CPSV-AP API FOR NETHERLANDS

Making the SRU API compliant with CPSV-AP

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1. Introduction

The CPSV-AP API implemented for the Netherlands converts the output of SRU API into the CPSV-AP data model.

In order to perform such conversion, a mapping analysis was done to understand which data could be extracted from the SRU API.

After that, the CSPV-AP API has been implemented starting for the analysis of the input request and the output response, which determined the API contract.

2. The SRU API

The samenwerkende catalogi[1] is provided as an API which is based on the OWMS[2], a standard adopted at the national level in the Netherlands. OWMS is described as an XML Schema.

The SRU API is an XML based API which can be reached at the below URL:

http://zoekdienst.overheid.nl/SRUServices/SRUServices.asmx/Search

The SRU API has the below input parameters:

Table 1: Parameters accepted by the SRU API

Input Parameter	**Value**
version	1.2
operation	searchRetrieve
x-connection	sc
recordSchema	sc4.0
startRecord	1
maximumRecords	10
query	authority="Gelderland"

For example, users can get the first 10 records on the authority Gelderland with the below URL:

http://zoekdienst.overheid.nl/SRUServices/SRUServices.asmx/Search?version=1.2&operation=searchRetrieve&x-connection=sc&recordSchema=sc4.0&startRecord=1&maximumRecords=10&query=authority="Gelderland"

Only the last three parameters (startRecord, maximumRecords, query) have been considered to be dynamic, and therefore passed through the CPSV-AP API e.g:

http://localhost:8080/swagger-cxf-server-1.0.0/api/PublicServices?startRecord=1&maximumRecords=10&query=authority="Gelderland"

3. The CPSV-AP Mapping

The CPSV-AP mapping with the SRU API is based on multiple XML schemas, which define the structure of the output of the SRU API, mainly:

[1] https://www.logius.nl/diensten/samenwerkende-catalogi/documentatie

[2] https://standaarden.overheid.nl/owms/terms

- Owms.xsd (5 properties can be mapped to CSPV-AP)
- Sc.xsd (2 properties can be mapped to CSPV-AP)
- Gzd.xsd (2 properties can be mapped to CPSV-AP)

The outcome of the mapping analysis shows that, a mapping towards CPSV-AP is possible. However, the result might not be fully compliant with CPSV-AP version 2.2.1 since two properties (authority and productHTML) have cardinalities more relaxed than the CPSV-AP.

The reader can find more details in the Mapping spreadsheet.

4. API Architecture

4.1 Input request and Output response

The CSPV-AP API implemented is a REST API, which has three input parameters:

- startRecord
- maximumRecords
- query

Which are the same input for the SRU API (see The SRU API for more details), and one output:

- PublicServiceDataset

The CSPV-API passes the three input parameters to the SRU API and adds the other parameters. It then gets back the SRU Response and generates a PublicServiceDataset.

