Web 2.0

Lecture 10: Annotations

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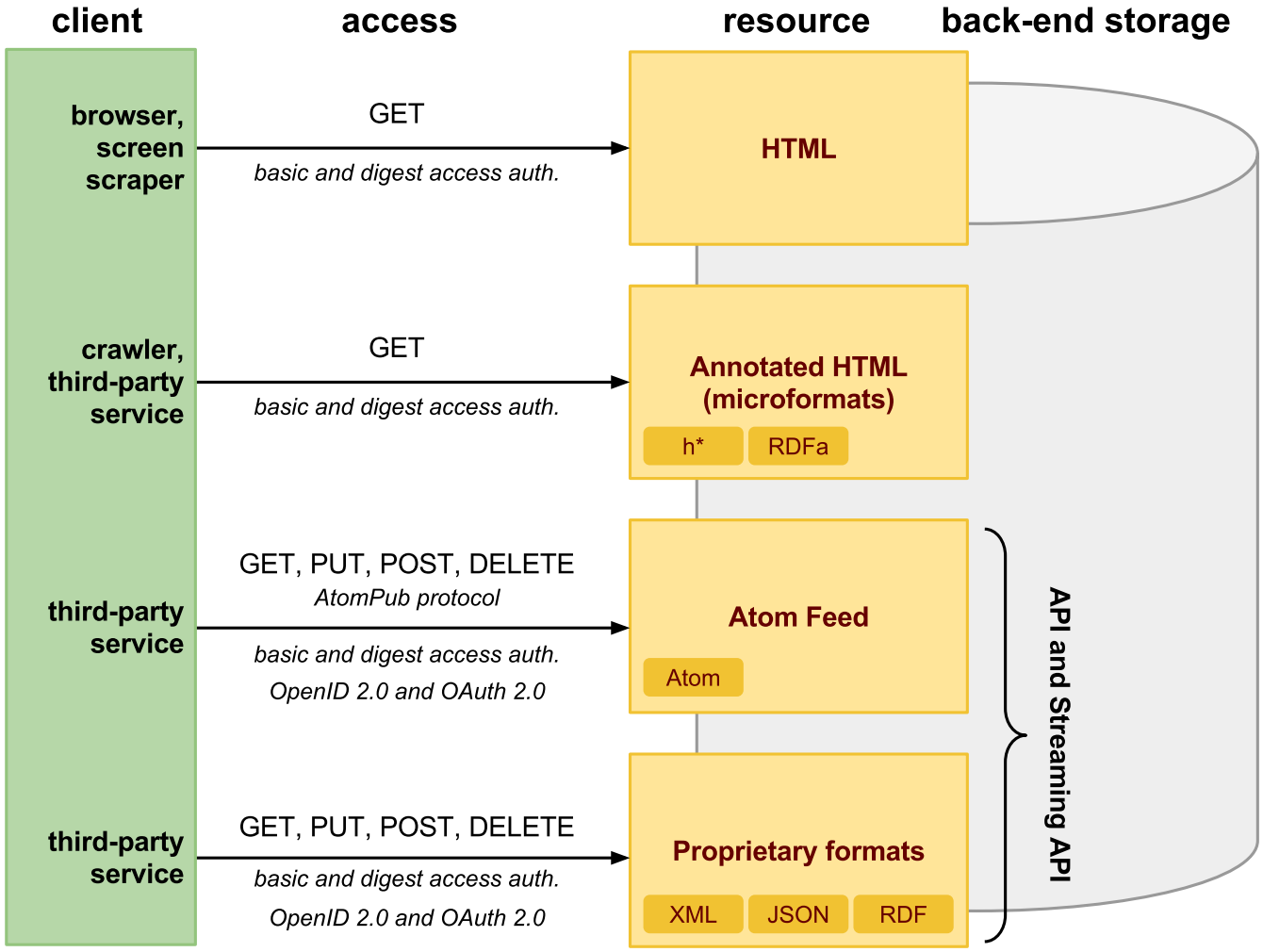
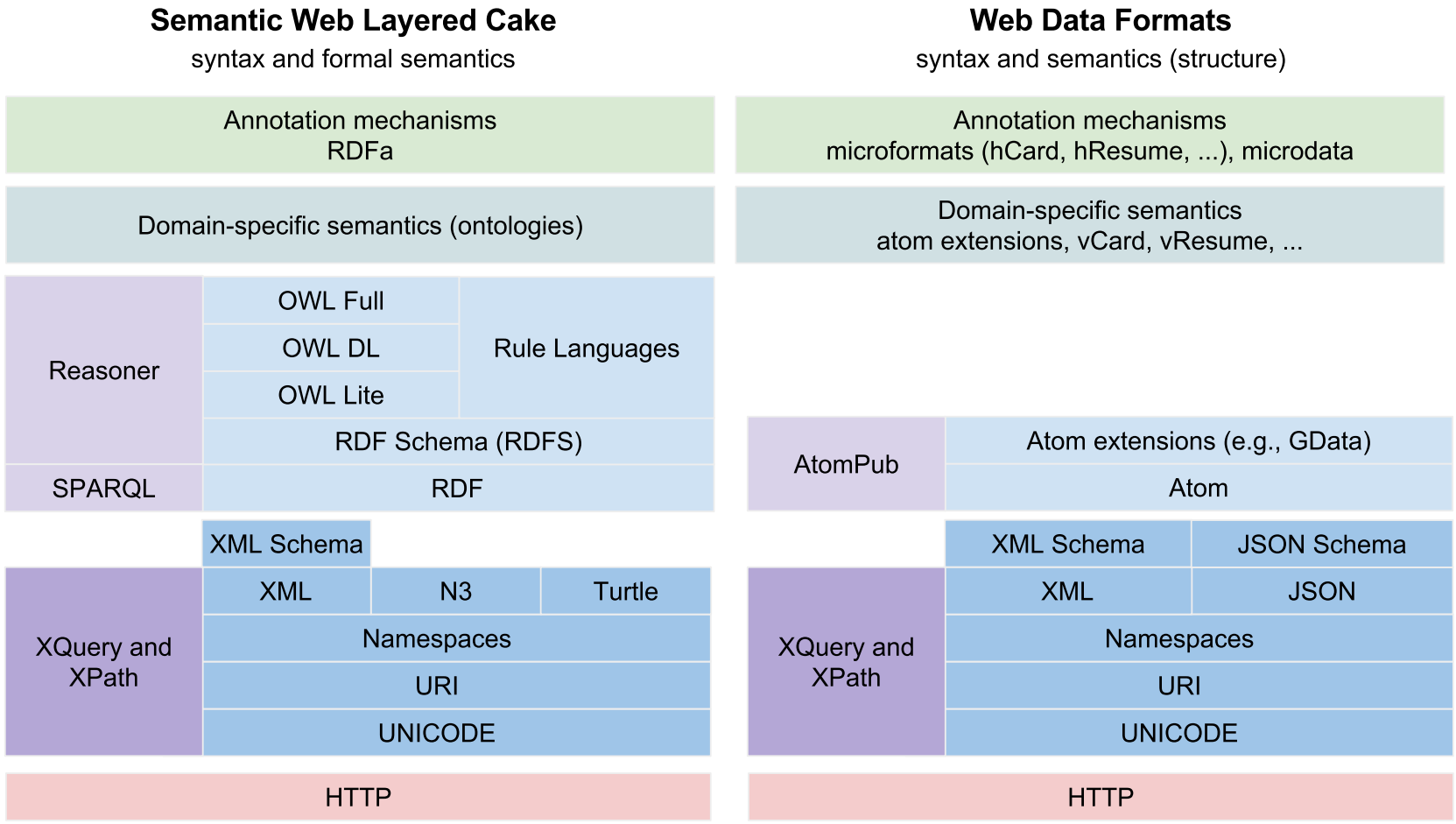
Data on the Web



