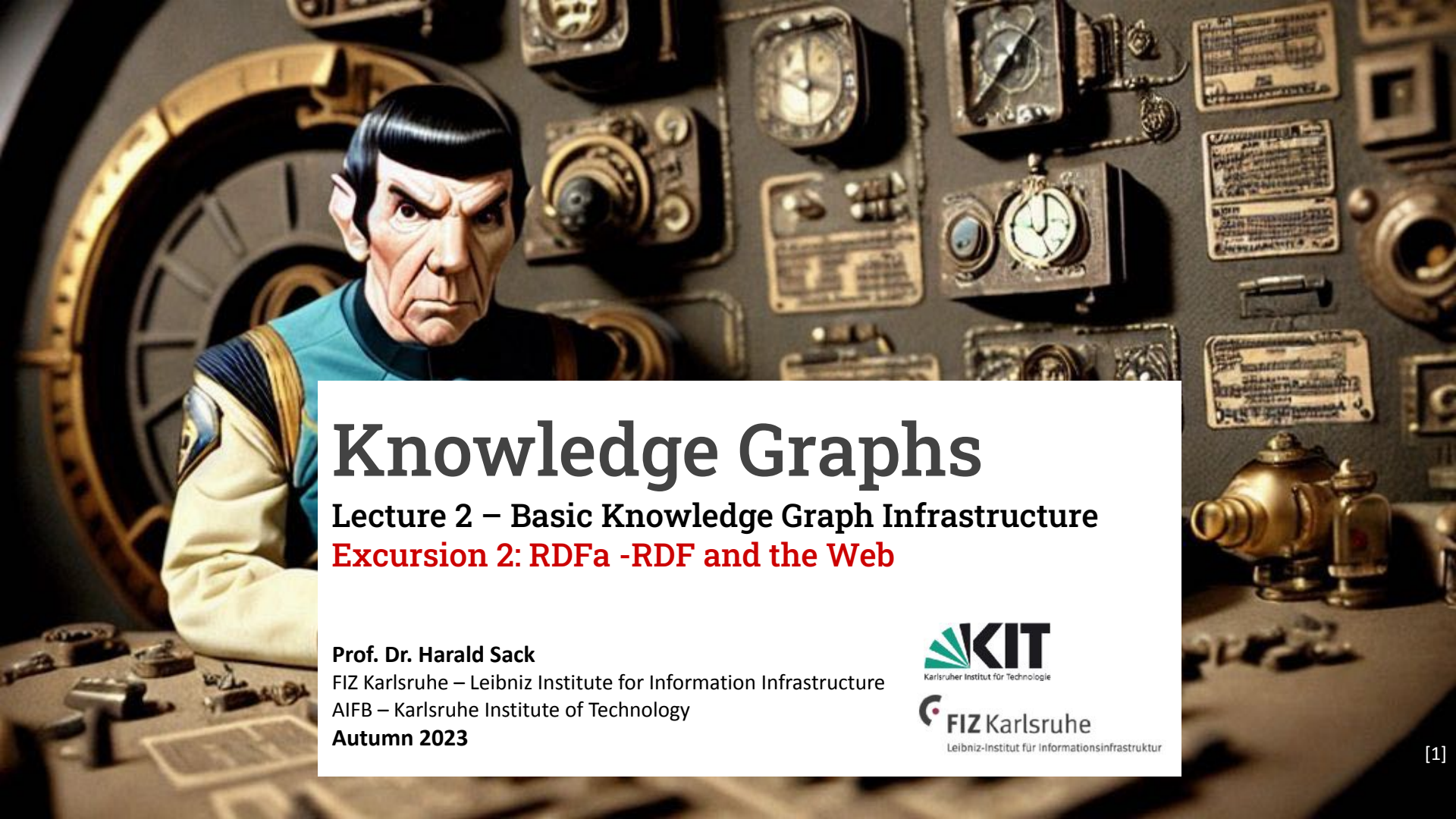

Knowledge Graphs

Lecture 2 – Basic Knowledge Graph Infrastructure

Excursion 2: RDFa -RDF and the Web

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[1]

