ICEG Training Interoperability

MS Teams (150min)

13 June 2022

#beinterop

start at
9:35

Agreements

- Audience is **muted**.
- Questions, comments or suggestions can be shared via the **chat function** of MS Teams.

    ➔ Interaction is encouraged!

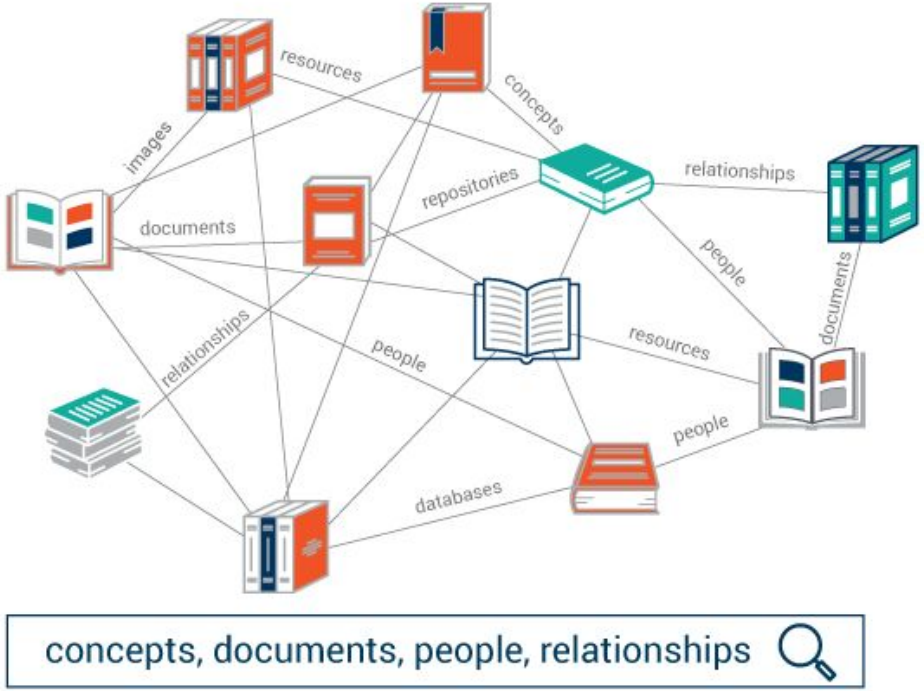
    +1 of -1

- A yes/no question can be answered simply and quickly via chat:

    Agree= +1 Disagree= -1

Today

9:35 - 10:40 - *plenary*
Introduction ICEG 10’
About linked data 45'
Example case 10’



Today

9:35 - 10:40 - *plenary*
Introduction ICEG 10’
About linked data 45'
Example case 10’

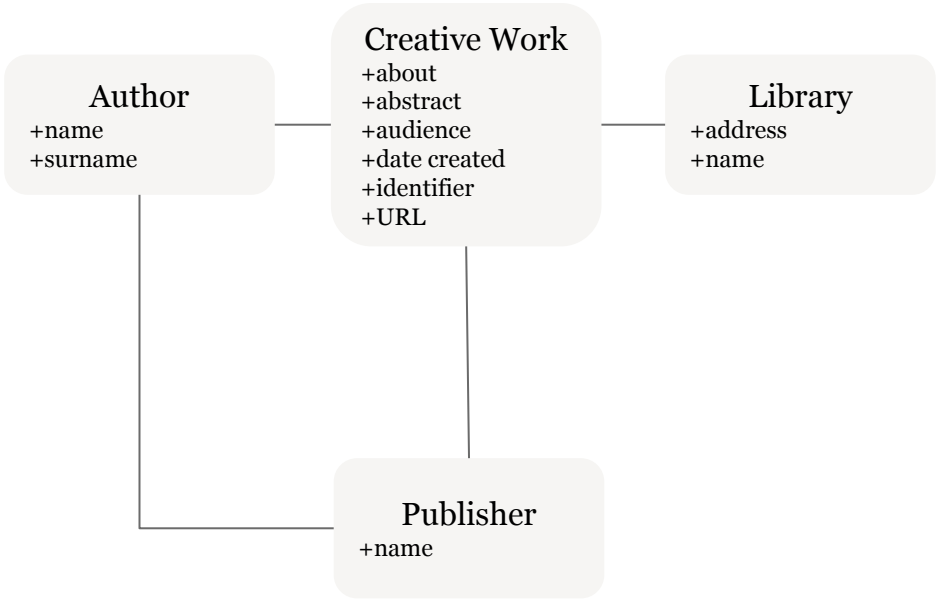
10:40 – 10:50
Break 10'

Today

9:35 - 10:40 - *plenary*
Introduction ICEG 10’
About linked data 45'
Example case 10’

10:40 – 10:50
Break 10'

10:50 - 11:50 – *break-out*
Case “Vaccination Passport” 60'



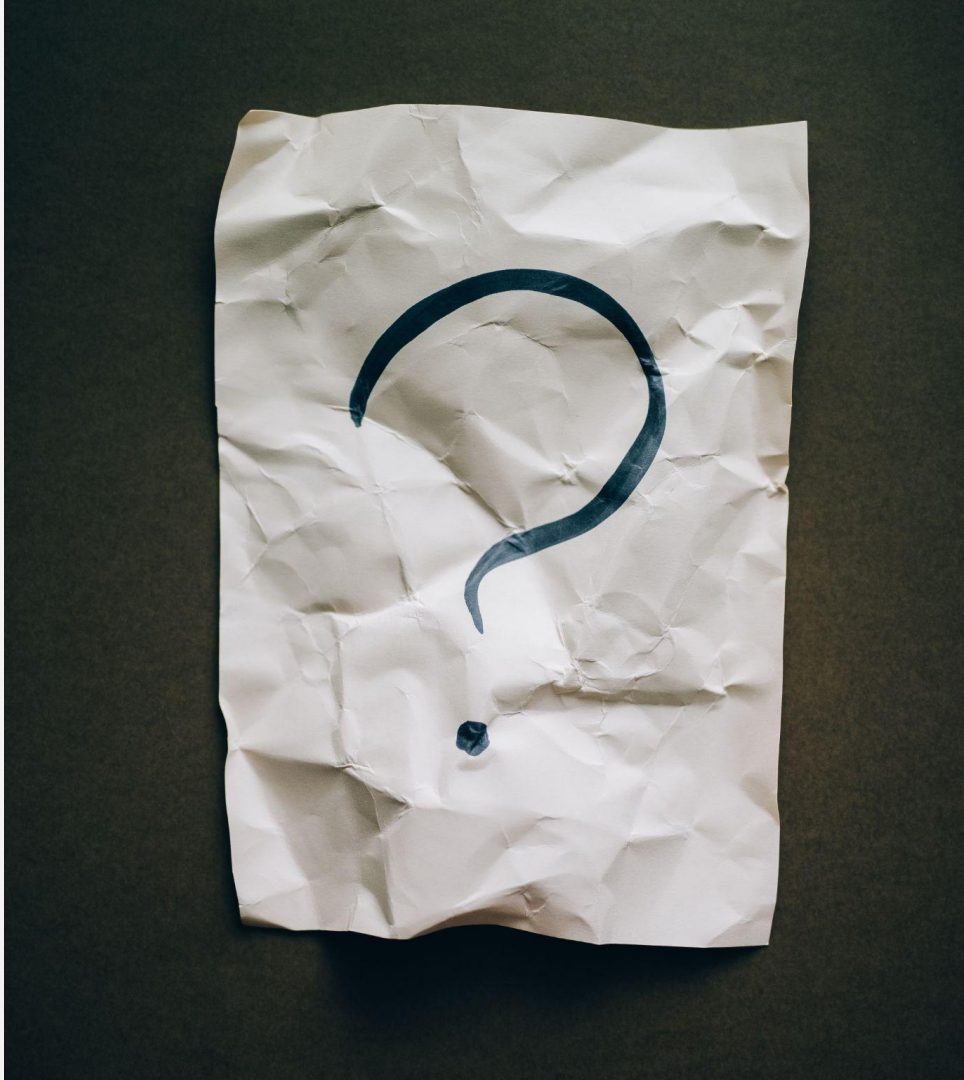
Today

9:35 - 10:40 - *plenary*
Introduction ICEG 10’
About linked data 45'
Example case 10’

10:40 – 10:50
Break 10'

10:50 - 11:50 – *break-out*
Case “Vaccination Passport” 60'

11:50 – 12:00 - *plenary*
Wrap-up and questions 10'



9:35 - 9:45 - Introduction

Introduction ICEG

ICEG mission statement and roles

The **ICEG* review group 'open standards**' has a permanent character and is responsible for the central coordination and follow-up of the work related to the standardisation of information.

Mission aligned to the **existing ICEG collaboration agreement** between the federal, regional and community authorities (dd. 2013-08-26).

The work is part of the standardisation of:

- meaning of the information (semantic),
- syntax (grammar) and technical standards for the exchange of the information
- metadata for discoverability ('data on data').

In addition, the working group monitors

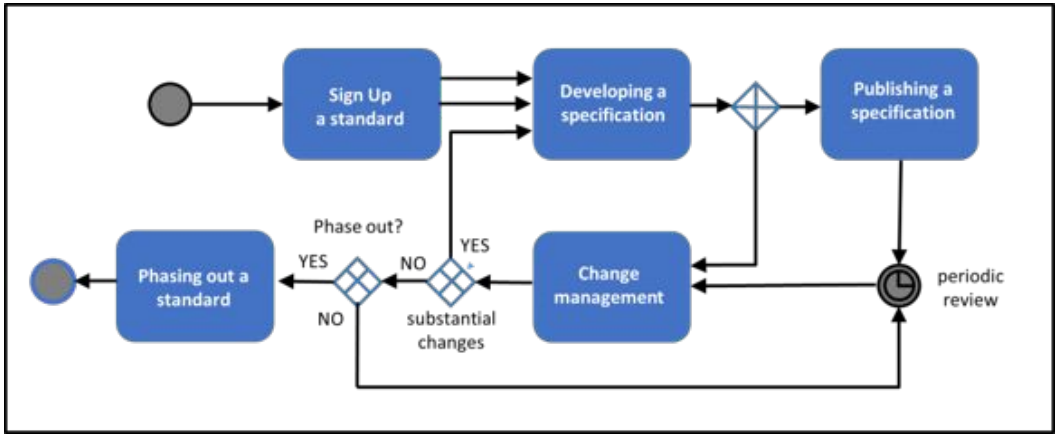
- mutual consistency of standards,
- international standards that impact governments in Belgium
- generic development and the change process.