Data Syntax, Structure and Semantics



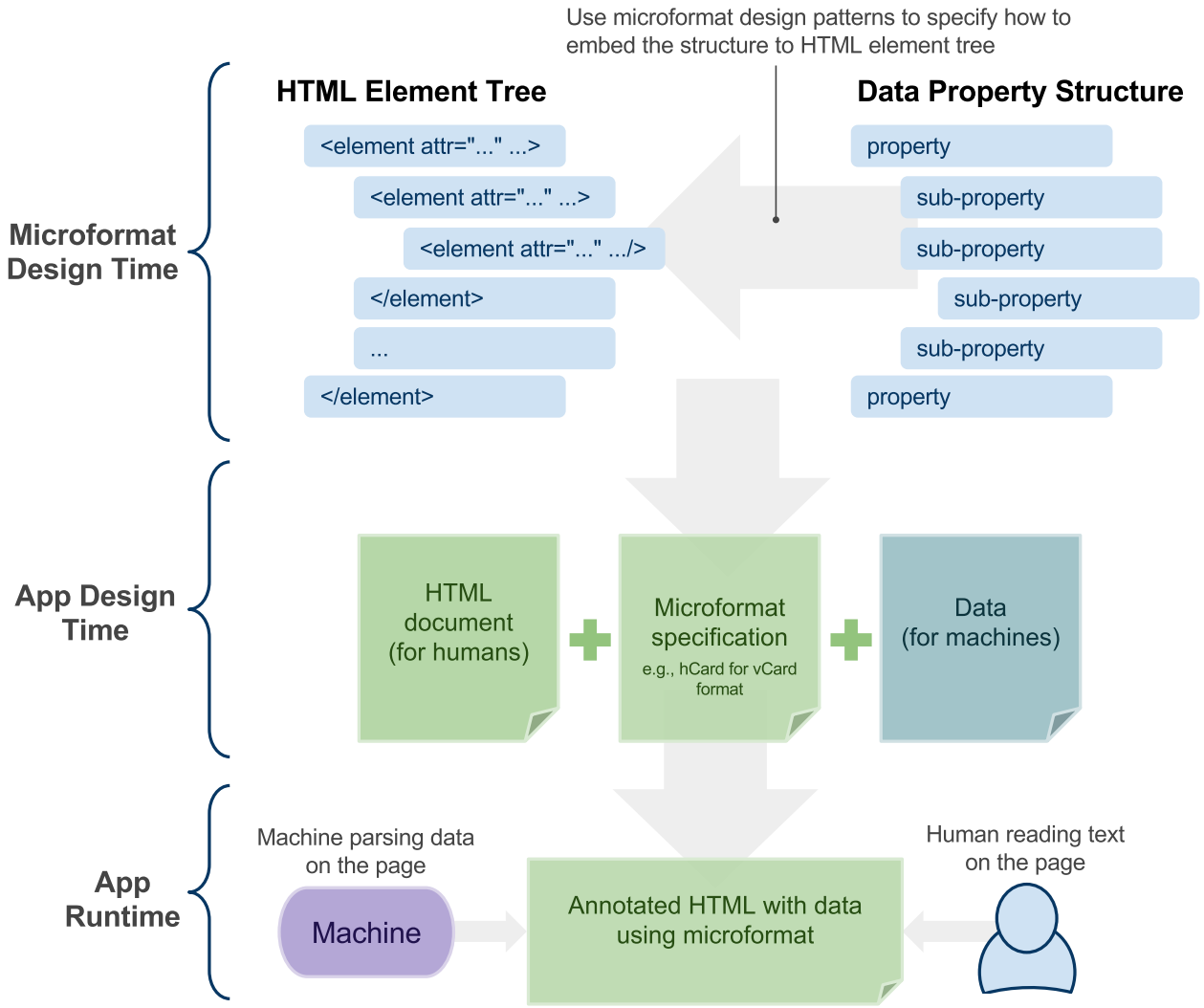
Overview

- 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 `<span>` *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*

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` *peoperty (by a whitespace or a comma)*
  - *see a complete specification in*

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 for details.*

Uptake and some statistics

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

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

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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*
    - → *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 easilly 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 underyling well-established formats
  - *Microdata have links to Semantic Web efforts and Linked Data (via RDF), microformats not*

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  - *Structured Property Values*
  - *Encoding RDF in XML (RDF/XML)*
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RDF

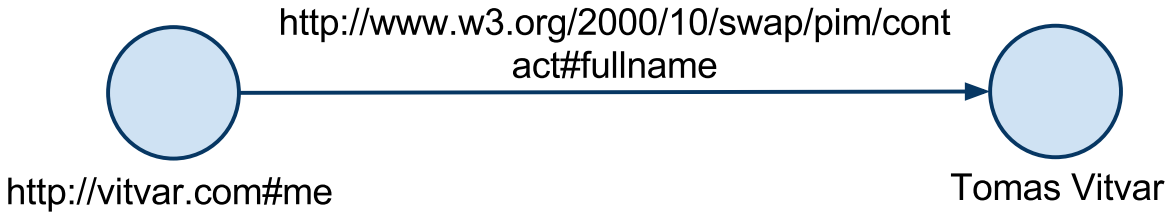
- Resource Description Framework (RDF)
  - *Resource – as defined in Web architecture*
    → *usually anything that can be conveyed electronically*
    → *plus abstract concepts that have no representation*
  - *RDF is at the bottom of Semantic Web stack of languages*
- References
  - *W3C Recommendations:*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