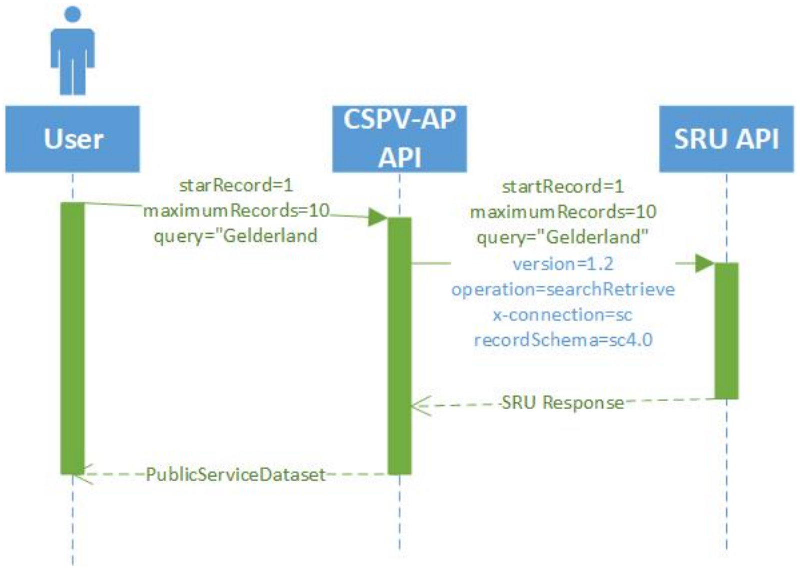


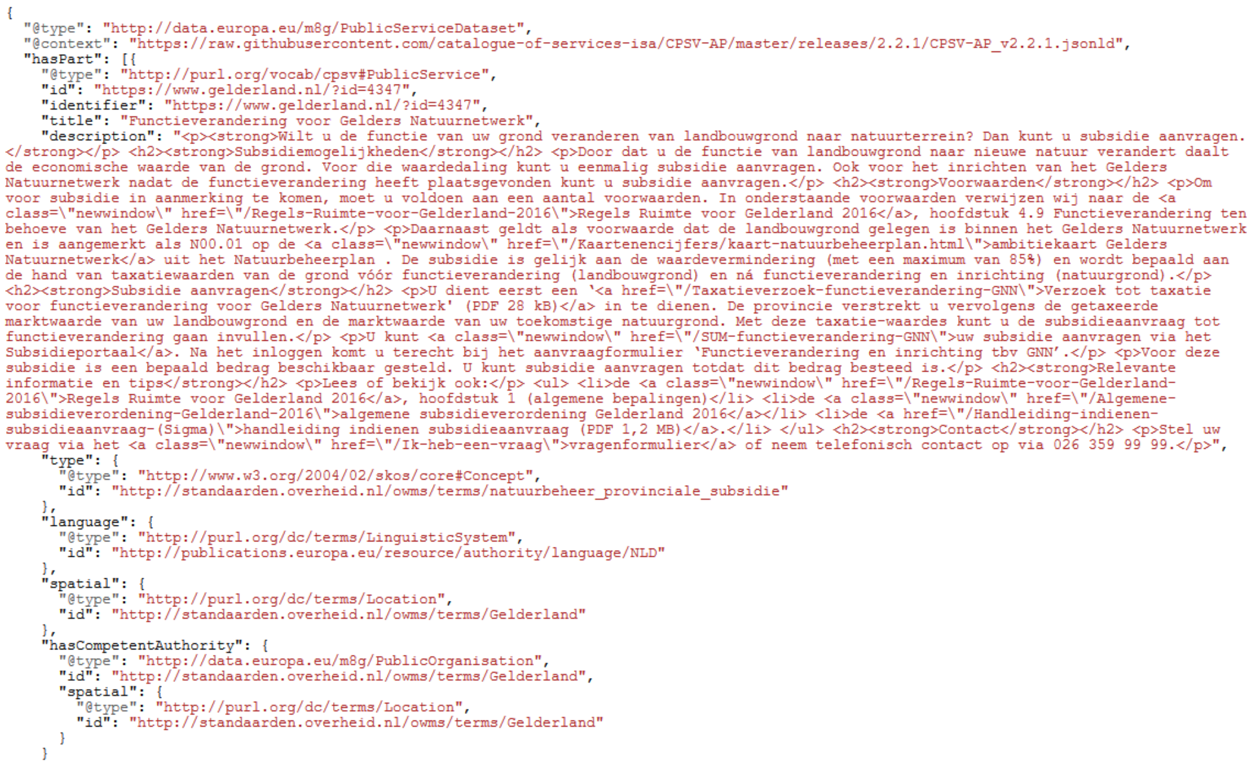
Figure 1: Sequence diagram of interaction between the CPSV-AP API and SRU API

The PublicServiceDataset contains a list of PublicService which in turn has the following properties/relations (based on the aforementioned The CPSV-AP Mapping):

- Identifier
- Title
- Language
- Spatial
- hasCompetentAuthority
- type

- description

While the PublicOrganization connected has its identifier and the Spatial property.