The working group on data standards gathers on a regular basis.

(*) ICEG = Interfederal Collaboration on e-Government

Governance: ICEG process and method

Scalable process for registering, developing, changing and phasing out data standards.



Abstract: French, Dutch

Full paper: English

W3C, IEEE, IETF, IAB en ISA, Open Stand, OSLO

Update ICEG data standards 2022

Existing standards:

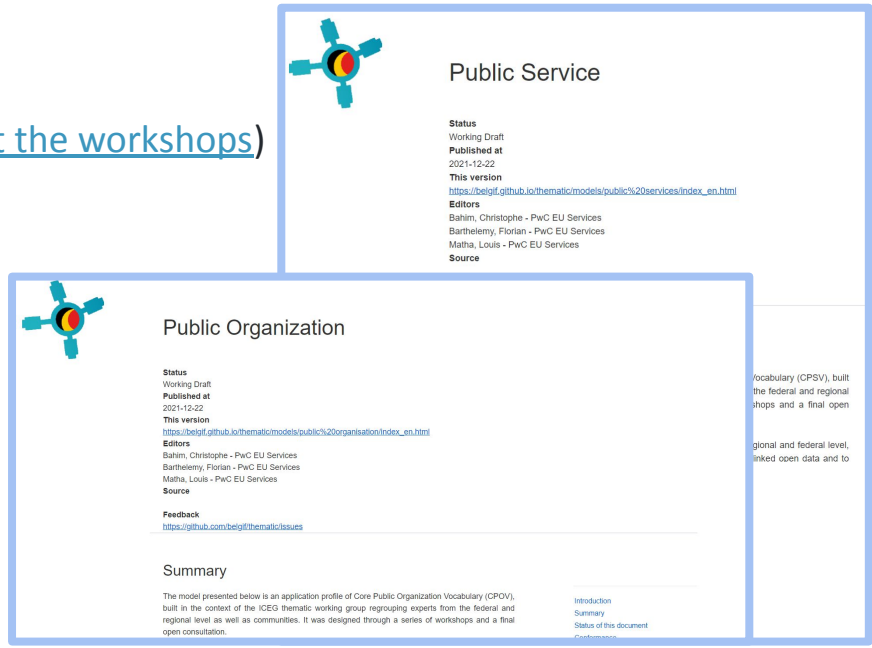
- ICEG Public Organization (link to specification)
- ICEG Public Service (link to specification)

Ongoing:

- Buildings and building units (more information about the workshops)

Pipeline:

- ICEG Timetable and Planning
- ICEG Hydrants
- ICEG Education Data
- …



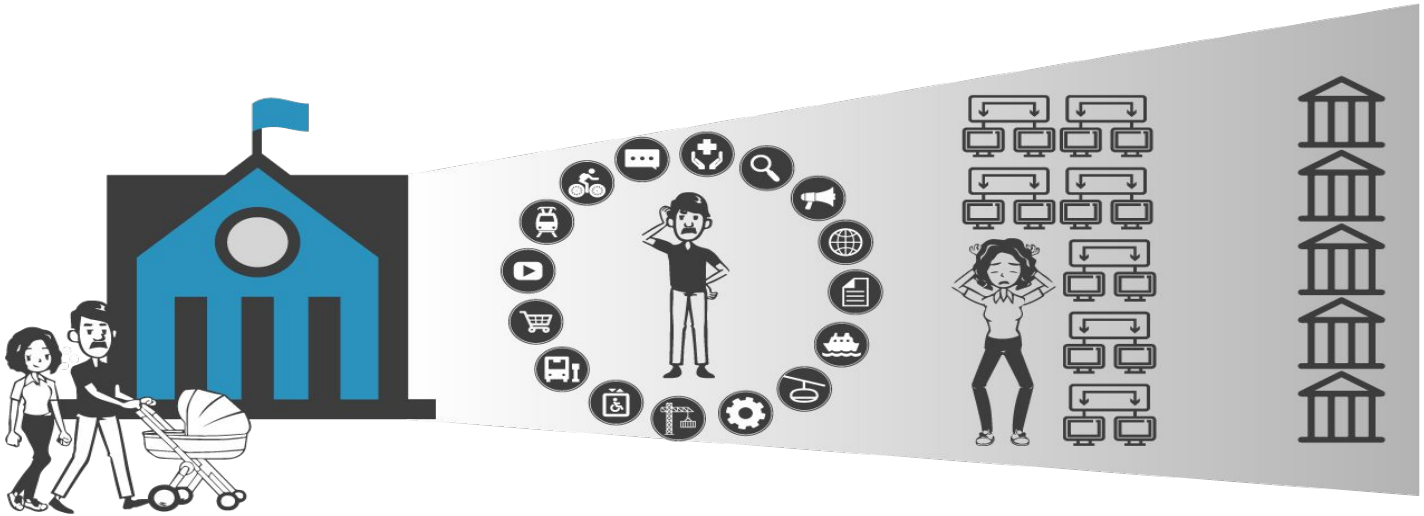
9:45 - 10:30 - About linked data

- Levels of interoperability
- Governance
- Semantic data
- API’s
- Tooling

Interoperability

The ability of **different autonomous organizations or systems** to **communicate and collaborate** with each other.

Interoperability: Why important?



Local government

> **1000** public services

> **250** information systems

> **1500** public administrations

Semantic interoperability

Applications look at the real world from different perspectives

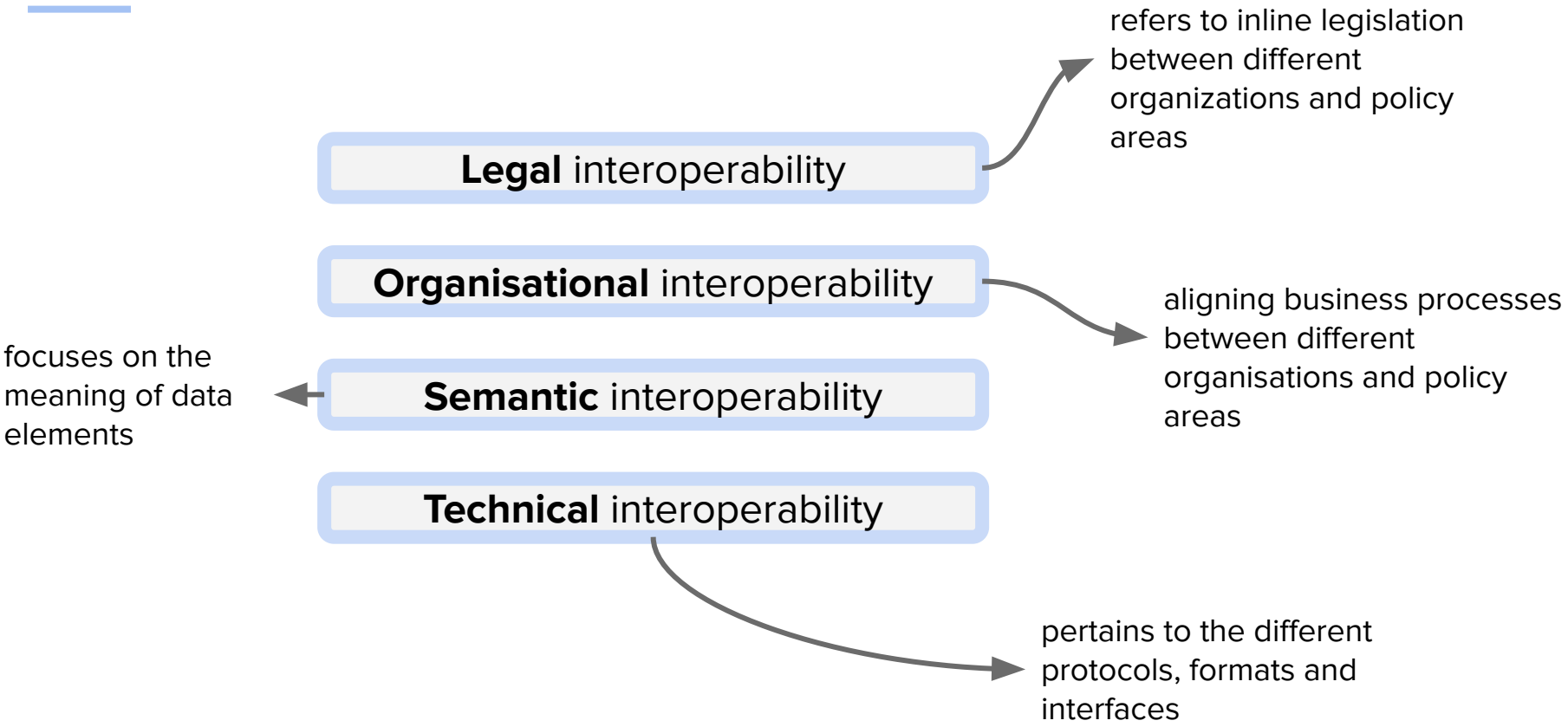
Information is structured/ modeled from 1 perspective

