Microdata and schema.org

Basics

- Microdata is a simple semantic markup scheme that's an alternative to RDFa
- Developed by WHATWG* and supported by major search companies (Google, Microsoft, Yahoo, Yandex)
- Like RDFa, it uses HTML tag attributes to host metadata
- Vocabularies are controlled and hosted at schema.org

* Web Hypertext Application Technology Working Group

What is WHATWG?

- Web Hypertext Application Technology Working Group
  - Community interested in evolving the Web with focus on HTML and Web API development
  - Ian Hickson is a key person, now at Google
- Founded in 2004 by individuals from Apple, Mozilla and Opera after a W3C workshop
  - Concern about W3C's embrace of XHTML
- Worked on HTML5, developed Microdata spec

HTML5

- Started by WHATWG as an alternative to XHTML, joined by W3C
  - HTML5 recommendation, October 2014
  - HTML5.1 recommendation, November 2016
  - WHATWG will evolve it as a “living standard”
- HTML5 ≈ HTML + CSS + js
- Native support for graphics, video, audio, speech, semantic markup, …
- Current support in major browsers

Microdata

- The microdata effort has two parts:
  - A markup scheme
  - A set of vocabularies/ontologies
- The markup is similar to RDFa in providing ways to identify subjects, types, properties & objects

  Also a standard way to encode Microdata as RDFa
- Sanctioned vocabularies at schema.org and include a small number of very useful ones: people, movies, events, recipes, etc.

An example

```
<div>
 <h1>Avatar</h1>
 <span>Director: James Cameron (born 1954) </span>
 <span>Science fiction</span>
 <a href=”avatar-trailer.html">Trailer</a>
</div>
```

An example: itemscope

- An *itemscope* attribute identifies a content *subtree* that is the subject about which we want to say something

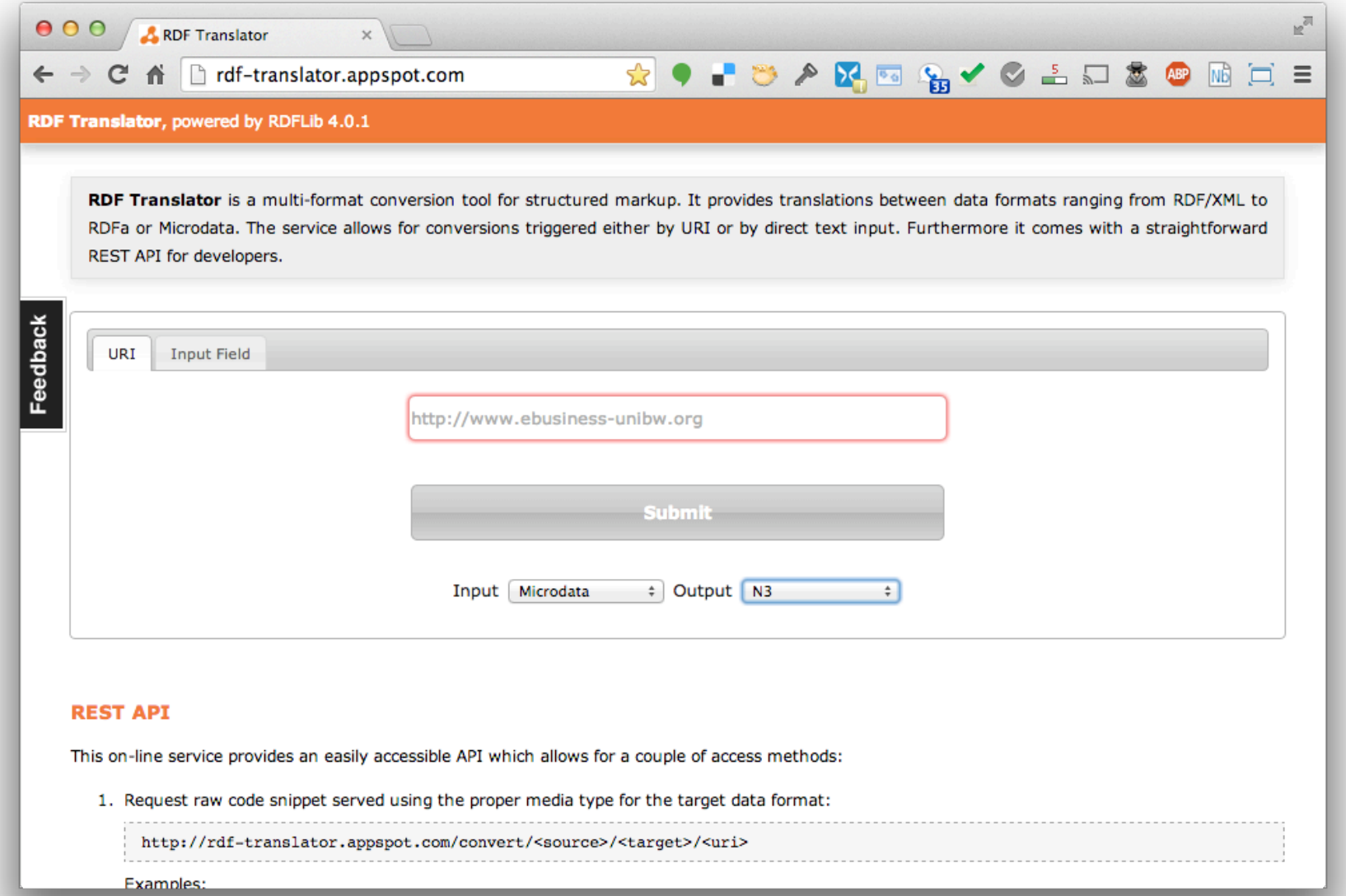
```
<div itemscope >
  <h1>Avatar</h1>
  <span>Director: James Cameron (born 1954) </span>
  <span>Science fiction</span>
  <a href=”avatar-trailer.html">Trailer</a>
</div>
```

