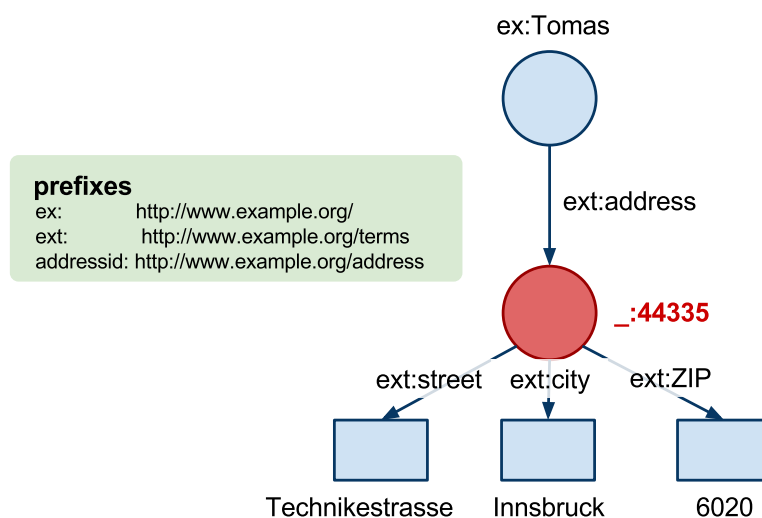
Structured Property Values

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



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!*



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*
 - *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 a person with e-mail `mailto:tomas@vitvar.com`*
 - *A person is an **abstract concept** that can be modeled using a blank node*

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*
- Typed literals
 - *pairing a string with a URIref that identifies a particular datatype*
(`xsd:` refers to `http://www.w3.org/2001/XMLSchema#`)
 - *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`*

Overview

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

Basic Rules

- Representation of RDF in XML language
- Example RDF triple
 - a page **index.html** was created on August 16, 1999
- RDF/XML representation
 - We can interpret a RDF statement as:
a **description** that is **about** a subject of the statement
 - XML element (QName) of the description is the **predicate**
 - a value of the element is the **object**
 - **URIs** must be written out when in attribute values

Multiple Statements and Typed Literals

- Example RDF triples
- RDF/XML representation
 - *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)*

Blank Nodes

- Example RDF triples
- RDF/XML representation
 - *A node with id **editor332** can be referenced from within the RDF graph, not outside of the RDF graph*

Overview

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

RDFa

- Embedding RDF data in XHTML
 - *XHTML only, is extensible, HTML not*
 - *RDFa defines a number of extension attributes*
 - *Parsers 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:
 - *RDFa Specification* [↗](#)
 - *RDFa Primer* [↗](#)

Property and Object Values as Resources

- Creating a property using **rel** attribute
 - *assume, following text is at <http://blog.vitvar.com/?p=107>*
 - *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*
- Typed literals
 - *RDFa defines a **datatype** extension attribute*
- Alternative content
 - *RDFa defines **content** extension attribute*
 - *replaces the object value that is in the element's value*

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*
 - *Also possible to use multiple subjects on a single page*

Types and Blank Nodes

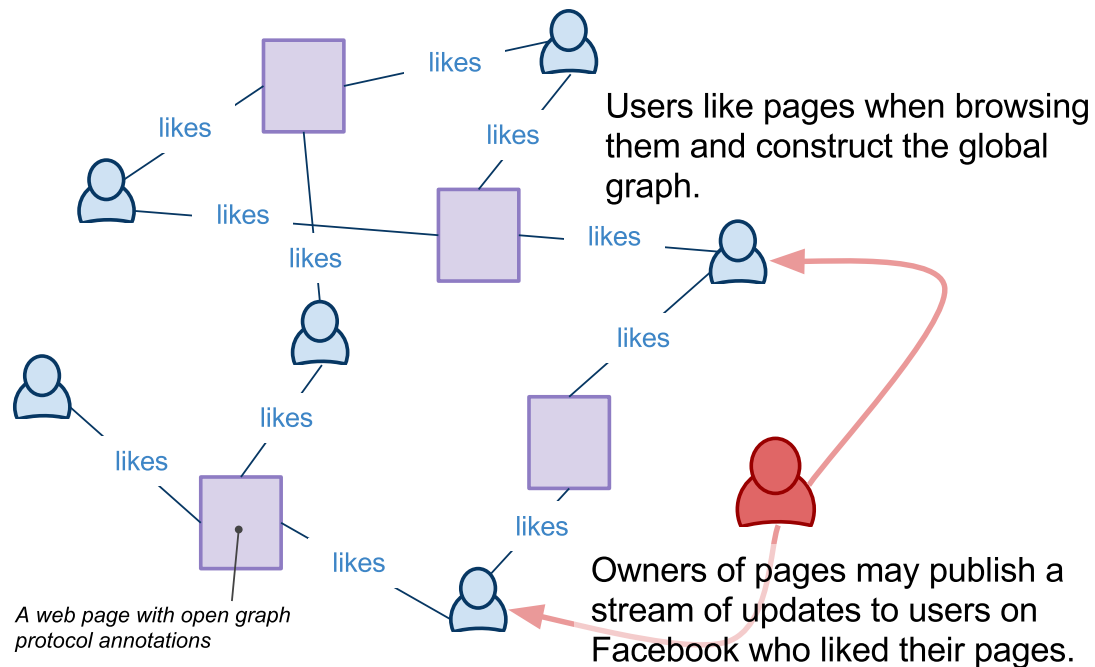
- Types
 - *RDFa defines **typeof** extension attribute*
 - *corresponds to **rdf:type** property*
- Blank node
 - *When annotation has **typeof** but not **about***
 - *blank node, that is, a node without a subject*
 - *I know Peter who has e-mail petr@novak.cz*

Overview

- Microformats
- Microdata
- RDF and RDFa
- OpenGraph Protocol

OpenGraph Protocol

- Global Social Graph
 - *important adoption of RDFa, see Open Graph Protocol* [🔗](#)
 - *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)*



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

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 Facebook Graph API [🔗](#)*
- Getting access
- Publishing updates