Knowledge Graphs

Lecture 2: Basic Knowledge Graph Infrastructure

2.1 How to Identify and Access Things

2.2 How to Represent Simple Facts with RDF

2.3 RDF Turtle Serialization

2.4 Vocabularies and Model Building with RDFS

2.5 RDF Complex Data Structures

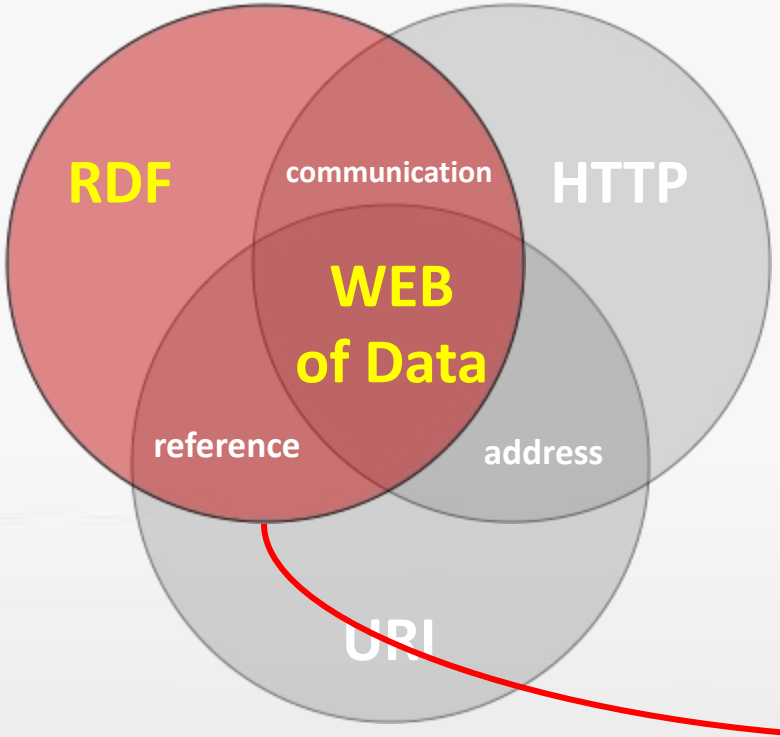
Excursion 1: RDF Reification and RDF*

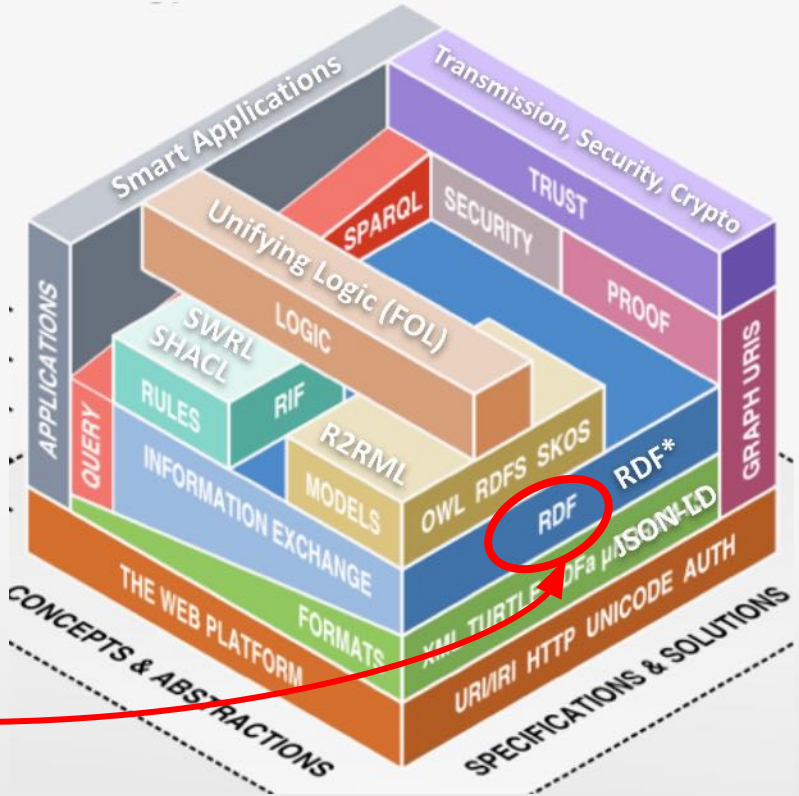
2.6 Logical Inference with RDF(S)

Excursion 2: RDFa – RDF and the Web

[1]

Basic Architecture of the Web of Data





[2]

Structured Data on the Web

In principle, there are four ways to embed structured data with explicit semantic annotations within HTML documents.