An example: itemtype

- An *itemscope* attribute identifies a content *subtree* that is the subject about which we want to say something
- The *itemtype* attribute specifies the subject's type

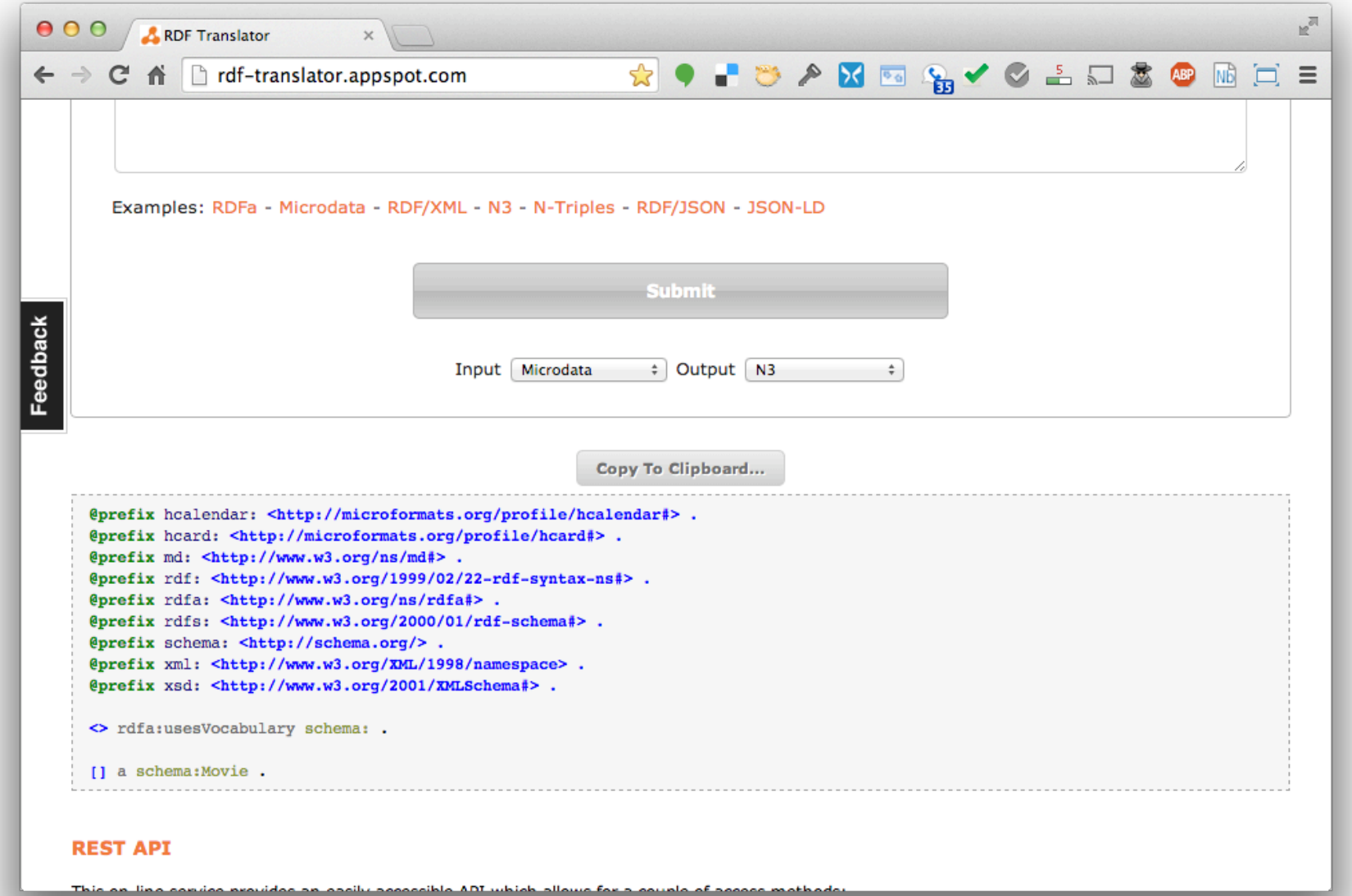
```
<div itemscope itemtype="http://schema.org/Movie">
  <h1>Avatar</h1>
  <span>Director: James Cameron (born 1954) </span>
  <span>Science fiction</span>
  <a href=”avatar-trailer.html">Trailer</a>
</div>
```