Authentic sources exist as silos

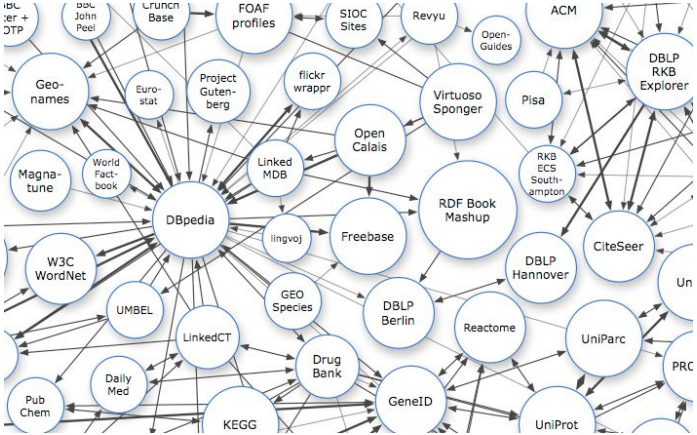
Multiple costs to linked information

Impact on quality and efficiency of service

4 levels of interoperability



Technical interoperability: The web as a blueprint



- Persistent Identifiers: URIs
- Dereferencable HTTP URIs
- Standardised Information (RDF)
- Links to other information

Technical interoperability: The web as a blueprint

Persistent Identifiers: URIs

http://data.vlaanderen.be/id/adres/3706808


INFORMATIE VLAANDEREN

PROCESS AND METHOD FOR THE DEVELOPMENT OF DATA STANDARDS

Version /// 1.0

Publication date /// 24 may 2019


SEMIC

Semantic Interoperability Community (SEMIC)

Last update 3 days ago

248 Members

30 Solutions

URI Policy Flanders

URI Standard & Guidelines of the Flemish Government

INFORMATIE VLAANDEREN

This document describes the **Flemish URI standard** for the disclosure of resources, information and data, by the Flemish authorities and has been specified by Information Flanders. A checklist is included at the end of this document, which can be used as a self-evaluation instrument for the evaluation of URIs.

The **guidelines** concerning the governance of persistent URIs were developed in the context of the Open Standards For Linked Organisations program (OSLO). OSLO is an interoperability program in the Region of Flanders. The program brings together expertise from different business domains and governmental levels, independent of a specific thematic project. The Flemish Government developed a domain model in line with international standards including DAV and ADMS enriched by data extensions to comply with the local context. The formal specification is published at

Dereferencable HTTP URIs

Standardised Information (RDF)

Links to other information

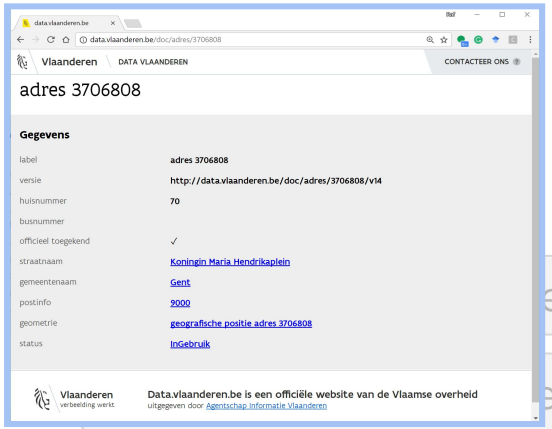
Koningin Maria Hendrikaplein 70, 9000 Gent

Technical interoperability: The web as a blueprint

Persistent Identifiers: URIs

Dereferencable HTTP URIs

http://data.vlaanderen.be/id/adres/3706808



Human readable

Computer readable

Technical interoperability: The web as a blueprint

Persistent Identifiers: URIs

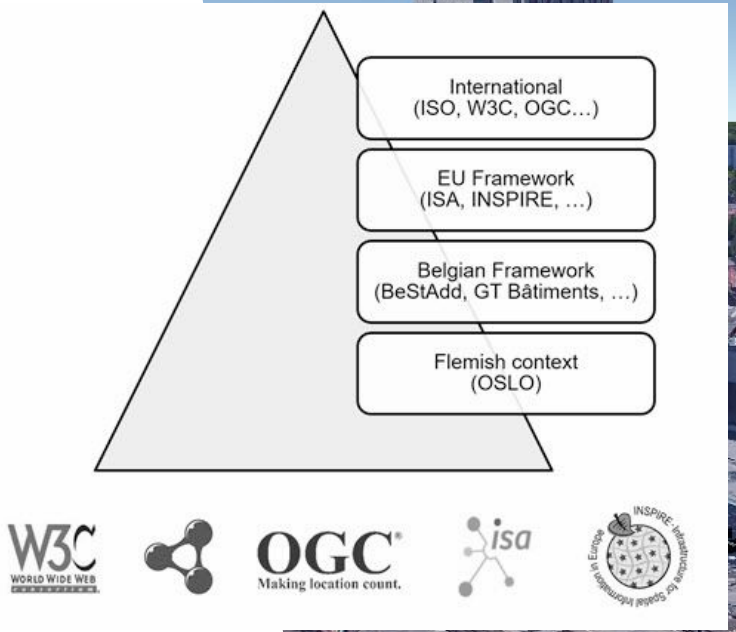
Dereferencable HTTP URIs

Standardised Information (RDF)

http://data.vlaanderen.be/ns/adres

https://www.w3.org/ns/locn#adminUnitL2

Links to other information



Technical interoperability: The web as a blueprint

Persistent Identifiers: URIs

Dereferencable HTTP URIs

Standardised Information (RDF)

Links to other information

data.vlaanderen.be/id/organisatie/OVO002949

Digitaal Vlaanderen

http://data.vlaanderen.be/id/adres/3706808

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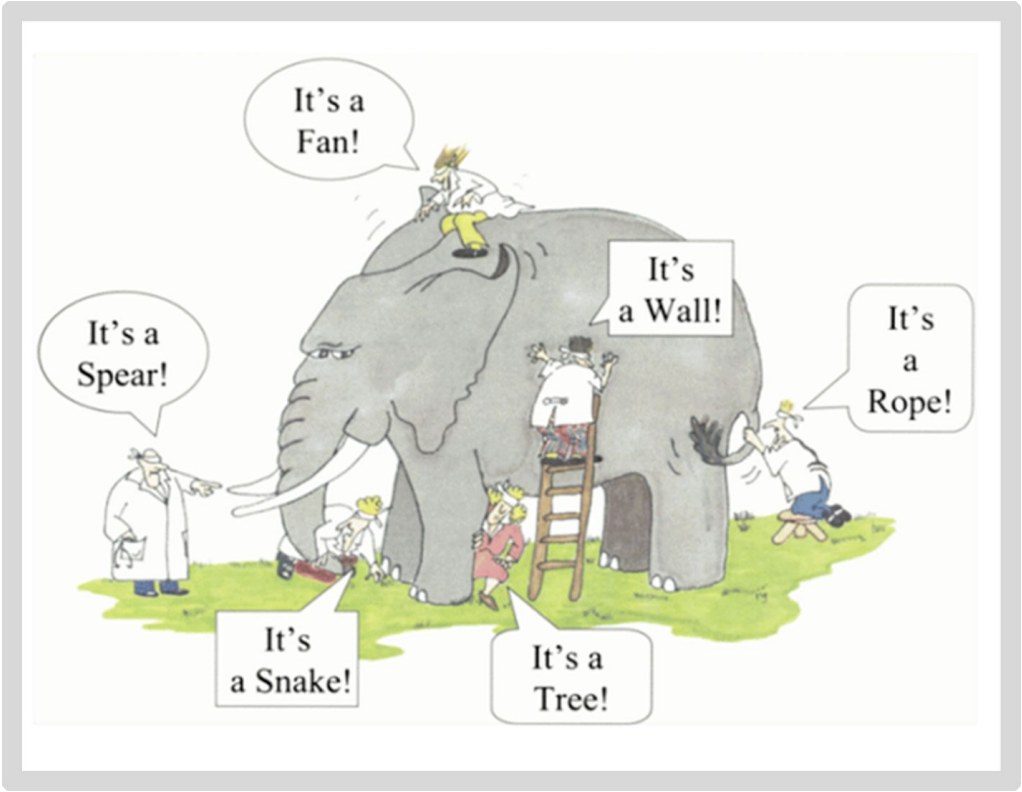
9000 Gent

It’s all about the context



But how do we understand each other?

JSON

```
{
  “Fietsteller-Zuid” : {
     “type” : “BicycleCounter”,
     “city” : “Ghent”,
     “today” : “100”
  }
}
```

Table / CSV / Spreadsheet

name	type	location	**number**
F7 Gent-Kortrijk	**BikePassageCounter**	Waregem	250

I want to exchange data

JSON

```
{
   “Fietsteller-Zuid” : {
      “type” : “BicycleCounter”,
      “city” : “Ghent”,
      “today” : “100”
   }
}
```

We know, but machines don’t

Triples!