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

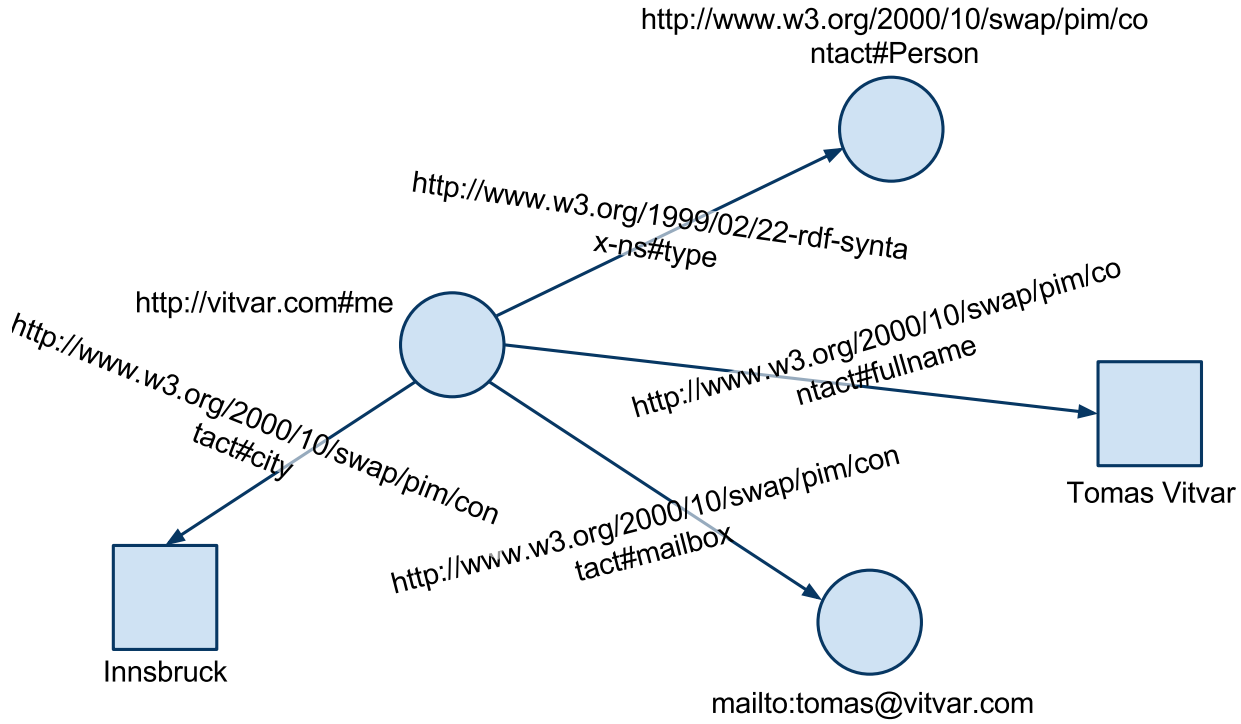
RDF Statement

- 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 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*
- 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*