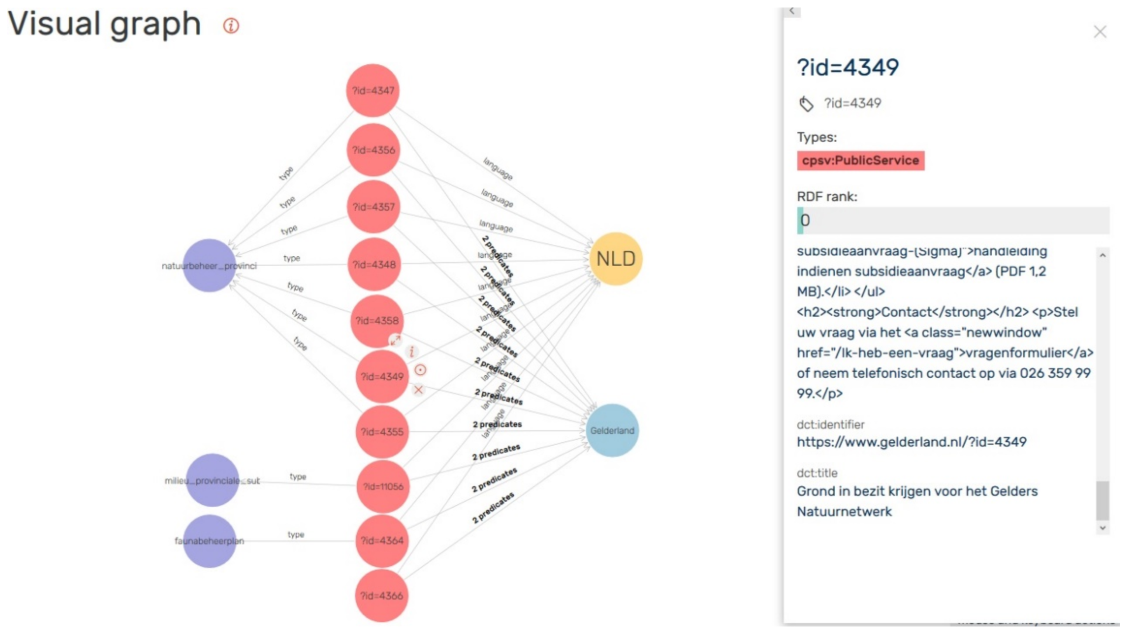


```
{
  "@type": "http://data.europa.eu/m8g/PublicServiceDataset",
  "@context": "https://raw.githubusercontent.com/catalogue-of-services-isa/CPSV-AP/master/releases/2.2.1/CPSV-AP_v2.2.1.jsonld",
  "hasPart": [{
    "@type": "http://purl.org/vocab/cpsv#PublicService",
    "id": "https://www.gelderland.nl/?id=4347",
    "identifier": "https://www.gelderland.nl/?id=4347",
    "title": "Functieverandering voor Gelders Natuurnetwerk",
    "description": "<p><strong>Wilt u de functie van uw grond veranderen van landbouwgrond naar natuurterrein? Dan kunt u subsidie aanvragen.
</strong></p> <h2><strong>Subsidiemogelijkheden</strong></h2> <p>Door dat u de functie van landbouwgrond naar nieuwe natuur verandert daalt
de economische waarde van de grond. Voor die waardedaling kunt u eenmalig subsidie aanvragen. Ook voor het inrichten van het Gelders
Natuurnetwerk nadat de functieverandering heeft plaatsgevonden kunt u subsidie aanvragen.</p> <h2><strong>Voorwaarden</strong></h2> <p>Om
voor subsidie in aanmerking te komen, moet u voldoen aan een aantal voorwaarden. In onderstaande voorwaarden verwijzen wij naar de <a
class=\"newwindow\" href=\"/Regels-Ruimte-voor-Gelderland-2016\">Regels Ruimte voor Gelderland 2016</a>, hoofdstuk 4.9 Functieverandering ten
behoeve van het Gelders Natuurnetwerk.</p> <p>Daarnaast geldt als voorwaarde dat de landbouwgrond gelegen is binnen het Gelders Natuurnetwerk
en is aangemerkt als N00.01 op de <a class=\"newwindow\" href=\"/Kaartenencijfers/kaart-natuurbeheerplan.html\">ambitiekaart Gelders
Natuurnetwerk</a> uit het Natuurbeheerplan . De subsidie is gelijk aan de waardevermindering (met een maximum van 85%) en wordt bepaald aan
de hand van taxatiewaarden van de grond vóór functieverandering (landbouwgrond) en ná functieverandering en inrichting (natuurgrond).</p>
<h2><strong>Subsidie aanvragen</strong></h2> <p>U dient eerst een ‘<a href=\"/Taxatieverzoek-functieverandering-GNN\">Verzoek tot taxatie
voor functieverandering voor Gelders Natuurnetwerk' (PDF 28 kB)</a> in te dienen. De provincie verstrekt u vervolgens de getaxeerde