Microdata <-> RDF



http://rdf-translator.appspot.com/

Microdata <-> RDF



http://rdf-translator.appspot.com/

An example: itemtype

- An *itemscope* attribute identifies content *subtree* that is the subject about which we want to say something
- The *itemtype* attribute specifies the subject's type

[ ] a schema:Movie .

```
<div itemscope itemtype="http://schema.org/Movie">
  <h1>Avatar</h1>
  <span>Director: James Cameron (born 1954) </span>
  <span>Science fiction</span>
  <a href="avatar-trailer.html">Trailer</a>
</div>
```

An example: itemprop

- An *itemscope* attribute identifies a content *subtree* that is the subject about which we want to say something
- The *itemtype* attribute specifies the subject's type
- An *itemprop* attribute gives a property of that type

```
<div itemscope itemtype="http://schema.org/Movie">
  <h1 itemprop="name">Avatar</h1>
  <span>Director: James Cameron (born 1954) </span>
  <span itemprop="genre">Science fiction</span>
  <a href="avatar-trailer.html" itemprop="trailer">Trailer</a>
</div>
```

An example: itemprop

- An *itemscope* attribute identifies a content *subtree* that is the subject about which we want to say something
- The *itemtype* attribute specifies the subject's type
- An *itemprop* attribute gives a property of the subject

```
[ ] a schema:Movie ;
    schema:genre "Science fiction" ;
    schema:name "Avatar" ;
    schema:trailer <avatar-trailer.html> .
```

```
<div itemscope itemtype="http://schema.org/Movie">
  <h1 itemprop="name">Avatar</h1>
  <span>Director: James Cameron (born 1954) </span>
  <span itemprop="genre">Science fiction</span>
  <a href=”avatar-trailer.html” itemprop="trailer">Trailer</a>
</div>
```

An example: embedded items

- An *itemprop* immediately followed by another *itemscope* makes the value an object

```
<div itemscope itemtype="http://schema.org/Movie">
 <h1 itemprop="name">Avatar</h1>
   <div itemprop="director"
        itemscope itemtype="http://schema.org/Person">
     Director: <span itemprop="name">James Cameron</span>
     (born  <span itemprop="birthDate">1954</span>)
  </div>
 <span itemprop="genre">Science fiction</span>
 <a href="avatar-trailer.html" itemprop="trailer">Trailer</a>
</div>
```