- Domain specific microformats
- Generic RDFa
- HTML5 Microdata (including schema.org)
- HTML page metadata via OpenGraph (Facebook)

Microformats

- Microformats emerged about 2005.
- (X)HTML Markup to express (limited) semantics in an HTML document:
  - designed to solve simple, specific problems,
  - designed for humans first, machines second,
  - used in web pages to describe a specific type of information, e.g. a person, an event, a product, a review, etc.
- Applications can easily extract data from HTML documents.
- In general, Microformats use the `class` attribute in **HTML tags** (most times `<span>` or `<div>` tags) and assign brief and descriptive names to entities and their properties.

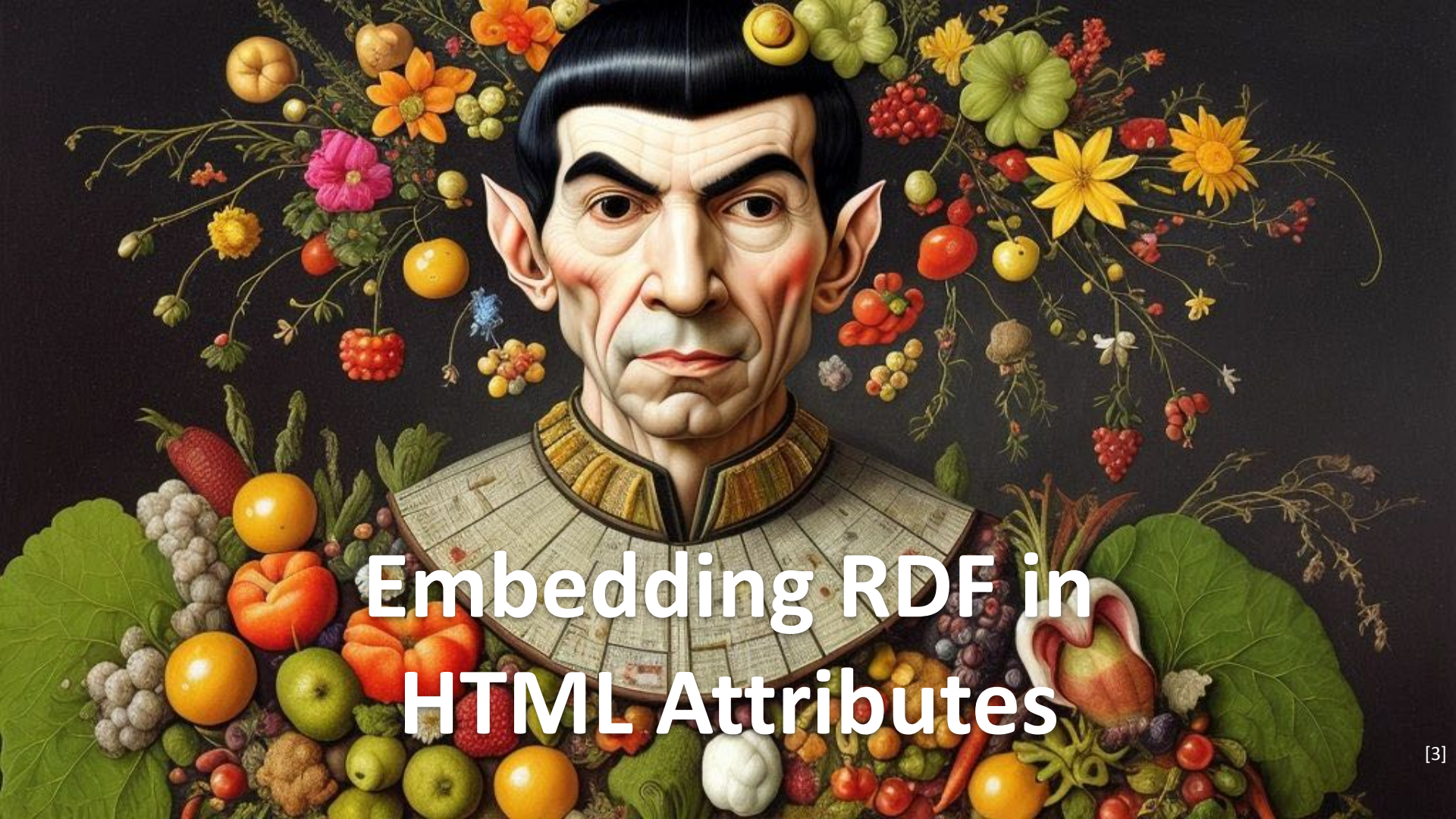
Microformats

Simple Example: HTML marked up with hCard microformat

```
<div class="vcard">
 <span class="fn">Spock</span>
 <span class="title">Science Officer</span>
 <span class="org">United Earth Starfleet</span>
 <span class="adr">
    <span class="street-address">Starfleet HQ, 24-593 Federation Drive</span>
    <span class="postal-code">14482</span>
    <span class="locality">San Francisco, CA</span>
  </span>
 Tel.<span class="tel">604-555-1234</span>
 <img class="photo" src="www.united-earth-starfleet.org/Spock.jpg" />
</div>
```

Microformats – Pros and Cons

- Microformats can **easily be transcoded to RDF** via XSLT.
- New microformat vocabularies **first must be consolidated** by the community, while a new XSLT style-sheet must always be developed for extraction.
- By **using more than one** microformat vocabulary in a single (X)HTML document the processing **complexity increases** rapidly.
- **Conflicts** with used (X)HTML attributes might be possible.



[3]

RDFa

- RDFa = **RDF** in HTML **a**ttributes
- Enables generic RDF annotation in HTML documents by reusing existing HTML attributes.

- RDFa 1.1 based on HTML5 (W3C Recommendation 2015)
  - **RDFa Lite 1.1**
  - RDFa 1.1

RDFa Lite 1.1

RDFa reuses existing (X)HTML attributes (e.g. `href`, `src`) and introduces new HTML attributes:

- `vocab`,
- `typeof`,
- `property`,
- `resource`,
- `prefix`