marktwaarde van uw landbouwgrond en de marktwaarde van uw toekomstige natuurgrond. Met deze taxatie-waardes kunt u de subsidieaanvraag tot
functieverandering gaan invullen.</p> <p>U kunt <a class=\"newwindow\" href=\"/SUM-functieverandering-GNN\">uw subsidie aanvragen via het
Subsidieportaal</a>. Na het inloggen komt u terecht bij het aanvraagformulier ‘Functieverandering en inrichting tbv GNN’.</p> <p>Voor deze
subsidie is een bepaald bedrag beschikbaar gesteld. U kunt subsidie aanvragen totdat dit bedrag besteed is.</p> <h2><strong>Relevante
informatie en tips</strong></h2> <p>Lees of bekijk ook:</p> <ul> <li>de <a class=\"newwindow\" href=\"/Regels-Ruimte-voor-Gelderland-
2016\">Regels Ruimte voor Gelderland 2016</a>, hoofdstuk 1 (algemene bepalingen)</li> <li>de <a class=\"newwindow\" href=\"/Algemene-
subsidieverordening-Gelderland-2016\">algemene subsidieverordening Gelderland 2016</a></li> <li>de <a href=\"/Handleiding-indienen-
subsidieaanvraag-(Sigma)\">handleiding indienen subsidieaanvraag (PDF 1,2 MB)</a>.</li> </ul> <h2><strong>Contact</strong></h2> <p>Stel uw
vraag via het <a class=\"newwindow\" href=\"/Ik-heb-een-vraag\">vragenformulier</a> of neem telefonisch contact op via 026 359 99 99.</p>",
    "type": {
      "@type": "http://www.w3.org/2004/02/skos/core#Concept",
      "id": "http://standaarden.overheid.nl/owms/terms/natuurbeheer_provinciale_subsidie"
    },
    "language": {
      "@type": "http://purl.org/dc/terms/LinguisticSystem",
      "id": "http://publications.europa.eu/resource/authority/language/NLD"
    },
    "spatial": {
      "@type": "http://purl.org/dc/terms/Location",
      "id": "http://standaarden.overheid.nl/owms/terms/Gelderland"
    },
    "hasCompetentAuthority": {
      "@type": "http://data.europa.eu/m8g/PublicOrganisation",
      "id": "http://standaarden.overheid.nl/owms/terms/Gelderland",
      "spatial": {
        "@type": "http://purl.org/dc/terms/Location",
        "id": "http://standaarden.overheid.nl/owms/terms/Gelderland"
      }
    }
```