<Fietsteller-Zuid> <type> <**BicycleCounter**>
<Fietsteller-F7> <type> <**BikePassageCounter**>
<Fietsteller-Zuid> <**today**> <100>
<Fietsteller-F7> <**number**> <250>

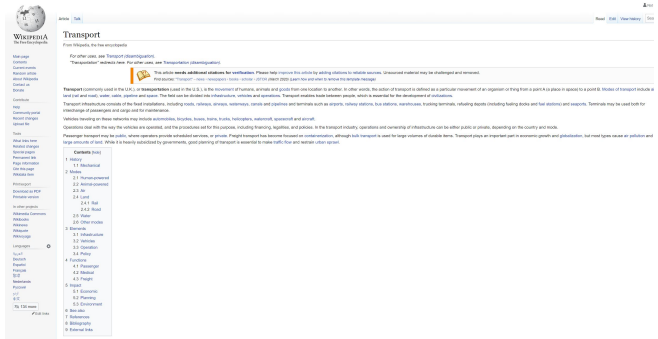
- *BicycleCounter* is the same as a *BikePassageCounter*
- *Number* basically means the same as *today* in this context

Solved by using URIs

<Fietsteller-Zuid> <type> <**BicycleCounter**>
<Fietsteller-F7> <type> <**BikePassageCounter**>
<Fietsteller-Zuid> <**today**> <100>
<Fietsteller-F7> <**number**> <250>

https://wikipedia.org/BikeCounter

But machines only get a human readable description (HTML)



***URI** = **U**niform **R**esource **I**dentifier*

We use URIs that provide both a human and machine readable description

<Fietsteller-Zuid> <type> <**BicycleCounter**>
<Fietsteller-F7> <type> <**BikePassageCounter**>
<Fietsteller-Zuid> <**today**> <100>
<Fietsteller-F7> <**number**> <250>

https://data.vlaanderen.be/ns/example#BikeCounter

Klasse *Omleiding*

Type	Klasse
URI	https://data.vlaanderen.be/ns/mobiliteit#Omleiding
Specialisatie van	https://data.vlaanderen.be/ns/mobiliteit#Verkeersmaatregel
Definitie	Tijdelijke route die aanbevolen wordt te volgen door de betreffende weggebruiker.

```
<https://data.vlaanderen.be/ns/mobiliteit#Artikel.heeftMobiliteitsmaatregel> a owl:ObjectProperty ;
    rdfs:label "heeft mobiliteitsmaatregel"@nl ;
    rdfs:comment "Mobiliteitsmaatregel die beschreven staat in het artikel."@nl ;
    rdfs:domain besluit:Artikel ;
    rdfs:isDefinedBy <https://data.vlaanderen.be/ns/mobiliteit> ;
    rdfs:range <https://data.vlaanderen.be/ns/mobiliteit#Mobiliteitsmaatregel> .

<https://data.vlaanderen.be/ns/mobiliteit#Bevestiging.bevestigtAan> a owl:ObjectProperty ;
    rdfs:label "bevestigt aan"@nl ;
    rdfs:comment "Draagconstructie waaraan de bevestiging is bevestigd."@nl ;
    rdfs:domain <https://data.vlaanderen.be/ns/mobiliteit#Bevestiging> ;
    rdfs:isDefinedBy <https://data.vlaanderen.be/ns/mobiliteit> ;
    rdfs:range <https://data.vlaanderen.be/ns/mobiliteit#DraagconstructieVerkeersborden> .
```

Human readable

Machine readable

Applying context and URI's to our example, creating JSON-LD

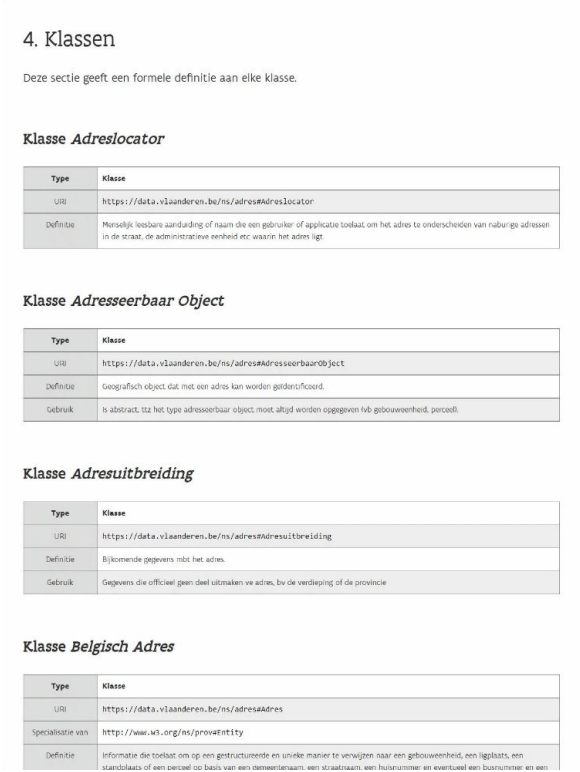
```
{
  "@context" : {
    "BicycleCounter" : "https://data.vlaanderen.be/ns/example#BikeCounter"
    "today" : "https://data.vlaanderen.be/ns/example#totalNumberOfBicycles"
  },
  "@id" : "https://example.org/id/Fietsteller-Zuid",
  "@type" : "BicycleCounter",
  "today" : 100
}
```

```
{
  "@context" : {
    "BikePassageCounter" : "https://data.vlaanderen.be/ns/example#BikeCounter"
    "number" : "https://data.vlaanderen.be/ns/example#totalNumberOfBicycles"
  },
  "@id" : "https://example.org/id/Fietsteller-F7",
  "@type" : "BikePassageCounter",
  "number" : 250
}
```

Vocabularies & Application Profiles

Vocabularies contain a list of terms per domain

➜ *For example: address, organization, person, ...*



4. Klassen

Deze sectie geeft een formele definitie aan elke klasse.

Klasse *Adreslocator*

Type	Klasse
URI	https://data.vlaanderen.be/ns/adres#Adreslocator
Definitie	Menselijk leesbare aanduiding of naam die een gebruiker of applicatie toelaat om het adres te onderscheiden van naburige adressen in de straat, de administratieve eenheid etc waarin het adres ligt.

Klasse *Adresseerbaar Object*

Type	Klasse
URI	https://data.vlaanderen.be/ns/adres#AdresseerbaarObject
Definitie	Geografisch object dat met een adres kan worden geïdentificeerd.
Gebruik	Is abstract, tlz het type adresseerbaar object moet altijd worden opgegeven fvb gebouweenheid, perceel).

Klasse *Adresuitbreiding*

Type	Klasse
URI	https://data.vlaanderen.be/ns/adres#Adresuitbreiding
Definitie	Bijkomende gegevens mbt het adres.
Gebruik	Gegevens die officieel geen deel uitmaken ve adres, bv de verdieping of de provincie

Klasse *Belgisch Adres*

Type	Klasse
URI	https://data.vlaanderen.be/ns/adres#Adres
Specialisatie van	http://www.w3.org/ns/prov#Entity
Definitie	Informatie die toelaat om op een gestructureerde en unieke manier te verwijzen naar een gebouweenheid, een ligplaats, een standplaats of een perceel op basis van een gemeentenaam, een straatnaam, een huisnummer en eventueel een busnummer en een

Vocabularies & **Application Profiles**

Application profiles determine which data must be exchanged

➔ *For example: a street name*

Straatnaam

Beschrijving
Adrescomponent met de naam die officieel werd toegekend aan een straat (baan, doorgang, plein) of aan een gehucht en waaraan adressen kunnen zijn gekoppeld.

Eigenschappen
Voor deze entiteit zijn de volgende eigenschappen gedefinieerd: homoniem toevoeging, is toegekend door, status, straatnaam.

Eigenschap	Verwacht Type	Kardinaliteit	Beschrijving	Gebruik	Codelijst
homoniem toevoeging	String	0..1	Toevoeging om dubbele straatnamen (straatnamen met dezelfde naam maar andere ligging in de gemeente en eigen adressen) van elkaar te onderscheiden.		
is toegekend door	Gemeente	1	Agent die de straatnaam heeft toegekend.	In België is dit de gemeente.	
status	Statuswaarde	1	Actuele toestand van de straatnaam.		Link
straatnaam	GeografischeNaam	1..*	Naam vd straat.		

I have an API that publishes semantic data

Is my data in line with these standards? (compliance)

➜ Technical contracts as SHACL* ensure this.

- A document with a set of conditions

```
dienst:PublicServiceShape
    a sh:NodeShape ;
    sh:targetClass <http://purl.org/vocab/cpsv#PublicService> ;
    sh:property [
        sh:name "naam" ;
        sh:description "Officiële naam van de publieke dienstverlening." ;
        sh:datatype <http://www.w3.org/1999/02/22-rdf-syntax-ns#langString> ;
        sh:minCount 1 ;
        sh:maxCount 1 ;
        sh:path <http://purl.org/dc/terms/title> ;
    ] ;
    sh:property [
        sh:name "heeftVerantwoordelijke" ;
        sh:description "Publieke organisatie die verantwoordelijk is voor
            het aanbieden en beheren van de publieke dienstverlening." ;
        sh:class <http://data.europa.eu/m8g/PublicOrganisation> ;
        sh:minCount 1 ;
        sh:maxCount 1 ;
        sh:path <http://data.europa.eu/m8g/hasCompetentAuthority> ;
```

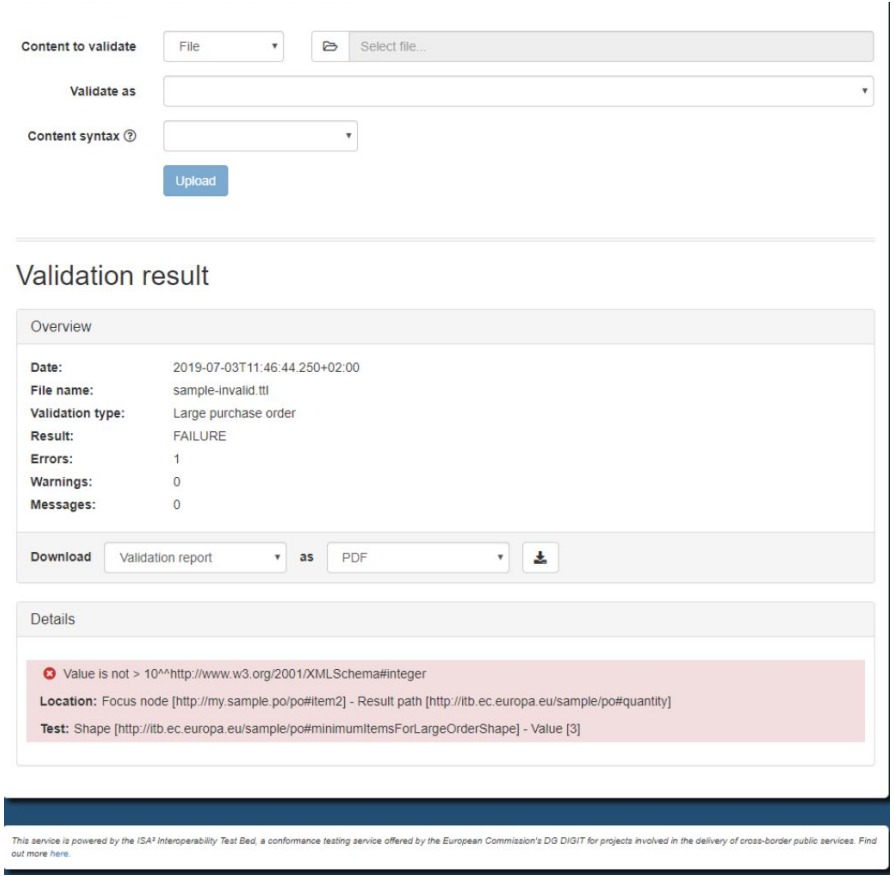
***SHACL** = **Sha**pes **C**onstraints **L**anguage*