An example: embedded items

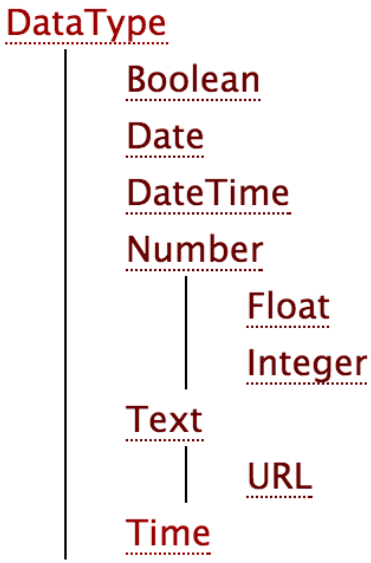
- An itemprop immediately following itemscope makes the value an object

```
[ ] a schema:Movie ;
    schema:director [ a schema:Person ;
          schema:birthDate "1954" ;
          schema:name "James Cameron" ] ;
    schema:genre "Science fiction" ;
    schema:name "Avatar" ;
    schema:trailer <avatar-trailer.html> .
```

```
<div itemscope itemtype="http://schema.org/Movie">
 <h1 itemprop="name">Avatar</h1>
   <div itemprop="director"
        itemscope itemtype="http://schema.org/Person">
     Director: <span itemprop="name">James Cameron</span>
     (born  <span itemprop="birthDate">1954</span>)
  </div>
 <span itemprop="genre">Science fiction</span>
 <a href="avatar-trailer.html" itemprop="trailer">Trailer</a>
</div>
```

schema.org vocabulary

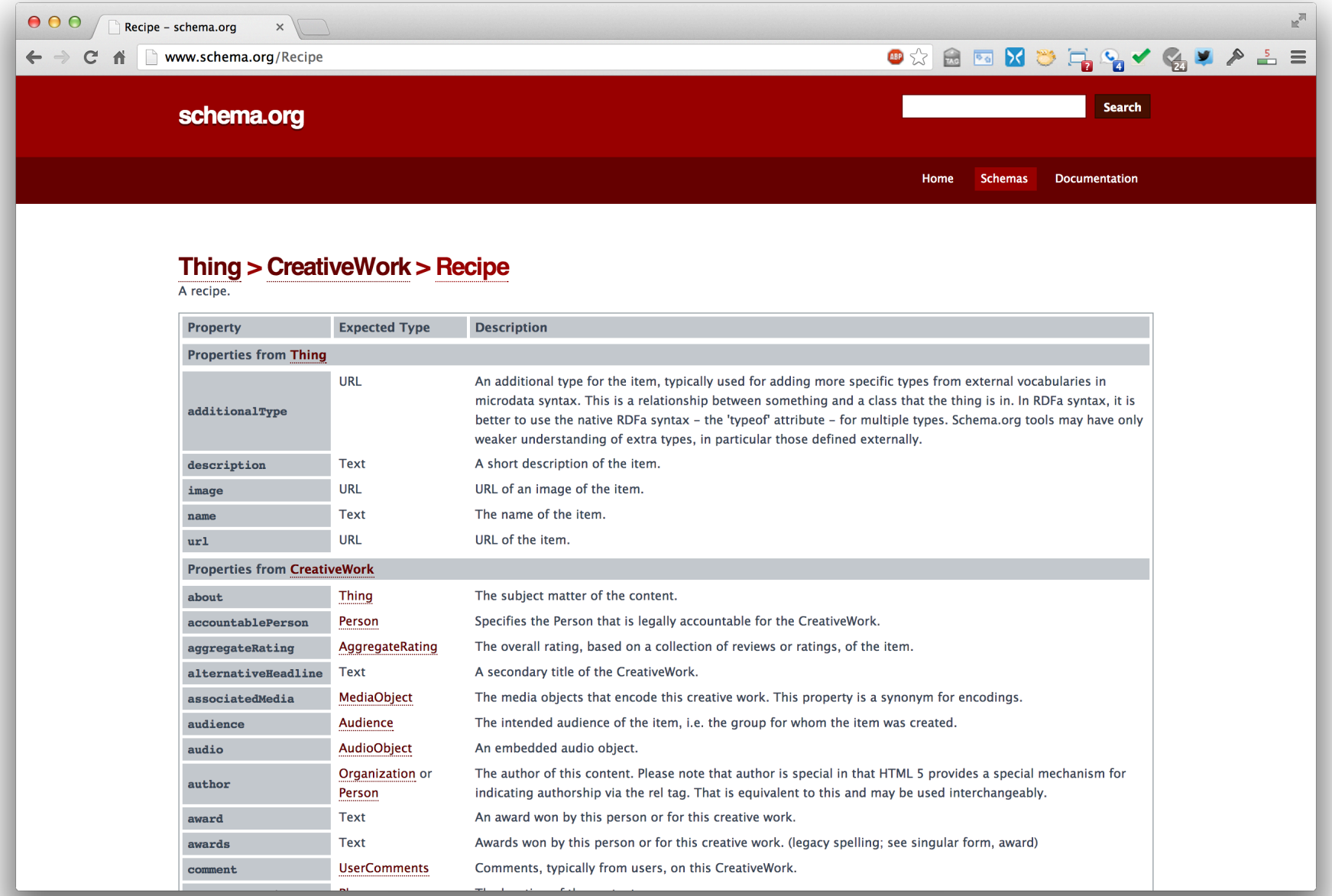
- Full type hierarchy in one file
- 619 classes, 876 properties (Nov '17)
- **Data types:** Boolean, Date, DateTime, Number, Text, Time
- **Objects:** Rooted at Thing with two 'metaclasses' (Class and Property) and eight subclasses
- See github repo for examples and code



