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Harmonising the public service models of the Points of Single Contact using the Core Public Service Vocabulary Application Profile

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Abstract. In the process of implementing the Services Directive, Member States have implemented electronic Points of Single Contact (PSCs) offering public services categorised according to business events. The objective of this paper is to present a commonly agreed data model for describing business events and public services with a particular focus on the electronic PSCs. The paper describes the definition and verification of this data model, called Application Profile of the ISA Core Public Service Vocabulary (CPSV-AP), which includes 16 classes and 85 properties. Moreover, the paper describes the model's mapping to the data models used in the PSCs of 10 MS.

Keywords: public service, business event, service directive, point of single contact, semantic interoperability, CPSV-AP

1. Introduction

In the process of implementing the Services Directive, Member States have implemented electronic Points of Single Contact, in the form of eGovernment portals that allow businesses to:

- Find information about business events and related public services, i.e. the rules to be followed, the prerequisites to be fulfilled, the formalities to be completed and the legislation that is governing a particular business event and its related public services; and
- Execute the public services online (wherever possible).

These electronic PSCs are currently facing several challenges, such as:

- Lack of coordination between the electronic PSCs within the same country and fragmentation of responsibilities;
- Heterogeneous, monolingual, descriptions of public services and business events;
- Administration-centric vs. business centric-approach; and
- National vs. cross-border public service provision.

There is thus a strong need within the MSs for harmonising the way business events and related public services are described. This can be achieved by means of a common data model for representing business events and public services. In our work, such common data model is defined as an Application Profile of the ISA Core Public Service Vocabulary1 (henceforth referred to as the CPSV-AP). An Application Profile2 is a specification that re-uses terms from one or more base standards, adding more specificity by identifying mandatory, recommended and optional elements to be used for a particular application, as well as recommendations for controlled vocabularies to be used.

2. Methodology

Work reported in this paper has been conducted according to the ISA process and methodology[3] for developing Core Vocabularies. The process involved the set-up of a Working Group (WG) and the publication of drafts of the specification for external review. The CPSV-AP was developed under the responsibility of the European Commission's ISA Programme[4] which was also chairing the WG. The WG[5] was responsible for defining the specifications and was established from (part of) the members of the EUGO Network[6] and TIE Cluster representatives. The representatives from 10 MSs (Austria, Estonia, Finland, Greece, Netherlands, Latvia, Lithuania, Poland, Spain and Sweden) participated in this process. Apart from email communication, the WG members participated in 4 webinars.

In practice, the specification of the CPSV-AP followed a four-step process:

Step 1: Following a bottom-up approach, we started by reviewing and analysing the state-of-the-art in the 28 MSs concerning the models being used for describing business events and public services on the electronic PSCs. This analysis led to the documentation of the classes and properties of the model being used in each MS.

Step 2: The participating 10 MSs were then asked to review and validate the analysis of the documented data model for their country.

Step 3: Subsequently, the PSCs' data models for describing business events and public services were compared in order to identify differences and commonalities. As a result, we identified possible new classes and properties for the CPSV-AP. These were suggested as a proposal to the WG. The CPSV-AP also includes a set of recommended controlled vocabularies for different properties with a primary focus on the identification of a common controlled vocabulary for public service types, which can then be linked to key business events. These controlled vocabularies were also subject to the approval of the WG.

Step 4: Furthermore, we proceeded to the creation of a (machine-readable) mapping of each PSC model to the classes, properties and values of the controlled vocabularies of the CPSV-AP, in order to harmonize the national data models and the common data model. The 10 participating MSs were then asked to contribute to and validate these mappings. Finally, a public review period was organised.

