

## ANNEX A

# Questionnaire on generating REST APIs from ontology artefacts

We would invite you to participate in this questionnaire which will allow investigating new mechanisms to make it easier for application developers to consume data represented with ontologies. More specifically, we want to know the perception of developers regarding API paths which allow getting data to solve ontology requirements. It will take around 25 minutes to fill out this questionnaire. All answers are anonymous.

You will be asked to provide your opinion and some short answers about different aspects of a set of API paths we will show you. The questionnaire is divided into the following main aspects:

- Background
- Specific questions on REST APIs
- Specific questions on API paths based on ontology artefacts

Take into account some of the existing best practices to build REST API paths that should be followed:

- Use singular nouns for naming single resources and plural nouns for collections of resources. For example, the resource path of a collection of countries would be */countries* and for a single country resource would be */spain*.
- Use URI templates to include path segments that must be substituted before resolution. For example, */countries/{countryId}* contains the template *{countryId}*

that will be substituted by the REST API or its clients, and will adopt a specific numeric or alphanumeric identifier value like */countries/1234* which refers to a country with identifier 1234.

- APIs usually include a query component that allows achieving certain functionality. For example, */countries?inhabitants-number=10000000* requests for countries with inhabitants number equal to 10000000.

## A.1 Background

1. Are you familiar with Web Services?

- ☐ yes, but I have only used them
- ☐ yes, I have designed, implemented, and used them
- ☐ no

2. Are you familiar with REST APIs?

- ☐ yes, but I have only used them for data consumption
- ☐ yes, I have designed, implemented, and used them
- ☐ no

3. Are you familiar with GraphQL?

- ☐ yes, but I have only used them for data consumption
- ☐ yes, I have designed the schemes and queries needed to consume data
- ☐ no

4. How many Web APIs have you developed?

- ☐ 0
- ☐ between 1 and 5
- ☐ between 6 and 10
- ☐ more than 10

5. Have you used any semantic technology (e.g. RDF, SPARQL, OWL, among others)??
- ☐ yes
  - ☐ no
6. If the answer to the previous question was yes, please specify the semantic technologies you are used to:

## **A.2 Specific questions regarding REST APIs**

1. Executing the GET operation on the API path */resources* would return:
- ☐ a list of resources
  - ☐ the information of a specific resource
  - ☐ a list of resources that match the search parameter value
2. Executing the GET operation on the API path */resources/{resources-id}* would return:
- ☐ a list of resources
  - ☐ the information of a specific resource
  - ☐ a list of resources that match the search parameter value
3. Executing the GET operation on the API path */resources?query="value"* would return:
- ☐ a list of resources
  - ☐ the information of a specific resource
  - ☐ a list of resources that match the search parameter value

## **A.3 Specific questions on APIs based on ontology artefacts**

Next, given a domain, we present a set of requirements that have been gathered to build the ontology that represents this domain. Then, for each requirement (written in

natural language) we present the API paths that will allow obtaining data to solve it.

In each case, assume that the operation to be executed in the API path is a GET.

In the following sections, we will present the requirements and API paths of three different domains. In addition, a set of questions regarding these API paths.

### **A.3.1 First domain: Local business census and activities licenses.**

This ontology represents data related to the census of business premises and terraces of a municipality, as well as their associated economic activities and opening licenses. The documentation of this ontology is available at <http://vocab.ciudadesabiertas.es/def/comercio/tejido-comercial/index-en.html>.

#### **■ For the requirement: “What are the local businesses of the city?”**

Consider the following API paths:

- 1) /local-business/local-business
- 2) /local-businesses

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /local-business/local-business
- ☐ /local-businesses
- ☐ Both
- ☐ I don't have a preference

#### **■ For the requirement: “Obtain the information of a certain terrace”**

Consider the following API paths:

1) /local-business/terrace/{id}

2) /terraces/{terrace-id}

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /local-business/terrace/{id}
- ☐ /terraces/{terrace-id}
- ☐ Both
- ☐ I don't have a preference

■ **For the requirement: “List all the shopping areas of the city.”**

Consider the following API paths:

1) /local-business/shopping-area

2) /shopping-areas

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /local-business/shopping-area
- ☐ /shopping-areas

- ☐ Both
- ☐ I don't have a preference

### A.3.2 Second domain: Air Quality

This ontology represents the air quality observations that are being published by many organizations and individuals as a result of the measurements that are taken by air quality stations and sensors. The documentation of this ontology is available at <http://vocab.linkeddata.es/datosabiertos/def/medio-ambiente/calidad-aire/index-en.html>

#### ■ For the requirement: “What are the air quality stations?”

Consider the following API paths:

- 1) /service/air-quality/list
- 2) /air-quality-stations

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/air-quality/list
- ☐ /air-quality-stations
- ☐ Both
- ☐ I don't have a preference

#### ■ For the requirement: “What is the information of an air quality station?”

Consider the following API paths:

1) /service/air-quality/list?id="value"

2) /air-quality-stations/{air-quality-station-id}

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/air-quality/list?id="value"
- ☐ /air-quality-stations/{air-quality-station-id}
- ☐ Both
- ☐ I don't have a preference

■ **For the requirement: "What are the air quality observations?"**

Consider the following API paths:

1) /service/air-quality

2) /air-quality-observations

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/air-quality
- ☐ /air-quality-observations

- ☐ Both
- ☐ I don't have a preference

### A.3.3 Third domain: Public Procurement

This ontology defines the concepts to describe the public procurement process and the contracts of the public sector. The documentation of this ontology is available at <http://contsem.unizar.es/def/sector-publico/pproc.html>

#### ■ For the requirement: “List all contracts of the city”

Consider the following API paths:

- 1) /service/public-procurement/contract
- 2) /contracts

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/public-procurement/contract
- ☐ /contracts
- ☐ Both
- ☐ I don't have a preference

#### ■ For the requirement: “What are the details of a contracting organization?”

Consider the following API paths:

- 1) /service/public-procurement/contracting-body/{id}
- 2) /organizations/{organization-id}



1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/public-procurement/contracting-body/{id}
- ☐ /organizations/{organization-id}
- ☐ Both
- ☐ I don't have a preference



**For the requirement: “What are the details of a notice?”**

Consider the following API paths:

1) /service/public-procurement/notice/{noticeId}

2) /notices/{notice-id}

1. From the API paths presented it could be said that:

- ☐ The 1st is generated automatically and the 2nd is generated manually
- ☐ The 2nd is generated automatically and the 1st is generated manually
- ☐ Both are generated manually
- ☐ Both are automatically generated
- ☐ It is not possible to determine how they were generated (Indistinguishable)

2. Which API path would you prefer to use?

- ☐ /service/public-procurement/notice/{noticeId}
- ☐ /notices/{notice-id}
- ☐ Both
- ☐ I don't have a preference