Tooling: SHACL-validator

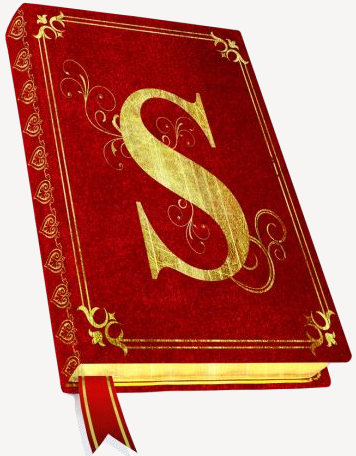
Europe provides tools to do this automatically: [RDF validator]

- Frontend
- **REST API**
- SOAP API

Flanders built its own frontend on top of the EU backend



10:30 - 10:40 - Example case “Saint Nicholas”



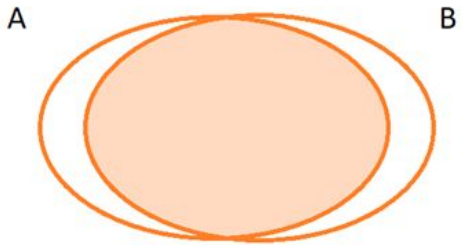
3 stakeholders and their use cases

- Purchase management
- Budget management

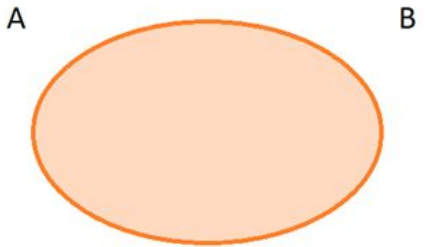
- Logistic planning so that all gifts are delivered on time

- Pass on wish list
- Receive a gift

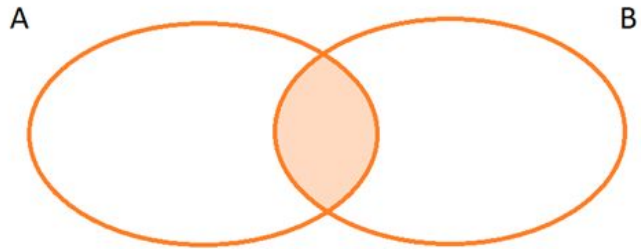
Mapping terminology (SKOS)



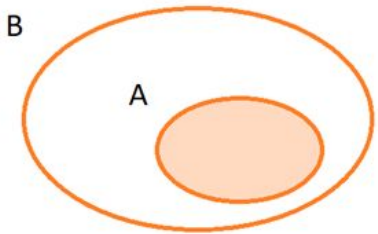
A has a close match B



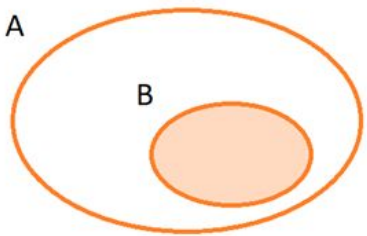
A has an exact match B



A has a related match B



A has a broad match B



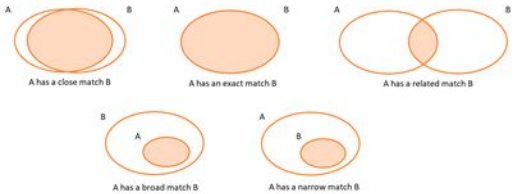
A has a narrow match B

Source and more information via: https://bit.ly/userhandbookisa (p.22-23)

Relevant concepts

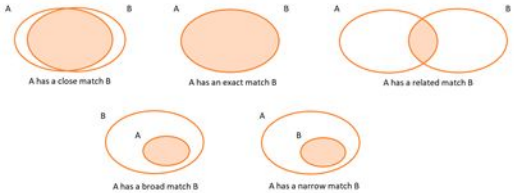
- Make a wish list: **Letter, Character Traits, Gifts**
- Receiving gifts: **Personal details, Delivery address**
- Purchasing management: **Supplier, Price**
- Budget management: **Price, Payment**
- Logistics: **Pick up address, Delivery address, Pete, Horse, Chimney**

Mapping on existing ICEG standards



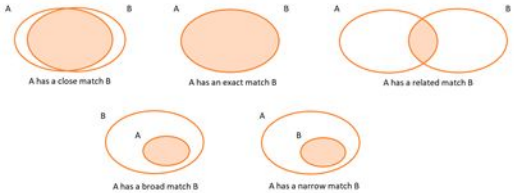
Own concept	Matching ICEG concept	SKOS Mapping type
Letter	*Does not (yet) exist*	*No match*
Character Traits	*Does not (yet) exist*	*No match*
Gifts	*Does not (yet) exist*	*No match*
Personal details	**ICEG-PublicOrganization::Person**	**Exact match**
Delivery address	**ICEG-PublicService::Address**	**Narrow match**
Supplier	**ICEG-PublicOrganization::Organization**	**Close match**
Price	*Does not (yet) exist*	*No match*
Payment	*Does not (yet) exist*	*No match*
Pick-up address	**ICEG-PublicService::Address**	**Narrow match**
Pete	**ICEG-PublicOrganization::Person**	**Narrow match**
Horse	*Does not (yet) exist*	*No match*
Chimney	*Does not (yet) exist*	*No match*

Mapping on OSLO standards



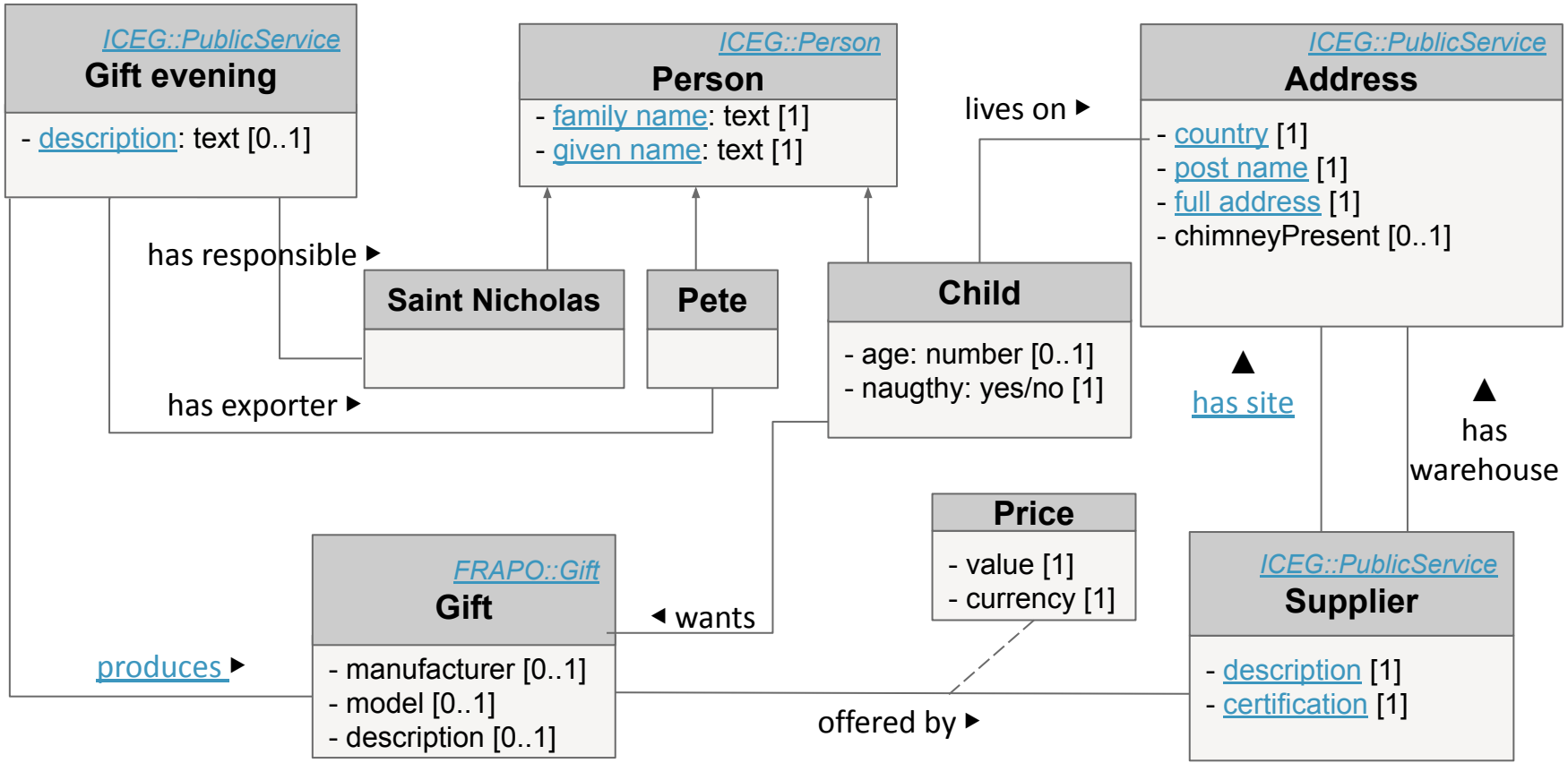
Own concept	Matching ICEG concept	SKOS Mapping type
Letter	**OSLO-Generiek::Document**	**Narrow match**
Character Traits	*Does not (yet) exist*	*No match*
Gifts	*Does not (yet) exist*	*No match*
Personal details	ICEG-PublicOrganization::Person	Exact match
Delivery address	ICEG-PublicService::Address	Narrow match
Supplier	ICEG-PublicOrganization::Organization	Close match
Price	**OSLO-Generiek::Geldbedrag**	**Related match**
Payment	*Does not (yet) exist*	*No match*
Pick-up address	ICEG-PublicService::Address	Narrow match
Pete	ICEG-PublicOrganization::Person	Narrow match
Horse	*Does not (yet) exist*	*No match*
Chimney	**OSLO-Generiek::Object**	**Narrow match**