[1] https://joinup.ec.europa.eu/asset/core_public_service/description
[2] http://dublincore.org/documents/2001/04/12/usageguide/glossary.shtml#A
[3] https://joinup.ec.europa.eu/node/43160
[4] http://ec.europa.eu/isa
[5] https://joinup.ec.europa.eu/node/104619
[6] http://ec.europa.eu/internal_market/eu-go/index_en.htm

3. Related work

All countries nowadays, including the 10 European Member States that were surveyed in the context of this work, have created models for describing public services. A commonly agreed view for public service is that it can be defined as a "*set of deeds and acts performed by or on behalf of a public administration for the benefit of a citizen, a business or another public administration*"[7]. Researchers in the past years, such as the Government Enterprise Architecture [[2]], have also been busy with studying and modelling public services. With the advent of eGovernment, the question on how to organise and present public services and information on public services at government portals emerged. The need for an efficient and citizen-centric way to organise public services on electronic PSCs led to the introduction of the Life Events (LE) term [[3],[4]]. This term has been defined as referring "*to the government services needs at specific stages in life*" [[5]] and as describing "*situations of human beings where public services may be required*" [[6]]. Similarly, the Business Events (BE) term – also called business episodes or business life-events – has been introduced for describing public services referring specifically to businesses [[4]].

Most public administrations have adopted the aforementioned terms and offer their services categorised according to LEs and BEs. This categorisation of public services is also used in the majority of PSCs. Consequently, the commonly agreed data model proposed in this paper intends to document public services in the context of BEs that comprise the business life cycle. Typical examples of such business events are[8]:

- Starting a business, e.g. starting a new activity or company;
- Starting cross-border business e.g. registering a company on abroad ;
- Doing business, e.g. staffing, reporting and notifying authorities;
- Closing a business, e.g. selling the company, closing a branch.

4. The Core Public Service Vocabulary Application Profile

The CPSV-AP (see Figure 1) has 16 classes and 85 properties. To indicate the minimum requirements to comply with the CPSV-AP, the classes and properties are being classified as being mandatory or optional. A minimal implementation of the CPSV-AP at least provides information on the mandatory properties of the mandatory classes. Optional classes can still have properties that are indicated as mandatory, if the particular class is used. 4 mandatory classes are defined, i.e. Business Event, Public Service, Input and Formal Organisation classes, and 27 mandatory properties.

Following, we discuss briefly one by one the classes of CPSV-AP:

Business Event class. This class represents a Business Event. A Business Event is a specific situation or event in the lifecycle of a business, which relates to one or more needs or obligations of that business at this specific point in time. A Business Event requires a set of public services to be delivered in order for the associated business needs or obligations to be fulfilled.

[7] e-Government Core Vocabularies, v1.1 https://joinup.ec.europa.eu/asset/core_vocabularies
[8] http://ec.europa.eu/idabc/servlets/Doc2bb8.pdf?id=1675

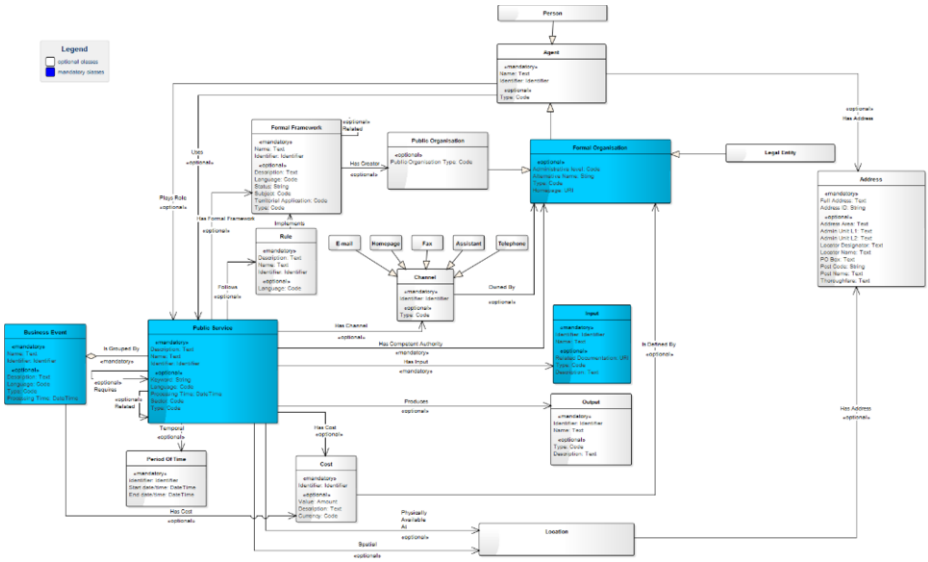

Figure 1. Graphical representation of the relationships between the classes and properties of the CPSV-AP

Public Service class. This class represents the Public Service itself. A Public Service is the capacity to carry out a procedure and exists whether it is used or not. CPSV-AP adopts the definition of the Public Service as defined in Section 3.