Figure 2: JSON-LD representation of the output of the CSPV-AP API via JSON-LD playground

In the example above, the reader can find a JSON-LD output of the CPSV-AP API, that displays, at the top, the PublicServiceDataset including, via the *@context* property, the CPSV-AP JSON-LD context which is reused to express linked data properties. Furthermore, the above example shows a PublicService with its properties (type, language, etc.).

Displaying the JSON-LD output as a graph, gives the following:



?id=4349

?id=4349

Types:
cpsv:PublicService

RDF rank:
0

subsidieaanvraag-(Sigma)">handleiding indienen subsidieaanvraag</a> (PDF 1,2 MB).</li> </ul> <h2><strong>Contact</strong></h2> <p>Stel uw vraag via het <a class="newwindow" href="/Ik-heb-een-vraag">vragenformulier</a> of neem telefonisch contact op via 026 359 99 99.</p>

dct:identifier
https://www.gelderland.nl/?id=4349

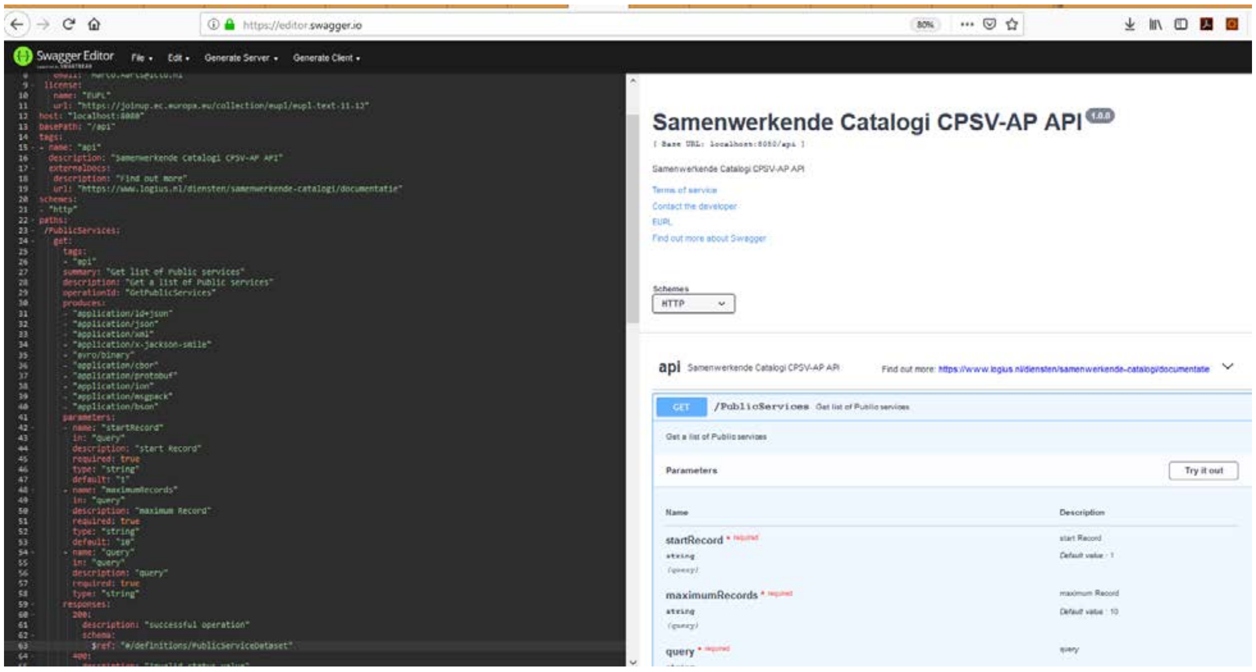
dct:title
Grond in bezit krijgen voor het Gelders Natuurnetwerk

Figure 3: The output of the CPSV-API displayed as graph via GraphDB triple store

As can be seen in the above image, all public services have the same competent authority (Gelderland) as requested to the API via the query parameter.