More specific types

- Class
- CreativeWork
- Event
- Intangible
- MedicalEntity
- Organization
- Person
- Place
- Product
- Property

http://www.schema.org/Recipe

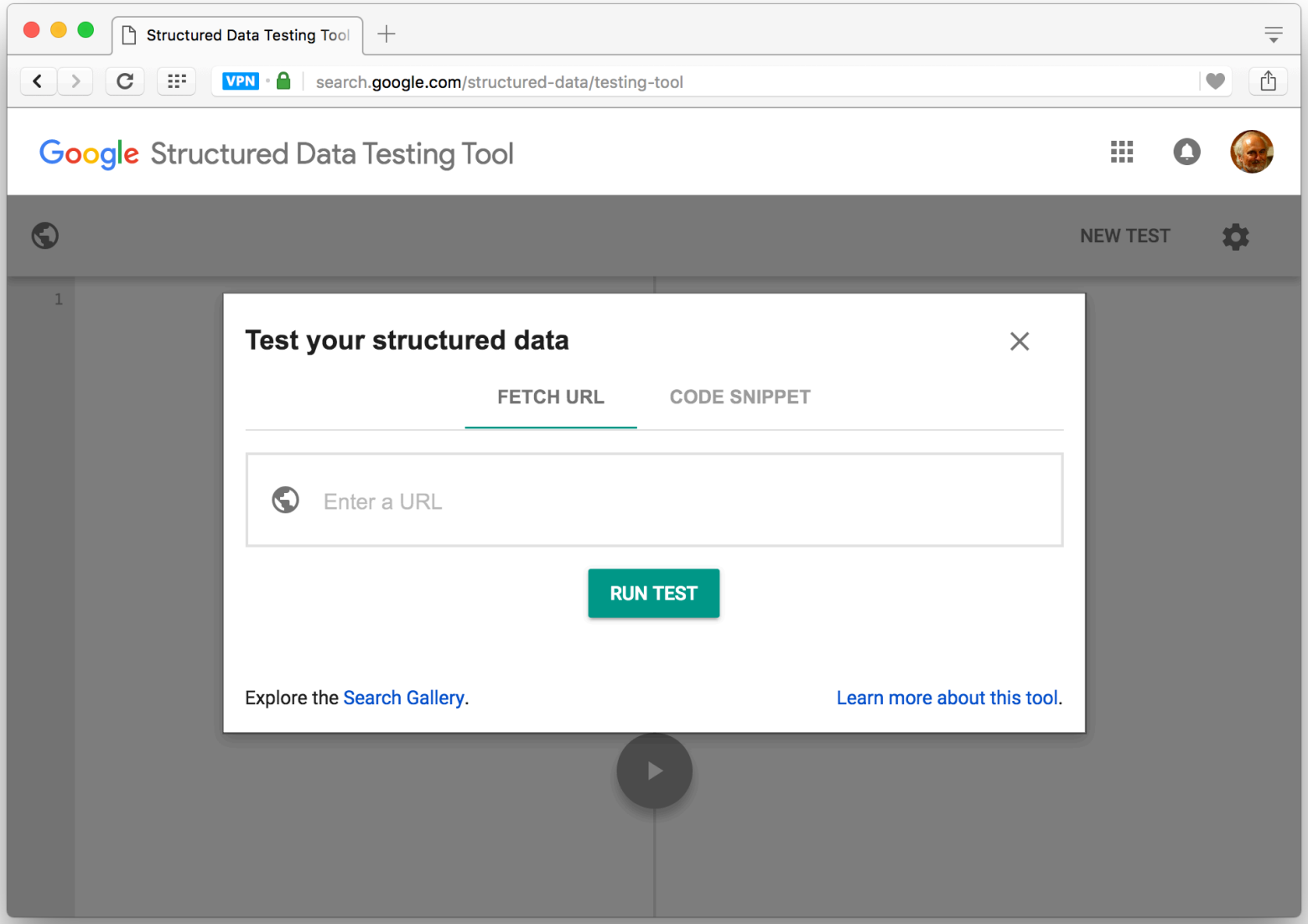


Thing > CreativeWork > Recipe

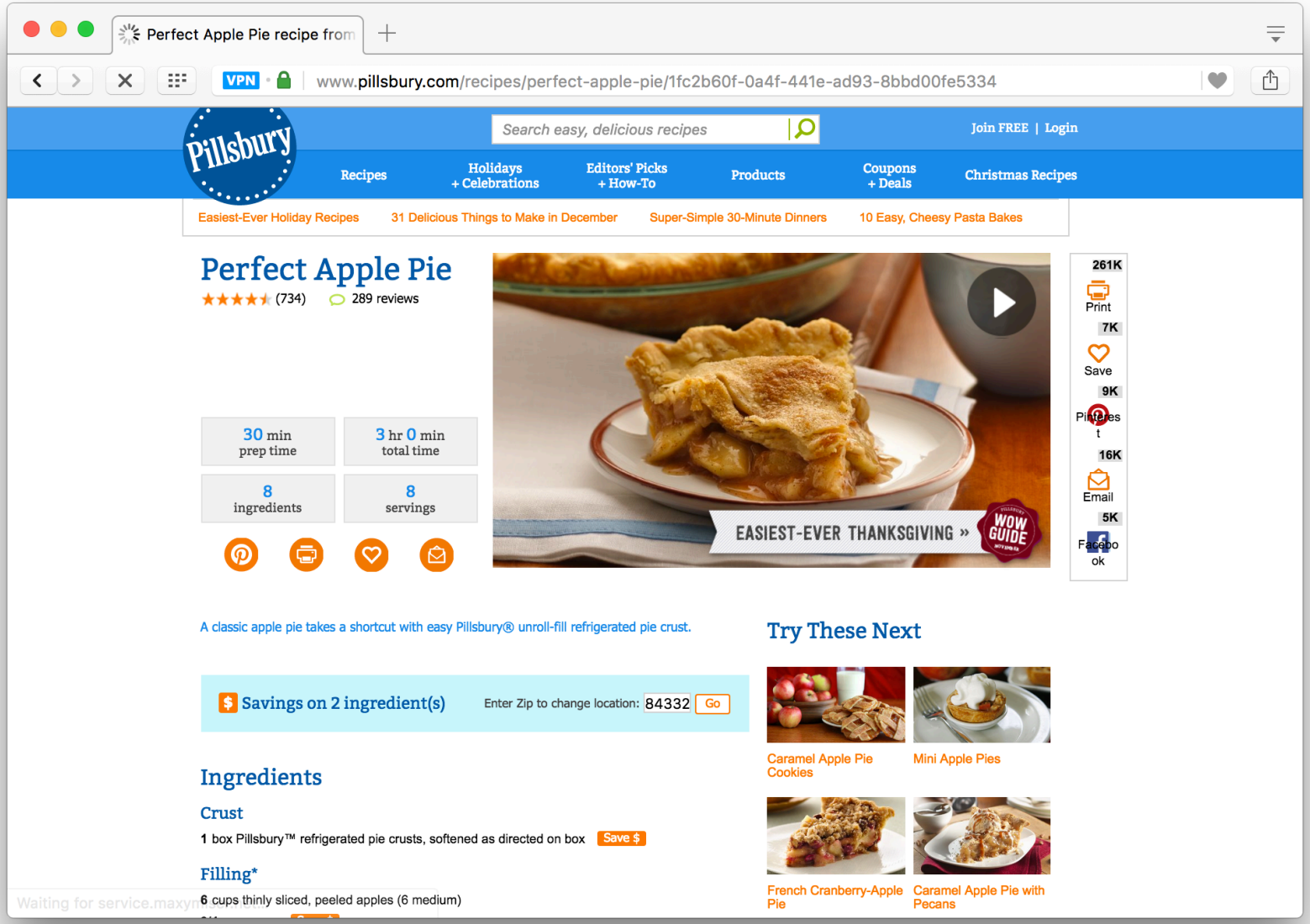
A recipe.