Input class. Input can be any resource, e.g. document, artefact. In the context of Public Services, Inputs are usually administrative documents, applications, etc.

Output class. Outputs can be any resource, e.g. document, artefact, produced by a Public Service. In the context of a Public Service, the Output documents an official documentation of the Competent Authority (Formal Organisation) that permits/authorises/entitles an Agent to (do) something.

Cost class. The Cost class represents any costs related to the execution of a Public Service or to all Public Services related to a Business Event which the Agent consuming it, needs to pay.

Channel class. The Channel class represents the medium through which an Agent provides, uses or otherwise interacts with a Public Service.

Period of Time class. The Period of Time class represents an interval of time that is named or defined by its start and end dates. This interval indicates from when to when a Public Service is executable.

Rule class. The Rule class represents a document that sets out the specific rules, guidelines or procedures that the Public Service follows.

Formal Framework class. This class represents the legislation, policies that lie behind the rules that govern the service. The definition and properties of the Formal Framework class in the CPSV-AP are aligned with the ontology included in "Council conclusions inviting the introduction of the European Legislation Identifier (ELI)"[9].

Agent class. The Agent class is any resource that acts or has the power to act. In some countries' legislation the concept Person is a class for anyone that can be legally

[9] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52012XG1026%2801%29

represented and can thus have both Natural Person and a Legal Person (organisation) as subclasses. In the context of this specification a Natural Person is described through the "Person" class, defined in the Core Person Vocabulary[10], and the Legal Person through the "Legal Entity" class, defined in the Core Business Vocabulary[11].

Formal Organisation class. The Formal Organisation class has been defined in the Organization Ontology[12]. It represents an Organisation which is recognized, with associated rights and responsibilities.

Public Organisation class. The Public Organisation class represents a Formal Organisation that is owned by and managed by a state's government.

Person class. The Person class represents a natural person. A natural Person can be the user of a particular Public Service.

Legal Entity class. The Legal Entity class has been defined in the Core Business Vocabulary[13] and represents a business that is legally registered. A Legal Entity is able to trade, is legally liable for its actions, accounts, tax affairs, etc. This makes legal entities distinct from the concept of organisations, groups or sole traders. This vocabulary is concerned solely with registered legal entities and does not attempt to cover all possible trading bodies. A Legal Entity can play different roles related Public Services. The Legal Entity can be a user of a particular Public Service but can also be the Competent Authority of the Public Service.

Location class. The Location class represents an identifiable geographic place. The Address class has been defined in the context of the Core Location Vocabulary[14].

Address class. The Address class represents an address for the representation of a Location. The representation of addresses varies widely from one country's postal system to another. Even within countries, there are almost always examples of addresses that do not conform to the stated national standard.

5. Mapping of the PSC data models to CPSV-AP

The mapping of the PSC data models to the CPSV-AP was based on the review and analysis on the way information is provided on the PSC on the one hand, and the CPSV-AP on the other hand. The objective of the mapping exercise was to promote the harmonization between the business event and public service models used in the 10 MSs and the commonly-agreed European data model, i.e. the CPSV-AP. Each mapping can be of five types (Figure 2), where A is the foreign class or property and B is the class or property from CPSV-AP.

A discussion on the mapping results for each of the participating countries follows:

Austria. Austria has 9 PSCs, while there is also a main Austrian PSC operating as an "umbrella" of the individual PSCs and as a gateway for easily finding each regional PSC. Our analysis included therefore one Austrian data model. The Austrian data model includes 6 classes (i.e. Business Event, Public Service, Input, Formal Framework, Formal Organisation, Location) of the CPSV-AP and 41 properties. All 6 classes have been mapped as "exact match" and 39 of the properties are also mapped as "exact match"; the rest 2 properties are a "related match" and a "close match".