Mapping on international standards



Own concept	Matching ICEG concept	SKOS Mapping type
Letter	OSLO-Generiek::Document	Narrow match
Character Traits	*Does not (yet) exist*	*No match*
Gifts	**http://purl.org/cerif/frapo/Gift**	**Narrow match**
Personal details	ICEG-PublicOrganization::Person	Exact match
Delivery address	ICEG-PublicService::Address	Narrow match
Supplier	ICEG-PublicOrganization::Organization	Close match
Price	OSLO-Generiek::Geldbedrag	Related match
Payment	**http://reference.data.gov.uk/def/payment#Payment**	**Exact match**
Pick-up address	ICEG-PublicService::Address	Narrow match
Pete	ICEG-PublicOrganization::Person	Narrow match
Horse	**http://dbpedia.org/ontology/Horse**	**Exact match**
Chimney	OSLO-Generiek::Object	Narrow match

Establish application profile / implementation model



1. Identify stakeholders

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Instruction for exercise:

Case “Vaccination passport”

Exercise

- In groups (NL and FR) we will go through the exercise of making our own implementation model.
- For some steps we will use Miro online whiteboard to gather input.
- The purpose is to get familiar with building implementation models by using the case of “Vaccination Passport”.

[ENG]	Group 1 [FR] - XX	Group 2 [FR] - XX	Group 3 [NL] - XX	Group 4 [NL] - XX	Group 5 [NL] - XX
Bert Van Kets	Véronique Minne	Tshitshi Kia Ntoni	Edwin Hurst	Myriam Buyse	Bruno Vanhove
	Marceau Louis	Maxime Doyen	Jan Van Aerschot	Xander Veldeman	Mathieu Vermeire
	Pauline Snyers	Olivier Braeckman	Glenn Verbinnen	Kris Neyts	Diederik Boomputte
	Benoit Sacre	Patrick Legrand	Evy De Winter	Joren Proost	Steven Geirnaert
	Geraldine Oger	Thierry Bertrand	Tim Maes	Nathalie Mertens	Jeffrey De Pretre
	Dominique Buffet	Edith Collet	Liesbeth Rombouts	Nicolas Roggen	Sophie Angenot
	Vincent van der Kaa	Marc Bertho	Hans Arents	Greet Deruyter	Lode Vervaeck
	Isabelle De Schutter	Jean-Yves Leblicq	Marc Buyland	Bart De Bruyn	Wim Bonneux
	Sébastien Pirlot	Cindy Somer	Robin Coosemans	Seppe Santens	Bart Lipkens
	Aurélie Vanrillaer	Ludovic Marchal	Floris Vanderhaeghe	Ben De Wit	Guido Nys
	Stéphanie Deblon	Vincent Bombaerts	Kim Husques	Gert Van de Wouwer	Ellen De Munck
	Philippe Gerlache	Catherine Moreaux	Katrien Leire		
	Fabien Pasquasy	Dany Louis			
	Eric Van Meerbeck	Jean-Christophe Lamotte			
	Jean-François Gillet	Denis Van Nuffelen			

5 break out rooms in MS Teams

Group 1 [FR] - XX: Link to MS Teams Meeting
Group 2 [FR] - XX: Link to MS Teams Meeting
Group 3 [NL] - XX: Link to MS Teams Meeting
Group 4 [NL] - XX: Link to MS Teams Meeting
Group 5 [NL] - XX: Link to MS Teams Meeting

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How to connect to Miro?

https://bit.ly/icegtraining2022

1. Follow the link to the Miro Whiteboard.
2. Explore the board.

A short break ...

Welcome back!

11:00 - 11:50 – Case “Vaccination passport”

- Illustration of the case
- 5 break-out rooms

Picture by Gustavo Fring

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3’

1.

Who are the stakeholders?

miro https://bit.ly/icegtraining2022

1.

Who are the stakeholders?

- Citizens
- Vaccination centra
- Test centra
- Hospitals
- Event sector
- Airports
- Other countries
- ...

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Step 2: Define use cases

What is a use case?

A **specific situation for the exchange of information/data** for which the data standard could be useful or be used.

Step 2: Define use cases

Define use cases:

- From the perspective of the stakeholder
- Describe the information needs of the different stakeholders:
  - Starting from data-input
  - Starting from data-output

4’

2.

What are the use cases?

miro https://bit.ly/icegtraining2022

What are the use cases?

- Citizens: ability to travel international
- Governments: information on who needs invitation
- Vaccination centra: ability to pass on vaccination information
- Test centra: ability to pass on testing results
- Hospitals: ability to consult vaccination information
- Event sector: identify persons at risk
- Airports: identify persons at risk
- Other countries: identify persons at risk
- ...

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Step 3: List and inventarize relevant concepts

- What do we want to keep information about?
- Which information do we want to keep?

3’

3.

Which information concepts?

miro https://bit.ly/icegtraining2022

3.

Which information concepts?

- Citizen
- COVID passport
- Certificate
- Vaccination
- Vaccin
- COVID-test
- Organisation
- Location
- ...

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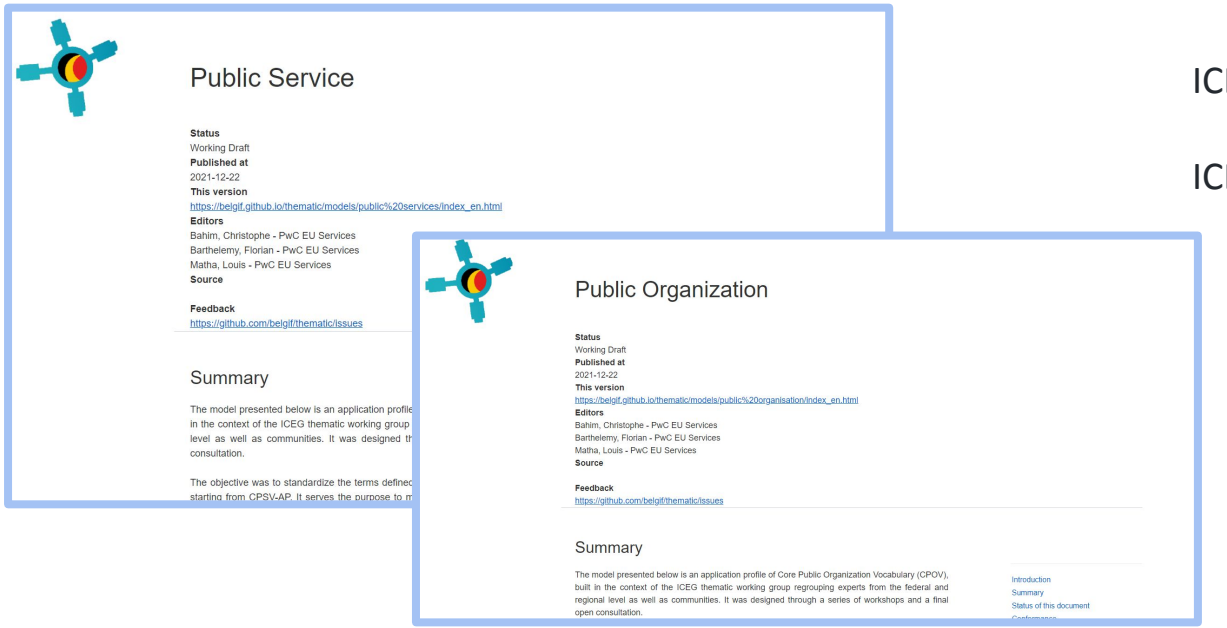
Step 4: Look for existing vocabularies and AP's

- Browse to Belgif GitHub where you can view the existing ICEG vocabularies and application profiles.
- Explore the AP's and see what you find interesting, eg: "Person", "Organisation", "Public Service", ..
- Click on the classes to jump to the vocabulary.
- Write down the classes (eg. "Address", "Person", "Organisation") that are relevant and reusable for this case.