Property	Expected Type	Description
Properties from Thing		
additionalType	URL	An additional type for the item, typically used for adding more specific types from external vocabularies in microdata syntax. This is a relationship between something and a class that the thing is in. In RDFa syntax, it is better to use the native RDFa syntax – the 'typeof' attribute – for multiple types. Schema.org tools may have only weaker understanding of extra types, in particular those defined externally.
description	Text	A short description of the item.
image	URL	URL of an image of the item.
name	Text	The name of the item.
url	URL	URL of the item.
Properties from CreativeWork		
about	Thing	The subject matter of the content.
accountablePerson	Person	Specifies the Person that is legally accountable for the CreativeWork.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
alternativeHeadline	Text	A secondary title of the CreativeWork.
associatedMedia	MediaObject	The media objects that encode this creative work. This property is a synonym for encodings.
audience	Audience	The intended audience of the item, i.e. the group for whom the item was created.
audio	AudioObject	An embedded audio object.
author	Organization or Person	The author of this content. Please note that author is special in that HTML 5 provides a special mechanism for indicating authorship via the rel tag. That is equivalent to this and may be used interchangeably.
award	Text	An award won by this person or for this creative work.
awards	Text	Awards won by this person or for this creative work. (legacy spelling; see singular form, award)
comment	UserComments	Comments, typically from users, on this CreativeWork.