[10] https://joinup.ec.europa.eu/asset/core_person/description
[11] https://joinup.ec.europa.eu/asset/core_business/description
[12] http://www.w3.org/TR/vocab-org/
[13] https://joinup.ec.europa.eu/asset/core_business/description
[14] https://joinup.ec.europa.eu/asset/core_location/description

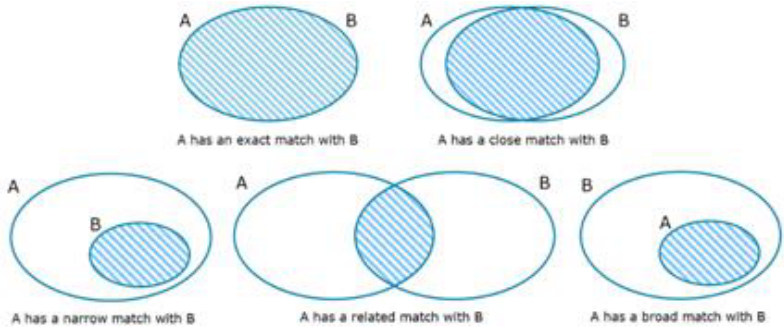

Figure 2. Mapping types

Estonia. The Estonian data model includes 5 classes of the CPSV-AP and 37 properties. 4 classes of the Estonian model are an "exact match" to CPSV-AP classes (Public Service, Input, Formal Framework, Formal Organisation) and 1 class (Business Event) is a "narrow match". More specifically, information and services on the Estonian PSC is categorized according to Topics which is a term with a wider meaning than Business Events. Hence, the "narrow" mapping used between Business Event and Topic. As regards properties' mapping, 32 properties have an "exact match" with CPSV-AP properties, 1 property has a "close match", 1 a "related match" and 3 a "narrow match" due to their direct relation with the Topic class.

Finland. The Finnish data model includes 9 classes (i.e. Business Event, Public Service, Input, Cost, Rule, Channel, Formal Framework, Formal Organisation, Agent) of the CPSV-AP and 80 properties. The Finnish PSC has the Service class which is an "exact match" to Public Service, but it also considers permits as a special subtype of services. The rest 7 classes have an "exact match" with CPSV-AP and 1 class (Agent) has a "close match". As regards the properties, most of them are "exactly" mapped; there are 2 properties with a "close match", 4 with a "related match" and 9 with either a "broad" or a "narrow match" due to the Service/Permit issue described previously.

Greece. The Greek data model includes 4 classes (i.e. Business Event, Public Service, Input, Location) of the CPSV-AP and 14 properties. The Business Event class of the CPSV-AP is only closely matched to the Provision Method of the Greek PSC which defines whether a service refers to business establishment, to cross-border business or both. The rest 3 classes are all an "exact match" to the relevant CPSV-AP classes. As regards properties, 12 are an "exact match" and 2 a "related match".

Netherlands. The concept of Public Service does not appear in the Dutch PSC. For this reason, the Dutch representative has additionally provided the description of the data model used in public administrations in the Netherlands[15]. In total, the Dutch data model includes 4 classes (i.e. Business Event, Public Service, Formal Framework, Address) and 25 properties. 2 of the classes (Public Service, Address) are an "exact match" with CPSV-AP and the rest 2 a "close match". As regards properties, 22 of them are an "exact match", 2 a "close match" and 1 a "related match".

Latvia. The Latvian data model includes 7 classes (i.e. Public Service, Input, Cost, Channel, Rule, Formal Framework, Formal Organisation) and 53 properties. The Latvian PSC is organized to support two types of services: e-Services and Services. Both of these have been mapped with the Public Service class of the CPSV-AP, the former as a

[15] https://www.logius.nl/ondersteuning/samenwerkende-catalogi/#c8604

"narrow match" and the latter as an "exact match". The rest classes are an "exact match" apart from the Contact class that is "close match". As regards properties, 30 of them are an "exact match" and the rest 23 properties are either a "close" or a "related match" with CPSV-AP.