Step 4: Look for existing vocabularies and AP's

Explore the ICEG vocabularies & application profiles

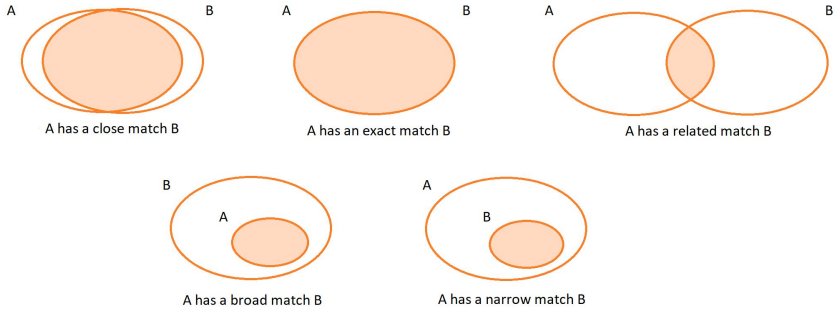


ICEG Public Service (link)

ICEG Public Organization (link)

Step 5: Map your concepts on the existing vocabularies and APs

- Place the required information classes (identified in step 3) alongside the existing OSLO classes (step 4) to identify differences and similarities.
- Provide a mapping value (SKOS) to the overlap:
  - Exact match
  - Related match
  - Broad/narrow match
  - No match



Source and more information via: https://bit.ly/userhandbookisa (p.22-23)

Step 5: Map your concepts on the existing vocabularies and APs

Align with existing standards:

International Standards

e.g for mobility Datex II, SIRI, NeTEx, Transmodel, G BFS, …

EU ISA CORE Vocabularies

CORE PERSON VOCABULARY

CORE BUSINESS VOCABULARY

CORE PUBLIC ORGANISATION VOCABULARY

DCAT-AP FOR DATA PORTALS IN EUROPE

OSLO Extention

OSLO PERSON VOCABULARY

OSLO BUSINESS VOCABULARY

OSLO ROAD VOCABULARY

OSLO ORGANISATION VOCABULARY

OSLO DCAT-AP VL VOCABULARY

EU - ISA²
Federal Government
Regional Government
Local Government
Industry
Academia

10’

Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7

4.

Which ICEG information concepts can we re-use?

EXTRA 5. Can you make the mapping?

miro https://bit.ly/icegtraining2022

4.

Which ICEG information concepts can we re-use?

Citizen	ICEG-PublicOrganization::Person
COVID passport	?
Certificate	?
Vaccination	?
Vaccin	?
COVID-test	?
Organisation	ICEG-PublicOrganization::Organization
Location	ICEG-PublicService::Address
…	

5.

EXTRA: Mapping on the existing ICEG standards

Own concept	Matching ICEG concept	SKOS Mapping type
Citizen	**ICEG-PublicOrganization::Person**	**Narrow march**
COVID passport	*Bestaat (nog) niet*	*No match*
Certificate	*Bestaat (nog) niet*	*No match*
Vaccination	*Bestaat (nog) niet*	*No match*
Vaccin	*Bestaat (nog) niet*	*No match*
COVID-test	*Bestaat (nog) niet*	*No match*
Organisation	**ICEG-PublicOrganization::Organization**	**Exact match**
Location	**ICEG-PublicService::Address**	**Narrow march**

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Step 6: Find a solution for unmapped concepts

- Models that are already in use by other public administrations in Flanders, Belgium or Europe. Examples are OSLO (Open Standards for Linking Organisations), INSPIRE data specifications etc.
- Look at international standards and vocabularies.

  tip: https://lov.linkeddata.es/
  - DC terms
  - schema.org
  - dbpedia.org
- Legislation and other official documents at Flemish, Belgian and European level.

Step 6: Some guidelines

- Check whether there are already data standards that define the necessary.
- Only in last instance define something completely yourself.
- For these new entities:
  - Check whether these are also relevant in a different context, for other parties, in the context of information exchange and whether an alignment process should be started around this.
- For things that don’t seem to match completely:
  - See if your information model cannot be adjusted.
  - If not: ICEG and other data standards can be changed. Feel free to send a comment!

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Step 7: Establish an implementation model

A few guidelines for establishing an implementation model:

- Start from the **entities** we have listed.
  - An entity= concepts/information elements that make up the information model
- Add **attributes** to the model
  - An attribute= a property of a particular entity
- Add **relationships** to the model:
  - A relationship= the relationships between the entities
- Add **cardinalities** to the model.
  - Showing how many times a relationship can occur (see example next slide)
- (Make definitions more concrete).

Step 7: Establish an implementation model

Cardinalities explained with an example:

<Wishbone chair>

has serial number → 78034

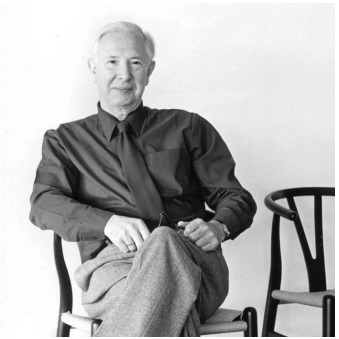
1 **1**

has designer →

0..* **1**

is made of → <oak> <papercord>

0..* **0..***



<Hans J. Wegner>

Step 7: Establish an implementation model

➢ Start from the **entities/concepts/classes** we have listed.

ICEG-PublicOrganization: :Person

COVIDpassport

Certificate

COVIDtest

Vaccination

RecoveryViaAntibodies

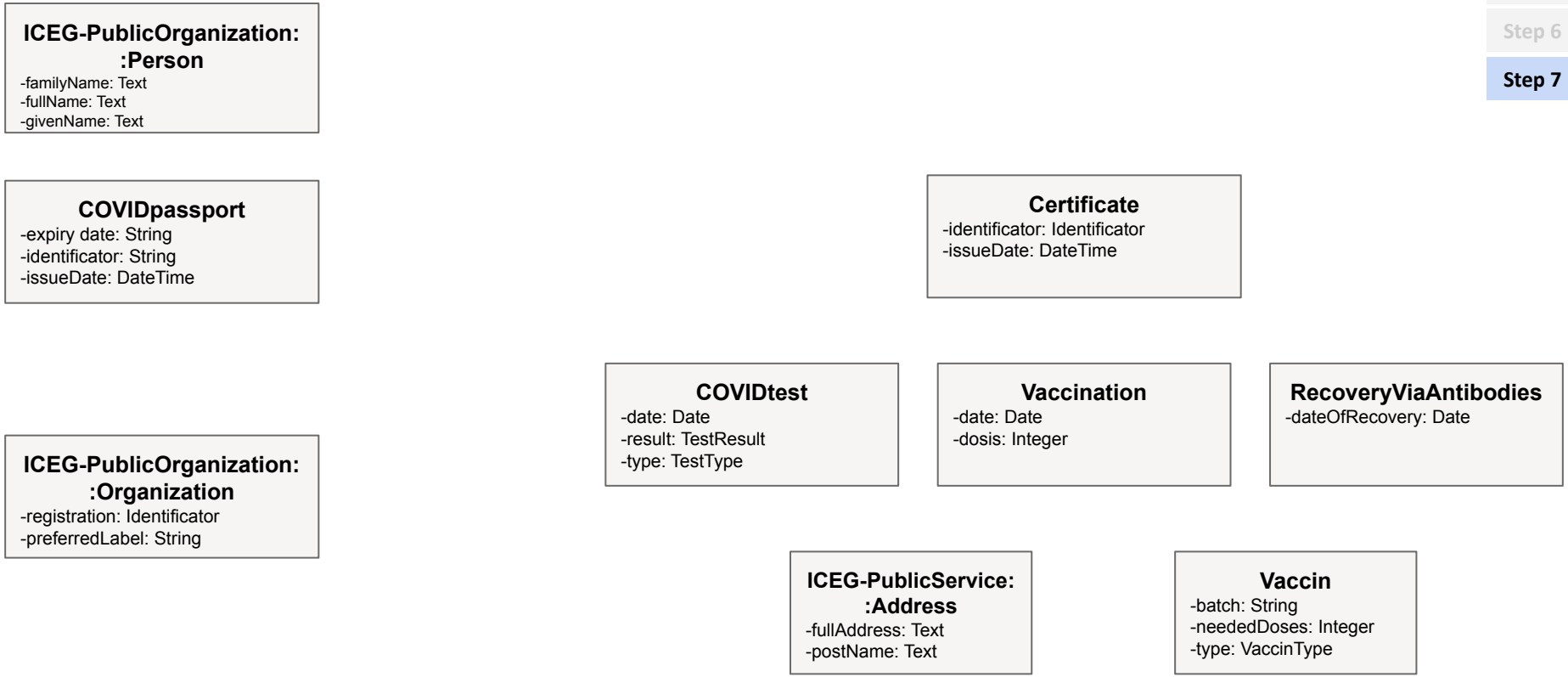
ICEG-PublicOrganization: :Organization

ICEG-PublicService: :Address

Vaccin

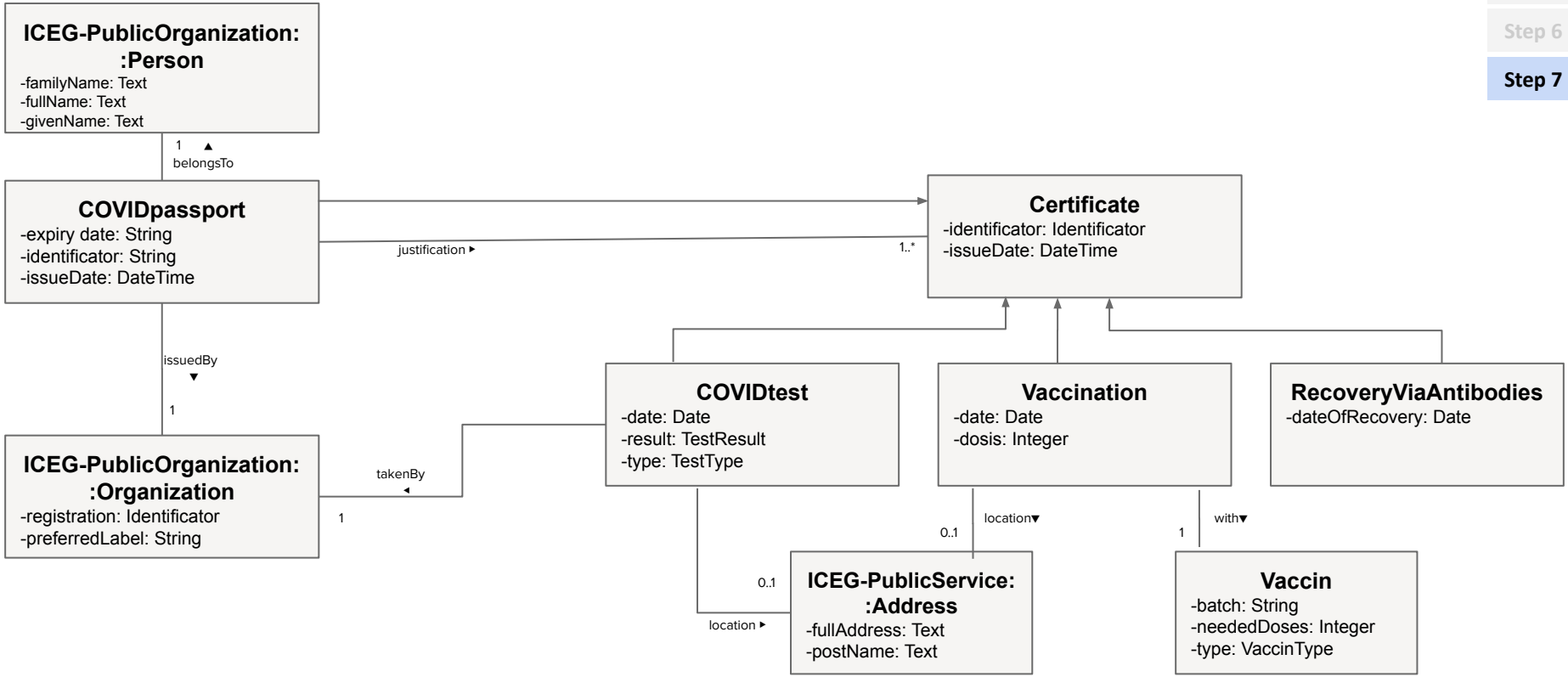
Step 7: Establish an implementation model