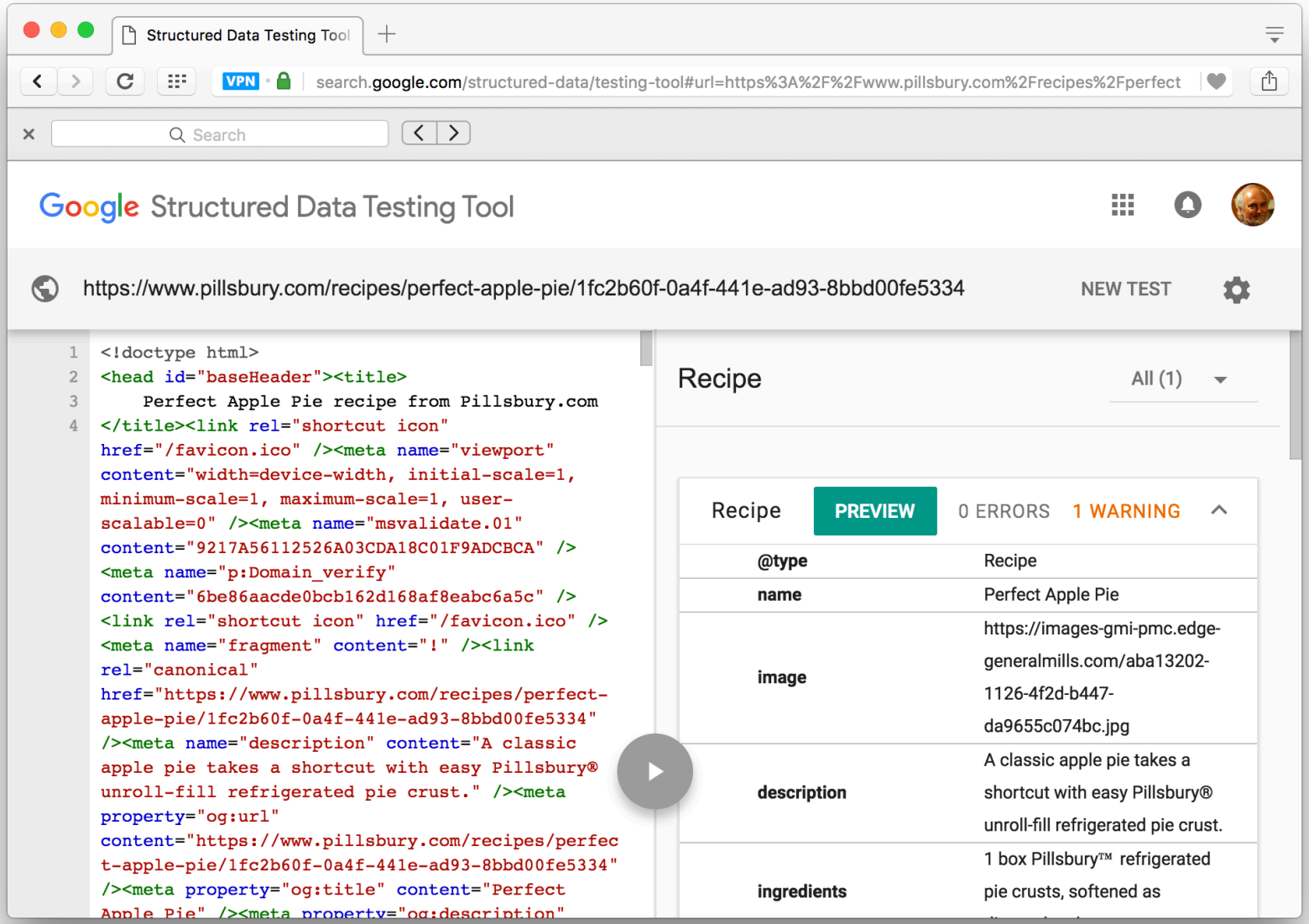
Testing Structured Data in HTML



Testing Structured Data in HTML



Testing Structured Data in HTML



Microdata as a KR language

- More than RDF, less than RDFS
- Properties have an *expected* type (range)
  - Can be a list of types, **any** of which are OK
  - Might be a string for many properties (*"some data better than none"*)
- Properties attached ≥ 1 types (domain)
- Classes can have multiple parents and inherit (properties) from all of them
- No axioms (e.g., disjointness, cardinality, etc.)
- No relation like subPropertyOf

Mixing vocabularies

- Microdata is intended to work with just one vocabulary: the one at schema.org
- Advantages: simple and controlled
  - Simple, organized, well designed
  - Controlled by the schema.org people
- Disadvantages: too simple, too controlled
  - Too simple, narrow, mono-lingual
  - Controlled by the schema.org people

Extending schema.org ontology

- Extensions: hosted vs. external
  - Hosted: managed & published by schema.org project
- You can subclass existing classes
  - Person/Engineer
  - Person/Engineer/ElectricalEngineer
- Subclass existing properties
  - musicGroupMember/leadVocalist
  - musicGroupMember/leadGuitar1
  - musicGroupMember/leadGuitar2

Hosted Extensions 11/17

- auto.schema.org
- bib.schema.org
- health-lifesci.schema.org
- iot.schema.org
- meta.schema.org
- pending.schema.org

Extension Problems

- Hard to establish agreed upon meaning
  - Through axioms supported by the language (e.g., equivalence, disjointness, etc.)
  - No place for documentation (annotations, labels, comments)
- Without a namespace mechanism, your Person/Engineer and mine can be confused and might mean different things
  - Is a Computer Scientist an engineer?

Serialization

- Schema.org has a data model and serializations
  - Microdata is the original, native serialization
  - RDFa is more expressive and works with the RDF stack
  - Everyone agrees that *RDFa Lite* is a good encoding: as simple as Microdata but more expressive
  - JSON-LD is an increasingly popular accepted encoding
- Search engines look for Microdata, RDFa and JSON-LD
- Schema.org considers RDFa to be the “canonical machine representation of schema.org”

Conclusions

- Microdata is an effort by a group of search companies to use a simple semantic language
- The semantics is pragmatic
  - e.g., expected types: a string is accepted where a thing is expected – “some data is better than none”
- The real value is in
  - the supported vocabularies and
  - their use by Search companies

=> Immediate motivation for using semantic markup