Lithuania. The data model includes 6 classes (i.e. Business Event, Public Service, Input, Rule, Formal Framework, Formal Organisation) and 30 properties. The information on the Lithuanian PSC is organized according to Business Events and Permits. For this reason the Permit class is "broadly" matched to Public Service class. All other classes are an "exact match" to CPSV-AP. Regarding properties, 33 are an "exact match", 6 a "close match" and 1 a "related match" with CPSV-AP.

Poland. The Polish data model includes 6 classes (i.e. Business Event, Public Service, Input, Rule, Formal Framework, Formal Organisation) and 62 properties. All classes are an "exact match" apart from the Step (of the procedure) class that is "close match" matched to Rule class of the CPSV-AP. As regards properties, 52 of them are an "exact match", 9 a "close match" and 1 a "related match" with CPSV-AP.

Spain. The Spanish data model includes 11 classes (i.e. Business Event, Public Service, Input, Output, Cost, Period of Time, Formal Framework, Formal Organisation, Public Organisation, Location, Address) and 60 properties. All classes are an "exact match" with the CPSV-AP apart from the Public Service class that is "closely" matched to CPSV-AP. As regards properties, 50 of them are an "exact match", 4 a "close match", 4 a "related match" and 2 a "narrow match" with CPSV-AP.

Sweden. The Swedish data model includes 4 classes (i.e. Business Event, Public Service, Input, Formal Organisation) and 23 properties. The Swedish PSC is built around the concept of Permits which are considered the result of the Public Services. For this reason the Permit class is "broadly" matched to the Public Service class. The rest classes as well as all properties are an "exact match" with CPSV-AP.

Mapping PSC data models with CPSV-AP revealed some interesting results. First, the national data models describing Business Events and Public Services do not cover the whole set of classes or properties defined in the CPSV-AP. Nevertheless, all national data models had additional concepts (mostly properties but sometimes also classes) not defined in the CPSV-AP. This is attributed to the fact that PSCs want to provide detailed information to users, and it cannot be considered as a deficiency of the CPSV-AP

Second, this mapping exercise lead to a few updates of the CPSV-AP that was originally defined. One such important update is the connection of the Public Service and the Formal framework classes. These classes were originally related only through the Rule class. However, the mapping revealed that usually Public Service and Formal framework classes were directly related. Another update is the specification of the Channel class to Email, Homepage, Fax, Telephone and Assistant. The latter was inserted purely as a result of the PSCs' analysis. Finally, the Cost class is also the result of the mapping exercise. Initially, cost was only related to Public Service as a property. However, the PSC analysis showed that cost is often related with Business Event and Formal Organisation classes as well.

6. Conclusions and future work

The CPSV-AP model can be used as the native data model for publishing business event and public service descriptions on a PSC or any other platform containing public service information. Also, it could serve as a common layer for mapping different existing data

models and seamlessly exchanging information on public services across platforms within and across borders. The CPSV-AP should be seen as a generic data model that can be further extended and tailored to the national context or to be suitable for other purposes like Public Service Portfolio management.

The adoption of CPSV-AP largely depends on its implementation in tools for the creation, publication, searching and finding, and exchange (mapping, exporting and harvesting) of these descriptions. In order to facilitate this adoption, future work will focus on the functional specifications of the following reusable tools: (a) a tools for creating machine-readable descriptions of public services; (b) tools for mapping the classes, properties and controlled vocabularies of any data model to CPSV-AP; and (c) tools enabling to harvest public service descriptions, by tagging the content with HTML tags (RDFa) and crawling the pages, or by using a web service that can be called for exporting and harvesting the information.

These tools will stimulate further usage of CPSV-AP towards a more user-centric and harmonised way of publishing information and descriptions of public services and towards easy exchange of this information between different platforms, both within the context of a country and cross-border.

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