➢ Add **attributes** to the model.



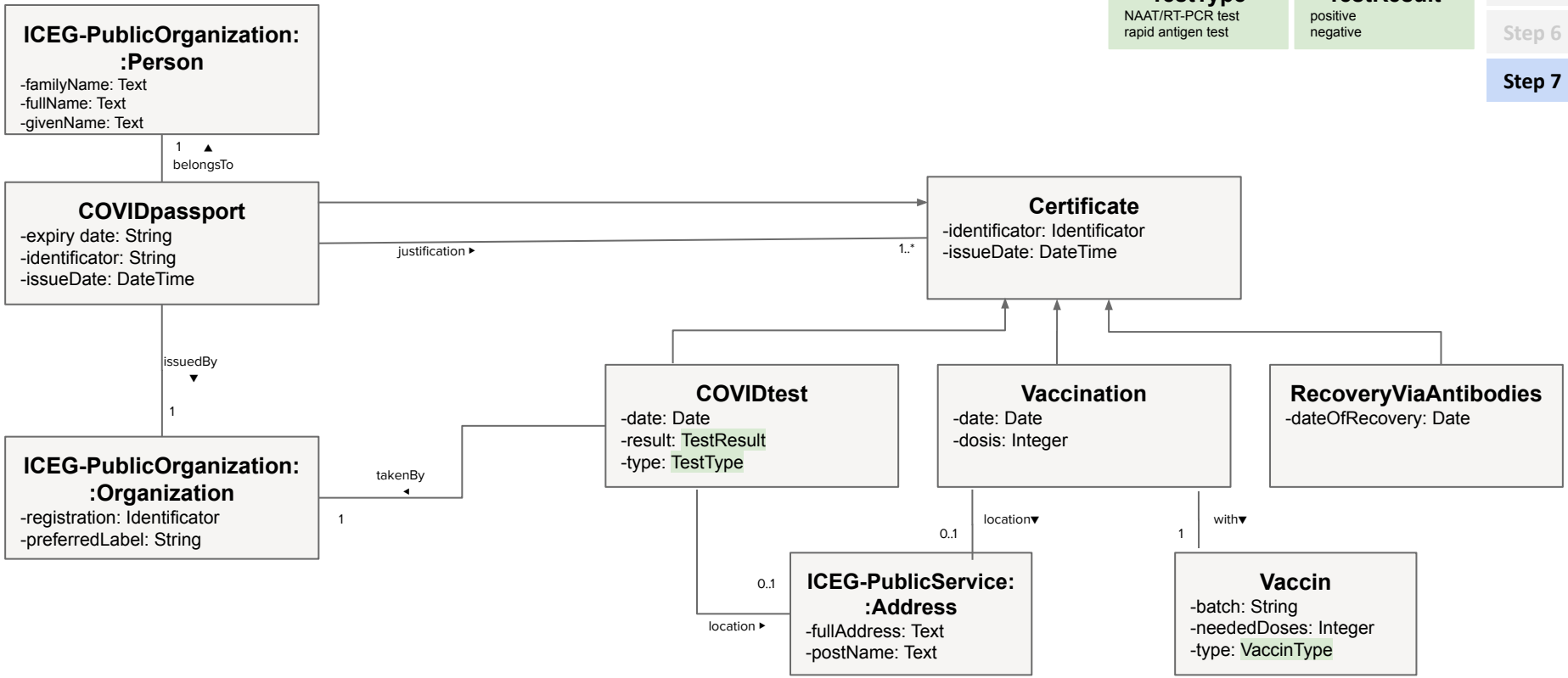
Step 7: Establish an implementation model

➢ Add **relationships and cardinalities** to the model.

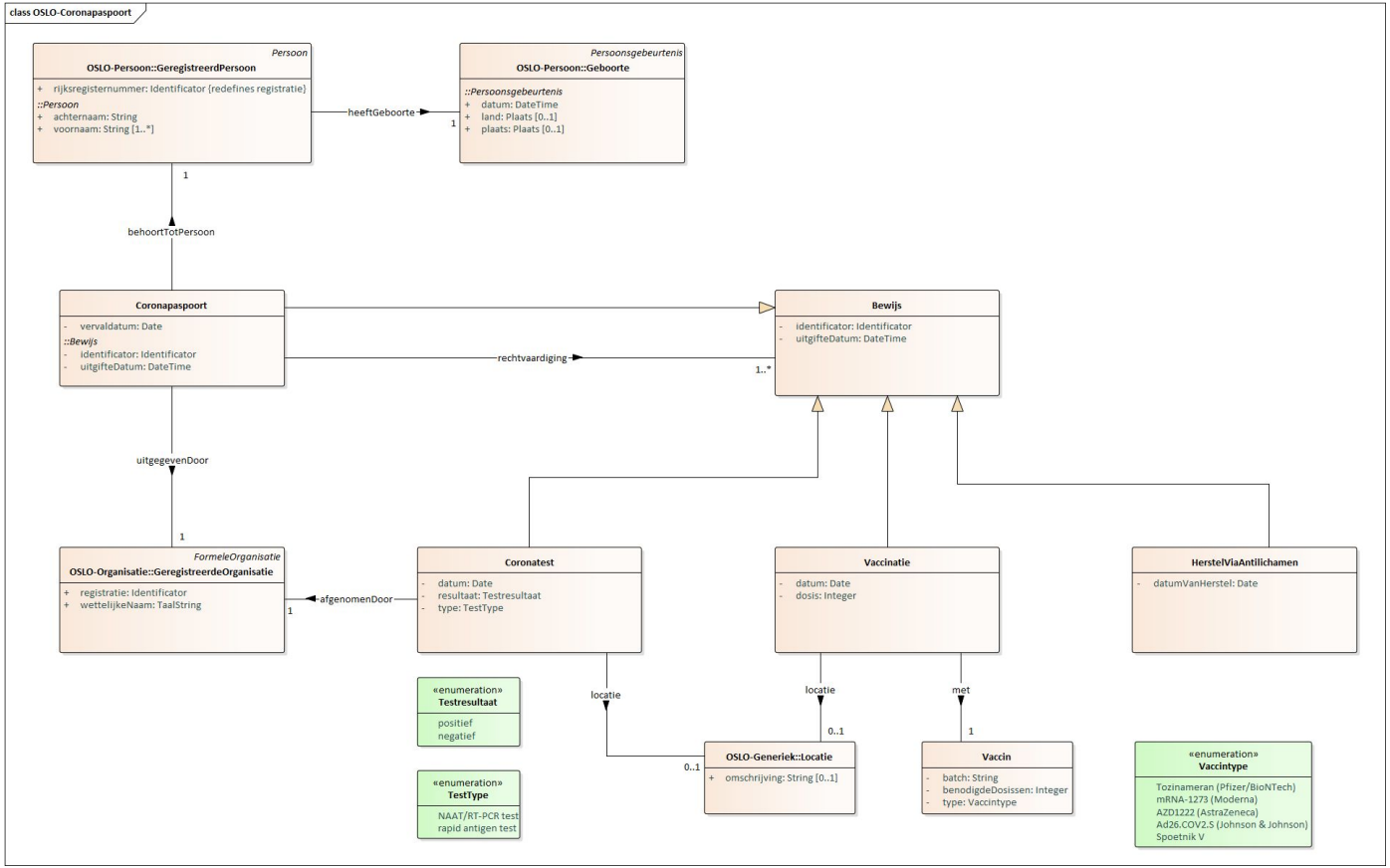


Step 7: Establish an implementation model

➢ If needed, add **enumerations** (codelists).



Final implementation model [NL]



Back to the plenary meeting

Link to MS Teams Plenary Meeting

11:50 - 12:00 - Wrap-up

- Any questions?
- Feedback - Did we meet the expectations? Please give feedback in the chat.

Important information

- Start your own standardisation trajectory: more information via XXX

- The slides of this training can be found on the ICEG GitHub page (link).

DIGITAAL VLAANDEREN | Vlaamse overheid | Wallonie | be be.brussels | FÉDÉRATION WALLONIE-BRUXELLES | BOSA DG Digitale Transformatie FOD Beleid en Ondersteuning | DG Transformation digitale SPF Stratégie et Appui

Thank you!