4.2 The API Contract

The API Contract has been created accordingly to the OpenAPI 2.0 (Swagger) standard using the online editor at: https://editor.swagger.io/ which provides syntax highlighting in case of typos and displays the possible representation:



```
  license:
    name: "EUPL"
    url: "https://joinup.ec.europa.eu/collection/eupl/eupl-text-11-12"
host: "localhost:8080"
basePath: "/api"
tags:
- name: "api"
  description: "Samenwerkende Catalogi CPSV-AP API"
  externalDocs:
    description: "Find out more"
    url: "https://www.logius.nl/diensten/samenwerkende-catalogi/documentatie"
schemes:
- "http"
paths:
  /PublicServices:
    get:
      tags:
      - "api"
      summary: "Get list of Public services"
      description: "Get a list of Public services"
      operationId: "GetPublicServices"
      produces:
      - "application/ld+json"
      - "application/json"
      - "application/xml"
      - "application/x-jackson-smile"
      - "avro/binary"
      - "application/cbor"
      - "application/protobuf"
      - "application/ion"
      - "application/msgpack"
      - "application/bson"
      parameters:
      - name: "startRecord"
        in: "query"
        description: "start Record"
        required: true
        type: "string"
        default: "1"
      - name: "maximumRecords"
        in: "query"
        description: "maximum Record"
        required: true
        type: "string"
        default: "10"
      - name: "query"
        in: "query"
        description: "query"
        required: true
        type: "string"
      responses:
        200:
          description: "successful operation"
          schema:
            $ref: "#/definitions/PublicServiceDataset"
        400:
```

Samenwerkende Catalogi CPSV-AP API 1.0.0

[Base URL: localhost:8080/api]

Samenwerkende Catalogi CPSV-AP API

Terms of service
Contact the developer
EUPL
Find out more about Swagger

Schemes: HTTP

api Samenwerkende Catalogi CPSV-AP API — Find out more: https://www.logius.nl/diensten/samenwerkende-catalogi/documentatie

GET /PublicServices Get list of Public services

Get a list of Public services

Parameters — Try it out

Name	Description
startRecord * required string (query)	start Record Default value : 1
maximumRecords * required string (query)	maximum Record Default value : 10
query * required	query

Figure 4: The online Swagger editor used to create the API contract

4.2.1 Protocol
The only supported protocol is HTTP, leaving security aside from the scope of the project.

4.2.2 Formats
As described in the contract, the CPSV-API supports content negotiation in order to provide different output formats via the HTTP Accept header by using the related mime types:

Table 2: Supported formats of the CPSV-AP API

Format	Type	Mime type
JSON-LD	Text	application/ld+json
XML	Text	application/xml
JSON	Text	application/json
SMILE	Binary	application/x-jackson-smile
AVRO	Binary	avro/binary
CBOR	Binary	application/cbor
Protobuf	Binary	application/protobuf
ION	Binary	application/ion
MSGPACK	Binary	application/msgpack
BSON	Binary	application/bson

The API provides the output in JSON-LD format by default, so there is no need to add the HTTP Accept header for this format.

4.2.3 Data models
The below data models are described within the API Contract which are those defined in the Input request and Output response section:

- PublicServiceDataset, as container of PublicService
- PublicService
- PublicOrganization
- Concept (Public Service type)
- Location (Public Service and Public Organization spatial)
- Language

4.3 Performance
As the user can choose to increase the number of public services to be provided the CPSV-API need to be performant.

Performance of the API can be given by:

- the output format chosen via the query;
- the caching mechanism established in the API;
- the zipping mechanism established in the API.

4.3.1 Binary formats
As explained in the Formats section, there are several supported binary formats, which are useful to improve the performance of the API. According to the tests conducted on the API, Avro and Protobuf formats are the most performant in terms of output length:

Table 3: Binary format comparison

Format	Byte length	GZIP compression
AVRO	38600	8527
PROTOBUF	38665	8573
SMILE	38788	8553
ION	38871	8721
MSGPACK	39471	8602
CBOR	39546	8622
BSON	40114	8748

4.3.2 Caching

Caching is enabled by means of the annotation in the API code (ApiApiServiceImpl.java) with a default of 10 minutes (600 seconds): @CacheControl("max-age=600").