RDFa Lite 1.1

First we need a **vocabulary** to talk about things.

```
<p vocab="http://xmlns.com/foaf/0.1/">
   My name is Spock and you can
   call me via 1-800-555-0527.
</p>
```

RDFa Lite 1.1

Then we have to define the **type of thing** we are talking about.

```
<p vocab="http://xmlns.com/foaf/0.1/"
   typeof="Person">
   My name is Spock and you can
   call me via 1-800-555-0527.
</p>
```

RDFa Lite 1.1

Now we can define all **properties** of the thing we are talking about.

```
<p vocab="http://xmlns.com/foaf/0.1/" typeof="Person">
   My name is
   <span property="name">Spock</span>
   and you can call me via
   <span property="phone">1-800-555-0527</span>.
   <img property="img"
        src="http://example.org/images/spock.jpg" />
</p>
```

RDFa Lite 1.1

- We can create **identifiers** for the things we are talking about.

```
<p vocab="http://xmlns.com/foaf/0.1/"
   resource="#spock" typeof="Person">
   My name is
   <span property="name">Spock</span>
   and you can call me via
   <span property="phone">1-800-555-0527</span>.
   <img property="img"
        src="http://example.org/images/spock.jpg" />
</p>
```

- `resource` refers to the base URI of the web page.

RDFa Lite 1.1

And if the vocabulary is not sufficient to describe all properties, we can use additional vocabularies by using prefixes.

```
<p vocab="http://xmlns.com/foaf/0.1/"
   prefix="ov: http://open.vocab.org/terms/"
   resource="#spock" typeof="Person">
   My name is
   <span property="name">Spock</span>
   and you can call me via
   <span property="phone">1-800-555-0527</span>.
   My favorite beverage is
   <span property="ov:preferredBeverage">Romulan Ale</span>.
</p>
```

RDFa 1.1

With full RDFa 1.1 you can add additional functionality:

Separate **content** from presentation:

```
<p vocab="http://purl.org/dc/terms/">
   <h2 property="title">Science Officer's Log 2012/13</h2>
   <h3 property="creator" resource="#me">Spock</h3>
   Creation Date:
   <span property="created" content="2212-10-28"> 28.10.2212 </span>
</p>
```

content

presentation

RDFa 1.1

With full RDFa 1.1 you can add additional functionality:

Use **datatypes** from XML Schema Definition

```
<p vocab="http://purl.org/dc/terms/">
   <h2 property="title">Syllabus SWT 2012/13</h2>
   <h3 property="creator" resource="#me">Harald</h3>
   Creation Date:
   <span property="created" datatype="xsd:gYear"> 2012 </span>
</p>
```

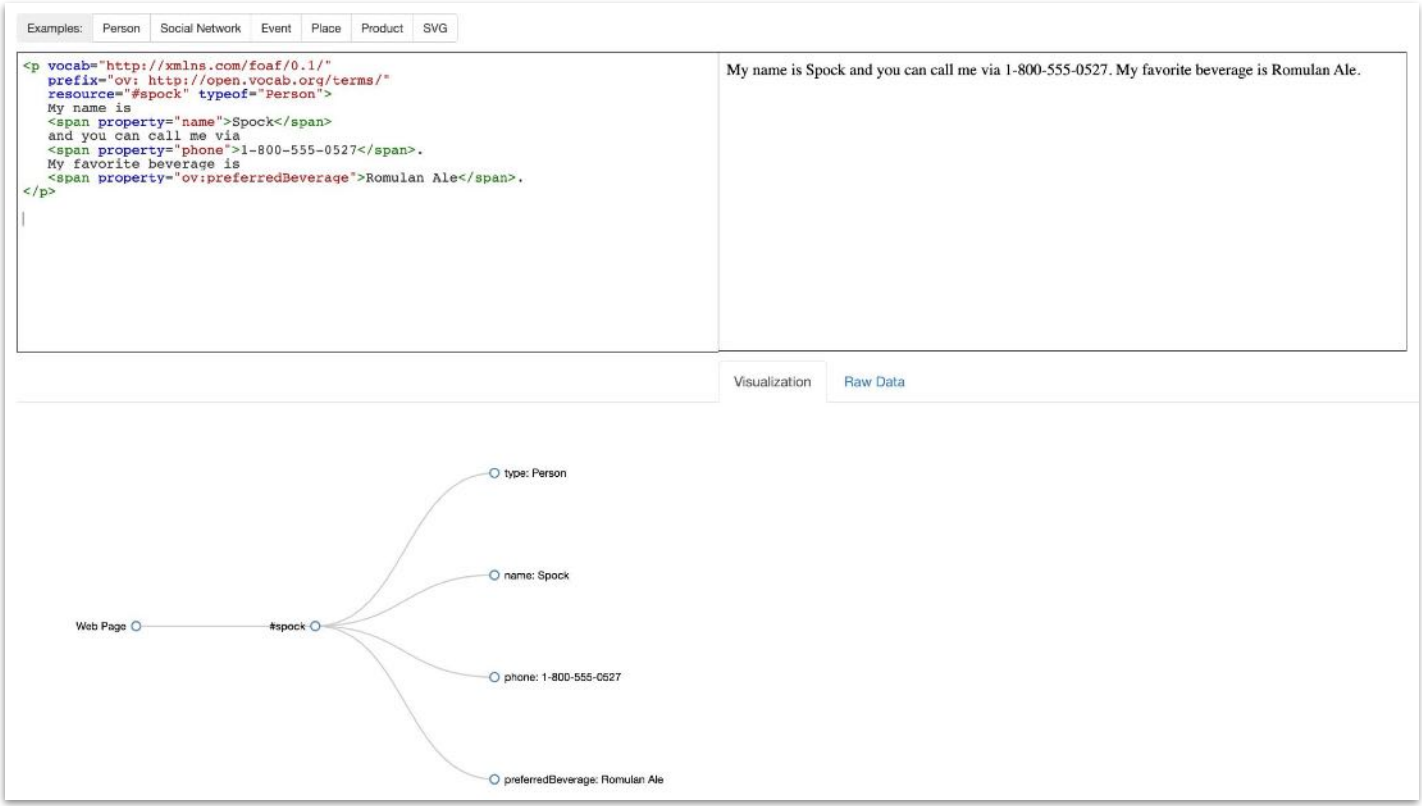
RDFa 1.1

- Distinguish two different sorts of RDF triples:
  - Triple with **resource** as object.
  - Triple with **literal** as object.