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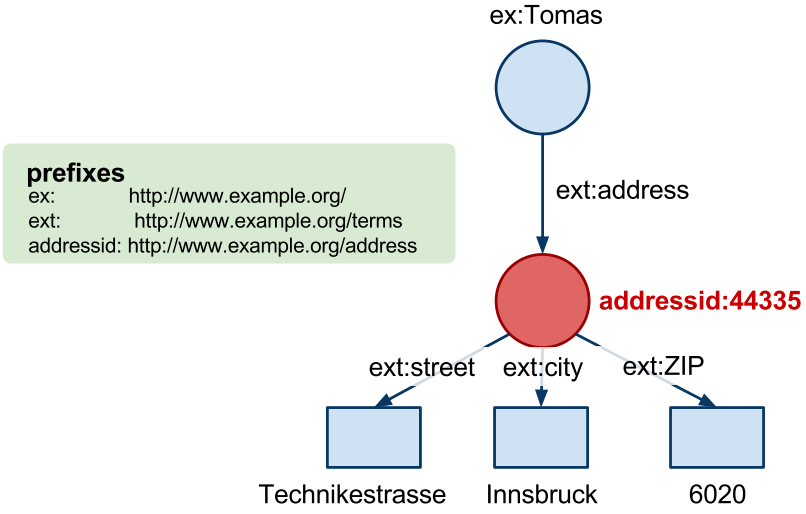
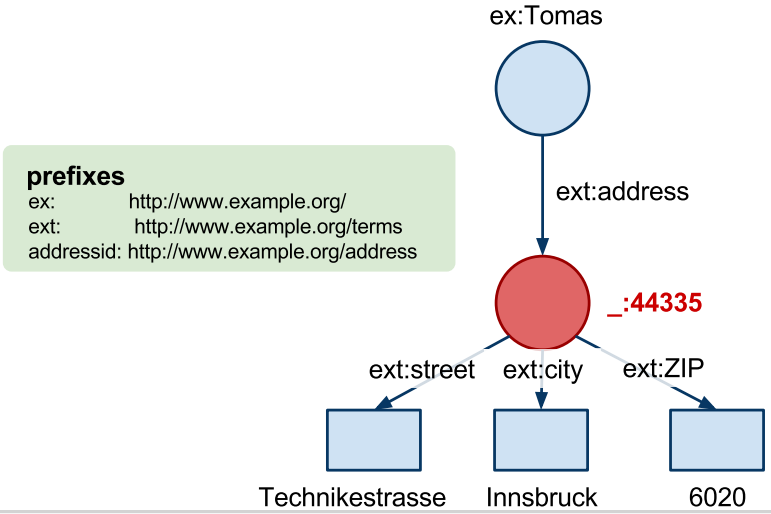
Structured Property Values

- Consider real-world complex structures
  - *Tomas works at Technikestrasse 21a, 6020 Innsbruck, Austria*
  - *One option to describe this using RDF:*
  - *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 uniqie 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`

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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*
- 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***
  - ***URIrefs 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*

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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:
  -
  -

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*

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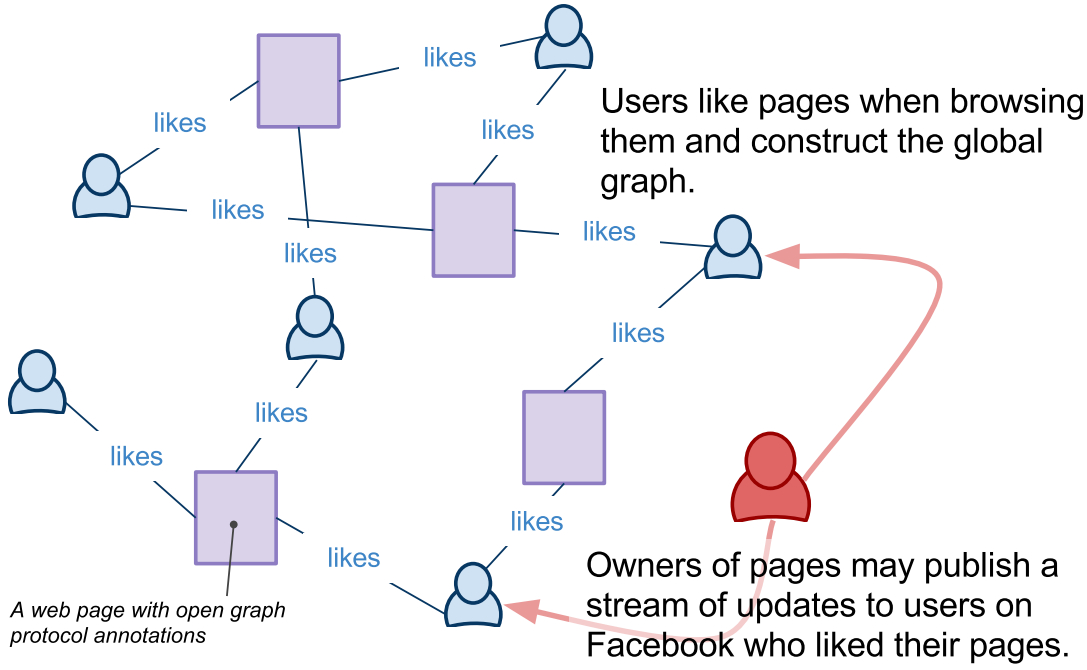
OpenGraph Protocol

- 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)*



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*
- Getting access
- Publishing updates