As a result, the response of the CPSV-AP API includes the HTTP Header Cache-Control set to 600 and the response code changed to 304.

4.3.3 Zipping

Zipping is enabled by default in the API, by leveraging two configuration properties:

1) threshold, set to 0 bytes, which means everything (bigger than 0) will be compressed;
2) Force, to force the zipping.

Such configuration can be found in the applicationContext.xml as seen in the Component architecture. As a result, the response of the CPSV-AP API includes the HTTP Header Content-encoding set to gzip.

4.3.4 Etag

ETags are usually used for two reasons: caching and conditional requests. The implementation is a shallow one – the application calculates the ETag based on the response, which will save bandwidth but not server performance.

The ETag value can be thought of as a hash computed out of the bytes of the Response body. Because the service likely uses a cryptographic hash function, even the smallest modification of the body will drastically change the output and thus the value of the ETag.

The CPSV-AP API supports the ETag by declaring a filter within the web.xml file. Such filter generates an ETag value based on the content of the response. This ETag is compared to the If-None-Match header of the request. If these headers are equal, the response content is not sent, but rather a 304 "Not Modified" status instead.

4.4 Component architecture

The below image shows the component diagram.

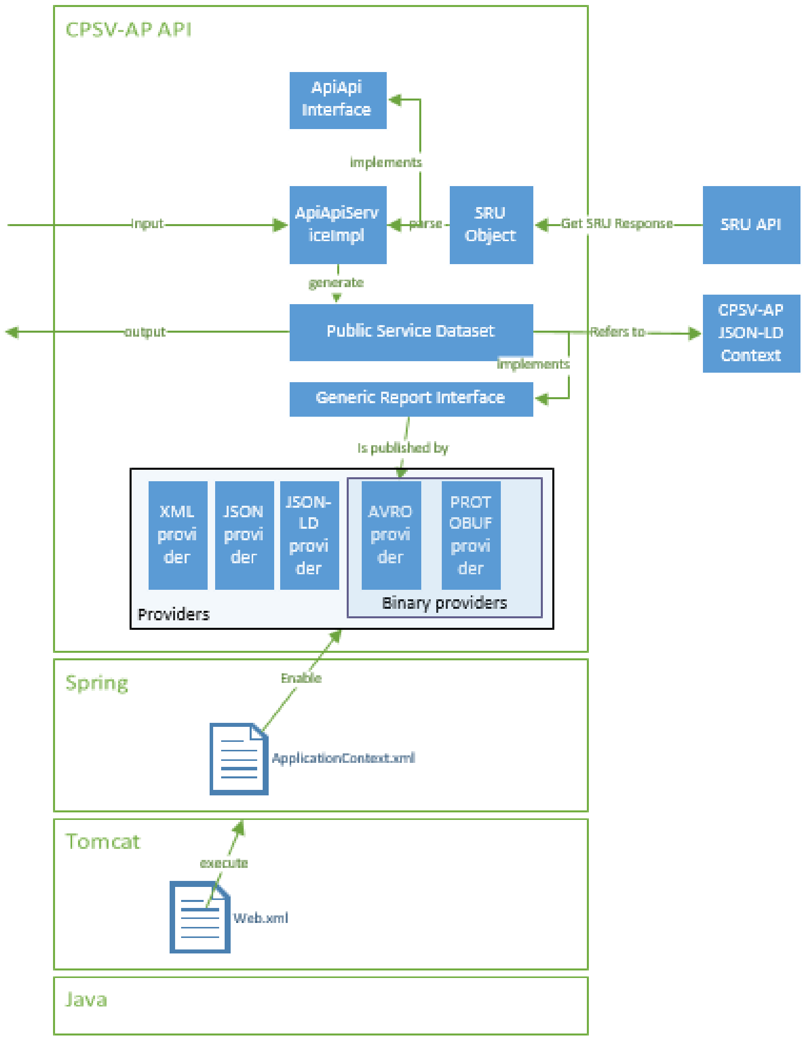


Figure 5: Component Diagram

The CPSV-AP API is based on the Apache CXF Framework and deployed on Apache Tomcat. In order to be deployed, a web.xml file, which specifies the base URL of the API and some filters (e.g. Etag), is required.