	Subject	Property	Object
Object is **Literal**	`resource / about`	`property`	**`content`** or #PCDATA
Object is **Resource** (URI)	`resource / about`	`property/rel`	**`href`** or **`resource`**

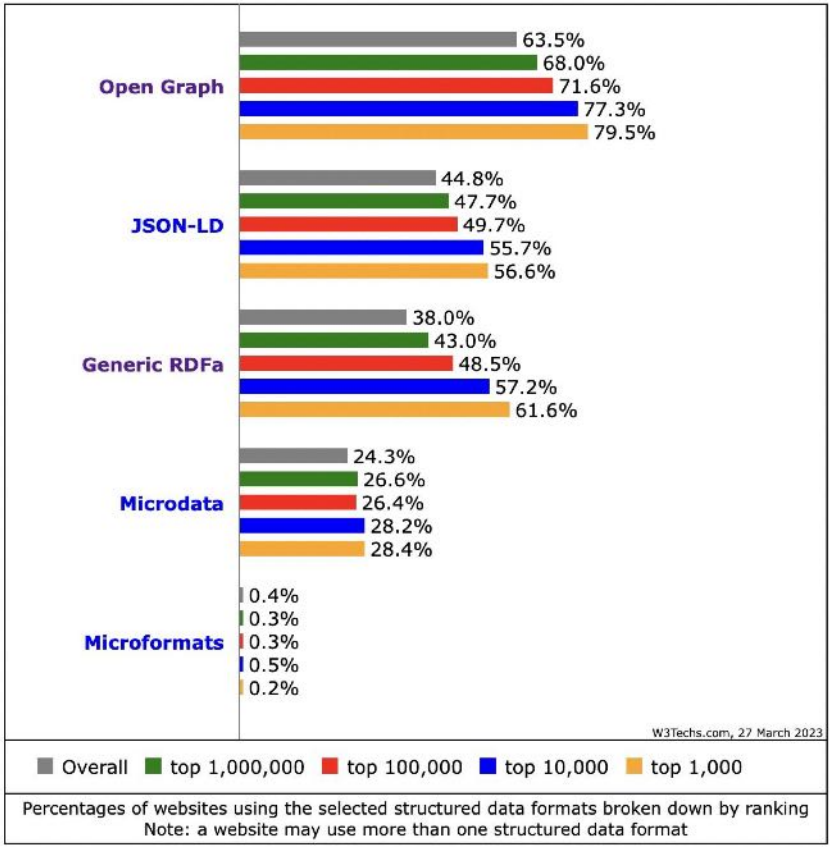
- **`about`** / **`rel`** only for compatibility with RDFa 1.0

RDFa Tools



https://rdfa.info/play/

RDFa Usage



https://w3techs.com/technologies/comparison/da-genericrdfa,da-jsonld,da-microdata,da-microformats,da-opengraph

Next Lecture...

Bibliographic References:

- Ivan Herman, Ben Adida, Manu Sporny, Mark Birbeck (eds., 2015), *RDFa 1.1 Primer - Third Edition, Rich Structured Data Markup for Web Documents*, W3C Working Group Note 17 March 2015.
- The Open Graph Protocol, https://ogp.me/
- Aidan Hogan (2020), *The Web of Data*, Springer.
  Chapt. 3.8.4 RDFa, pp. 81–84.

Picture References:

[1] "Mr. Spock, science officer of the USS Enterprise in a room with the walls covered with interlinked RDF source code fragments in the style of an Impressionistic painting.", created via ArtBot, ProtoGen Diffusion, 2023, [CC-BY-4.0], https://tinybots.net/artbot

[2] Benjamin Nowack, *The Semantic Web - Not a Piece of cake…*, at bnode.org, 2009-07-08 , [CC BY 3.0], https://web.archive.org/web/20220628120341/http://bnode.org/blog/2009/07/08/the-semantic-web-not-a-piece-of-cake

[3] "A manieristic painting in the style of Giuseppe Arcimboldo depicting a portrait of Mr. Spock's, which consists of multiple fruits, vegetables and flowers that come together to create the portrait of Spock. The portrait itself encapsulated the perfect balance and harmony with nature, arts, and science.", created via ArtBot, Deliberate, 2023, [CC-BY-4.0], https://tinybots.net/artbot

[4] "Mr. Spock, science officer of the USS Enterprise in a room with the walls covered with interlinked RDF source code fragments in the style of a Steampunk photography.", created via ArtBot, ProtoGen Diffusion, 2023, [CC-BY-4.0], https://tinybots.net/artbot