Semantic Web API Specification

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Overview

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Thesis Context

The Web is becoming a large repository of open data, available for:

- rich exploratory **querying**
- machine processing such as **generating visualizations**
- **combining multiple data sources**[1]

The **Semantic Web**[2] (Web 3.0) has been designed as a WWW extension that allows computing tools to search, combine and process content that is based on the meaning it has for us.

[1] Jacek Kopecký, Paul Fremantle, and Rich Boakes – *A history and future of web apis*

[2] `http://www.semanticweb.org`

Thesis Statement

Can we augment the existing **Web API Specifications** with **Semantic support** in order to derive both machine and human readable content in a better, more comprehensive way?

Thesis Contribution

Implemented support for **Semantic Augmentation** of **OpenAPI Specification**[3] within **Swagger Editor**[4] and **Swagger UI**[5] open source tools.

[3] https://swagger.io/specification/
[4] https://swagger.io/tools/swagger-editor/
[5] https://swagger.io/tools/swagger-ui/

Augmenting OpenAPI with Semantic Support
Swagger Editor
Swagger UI

Semantic support in Swagger Editor

Added properties for semantic augmentation:

- **x-same-as**
- **x-rdf-type**

Usage:

- **schema**-level — supported value is equivalent to **rdfs:Class**
- **property**-level — supported value is equivalent to **rdf:Property**

Supported values:

- concepts defined in the **Schema.org**[6] vocabulary

[6] `https://schema.org/`

Semantic support in Swagger Editor

```
components:
    schemas:
        Car:
            type: object
            x-same-as: 'http://schema.org/Vehicle'
            properties:
                emissionsCO2:
                    type: 'number'
                    x-same-as: 'http://schema.org/emissionsCO2'
            ...
```

Figure 1: Example of augmenting of OAS3 with semantics.

Demo

Future Directions

Incorporation of Other Ontologies

The **OpenAPI Specification** may be **extended**, enabling the user to incorporate/refer concepts from **other ontologies**.

(e.g. DBpedia[7], Disease Ontology[8], Dublin Core[9], etc.)

[7] http://dbpedia.org/ontology/
[8] http://www.disease-ontology.org/
[9] http://www.dublincore.org/specifications/dublin-core/

Publishing resulting Ontology

The addition of a mechanism through which the **ontology** resulted from the Semantic Augmentation is automatically published in a **triplestore**.

(e.g. AllegroGraph[10], Amazon Neptune[11] Stardog[12], etc.)

$\Downarrow$

This database will entail itself to provide **API recommendations** through the usage of **SPARQL queries** & inference support.

[10] https://franz.com/agraph/allegrograph/
[11] https://aws.amazon.com/neptune/
[12] https://www.stardog.com/

Self-detection of Semantic Concepts

The creation of a mechanism by which Swagger Editor can **self-detect** what **concepts** are defined in the created **API** and automatically create the associations or provide the user with suggestions from which he can choose the most appropriate one.

Conclusions

1. The Semantic Web[13] enables computing tools to do more useful work for us.
2. We have extended the functionality of the Swagger Editor and Swagger UI open source tools with Semantic support.
3. We have created a foundational layer that enables Semantic support and augmentation of OpenAPI definitions.
4. Future work can be done by incorporating other ontologies & using triplestore inference capabilities.

Thank you!

[13] https://www.w3.org/standards/semanticweb/