The CXF Framework is based on the Spring Framework. As such, to run, the API is required to have an ApplicationContext.xml which contains the list of providers (e.g. Avro, Protobuf, etc.). The applicationContext.xml is linked by the web.xml file and allows to generate dynamically the swagger json of the API (http://localhost:8080/swagger-cxf-server-1.0.0/api/swagger.json).

As explained in section "4.1 Input request and Output response", the CPSV-AP API passes input parameters to the SRU API, which returns an SRU Response. The input parameters are described inside the ApiApi Interface (which is also responsible of formatting the output of the API). The ApiApi Interface is implemented by the ApiApiServiceImpl. The SRU Response is translated into one or more SRU Objects, which represent descriptions of various public services.

The CPSV-AP API transforms the SRU Object into a PublicService Dataset. Such object contains java annotations to refer to the CPSV-AP JSON-LD context which is included when the user requires a JSON-LD output.

The PublicService Dataset implements the GenericReport interface which is used by the binary providers.

5. Development

5.1 Source code structure

In the below table, the reader can find the main folders and files included in the API.

Table 4: Source code structure

File / Folder	Description
pom.xml	File needed by Maven to compile and package the API.
.swagger-codegen-ignore	File needed by the Maven Swagger codegen plugin to generate the model and the API.
/doc	Documentation about the API.
/src/gen/java/io/swagger/api	API generated by the Maven Swagger codegen plugin.
/src/gen/java/io/swagger/model	Model generated by the Maven Swagger codegen plugin.
/src/gen/java/cxf	Model of the SRU API generated by JAXB.
/src/main/java/cxf/SruObject.java	Representation of a public service extracted from the SRU Response.
/src/main/java/io.swagger.api/impl/ApiApiServiceImpl.java	Implementation of the API.
/src/main/java/io.swagger.api/*	Gathers all the providers (Avro, Protobuf, etc.) used by the API.
/src/main/resources/wsdl/*	Xml schema used to generate the model of the SRU API.
/src/main/resources/applicationContext.xml	Application Context used by the Spring Framework.
/src/main/resources/netherlandsapi.yaml	API contract (expressed as YAML) used by the Maven Codegen plugin.
/src/main/webapp/WEB-INF/web.xml	Deployment file of the API.

5.2 Requirements

The main three requirements to compile and deploy the CSPV-AP API are:

1) JDK 8
2) Apache Maven
3) Apache Tomcat 8

One of the dependency described inside the “pom.xml” is the Jackson/json-ld module which has been modified to include the CPSV-AP remote context[3].

5.3 Compiling and Deploying

As the CPSV-AP API is implemented in Java as Maven project, it is easy to compile the project by means of the maven goal “compile”.

The “compile” goal will trigger the previous goals like “generate-sources” used by the maven-swagger-codegen plugin.

The “package” goal will create the war file in the */target* folder. Such war file needs to be copied under the webapps folder of Apache Tomcat, the application server used for the development. When Tomcat is up and running, the war file expands in a folder and the API can be used.

6. Testing

It has been tested that:

[3] https://github.com/catalogue-of-services-isa/jackson-jsonld

- the API provides the right output format depending on the accept header with the REST Client of Firefox;
- the Swagger file is correctly imported by SOAP UI;
- the JSON-LD output has been verified with the json-ld.org/playground/ website[4] and with the validator[5] which is able to retrieve the remote JSON-LD context.

7. Mapping spreadsheet

Attached below the mapping spreadsheet use to map CPSV-AP with the SRU data model.

Mapping.x

[4] https://json-ld.org/playground/

[5] http://rdfvalidator.mybluemix.net/