



08 June
2023

Enabling the Twin Digital and Green Transition via
personal IoT data
- The Case of Electric Vehicles

interoperable
europe

Agenda



Objectives and Context



Use cases for the Electric Vehicle proof-of-concept



Demo of the EV PoC



Q&A

Objectives and context

Questions that led to the creation of the PoC



Charging grid infrastructure

“Is it possible to improve future grid charging infrastructure by embedding data streams sourced in EV batteries?”

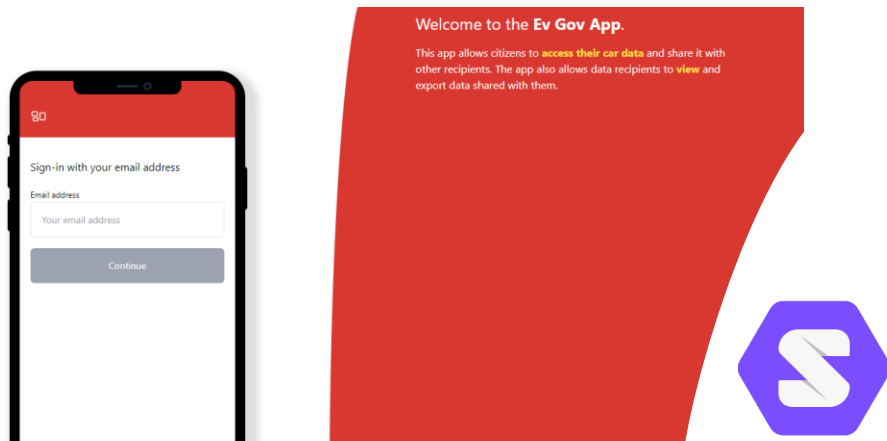


Battery lifespan

“Is it possible to expand the lifespan of an EV battery and facilitate its repurposing by embedding charging data sourced in the vehicles?”

Context

- Vehicle data is personal data associated to an individual;
- To protect individual data when sharing it among identified actors, a technology is needed that is ...



Legally Compliant

The PoC should allow personal (vehicle) data to be shared within the boundaries of the European legal framework



Decentralized, Interoperable, Open

The PoC should allow data collected by the vehicle throughout its lifespan to be available in a decentralized, interoperable and open way



Data Sharing for societal benefit

The PoC should respond to the posed questions and allow consumers, businesses and governments to extract tangible value from EV data



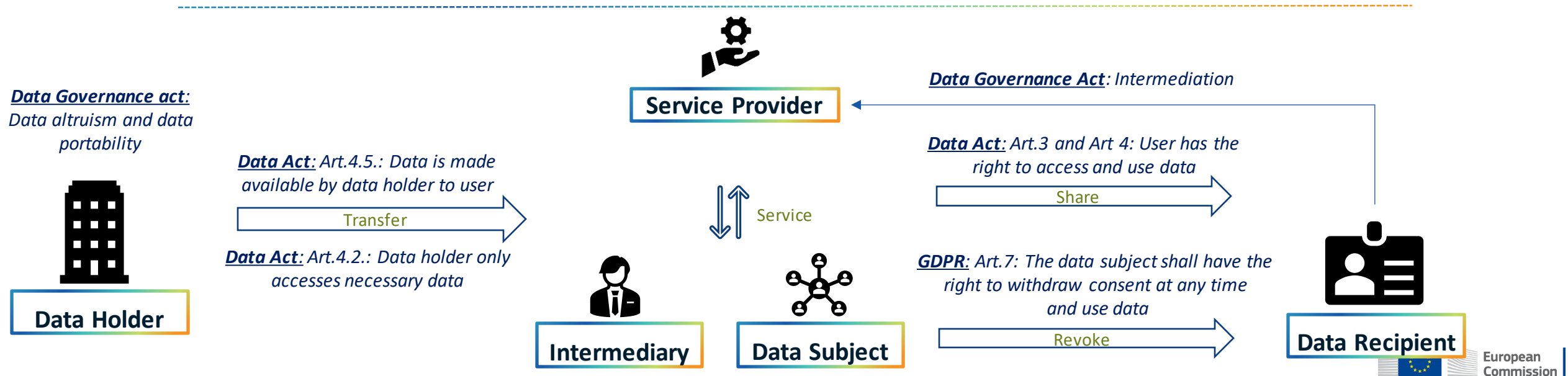
Data collection and sharing in the EU: legislation

The European Commission provides a broad legal framework to facilitate secure data collection, storage and sharing

The EV Proof-of-Concept needs to take into account:



... to enable an individual to control and share their personal data with a data recipient.



Current landscape and ongoing work

The transformation of the automotive industry has given rise to different needs:

- Digital traceability of material flows across the supply chain
- Transparency towards legislators
- A trustworthy, collaborative, open and secure (data) ecosystem
- Semantic interoperability



Data ecosystem based on Gaia-X providing:

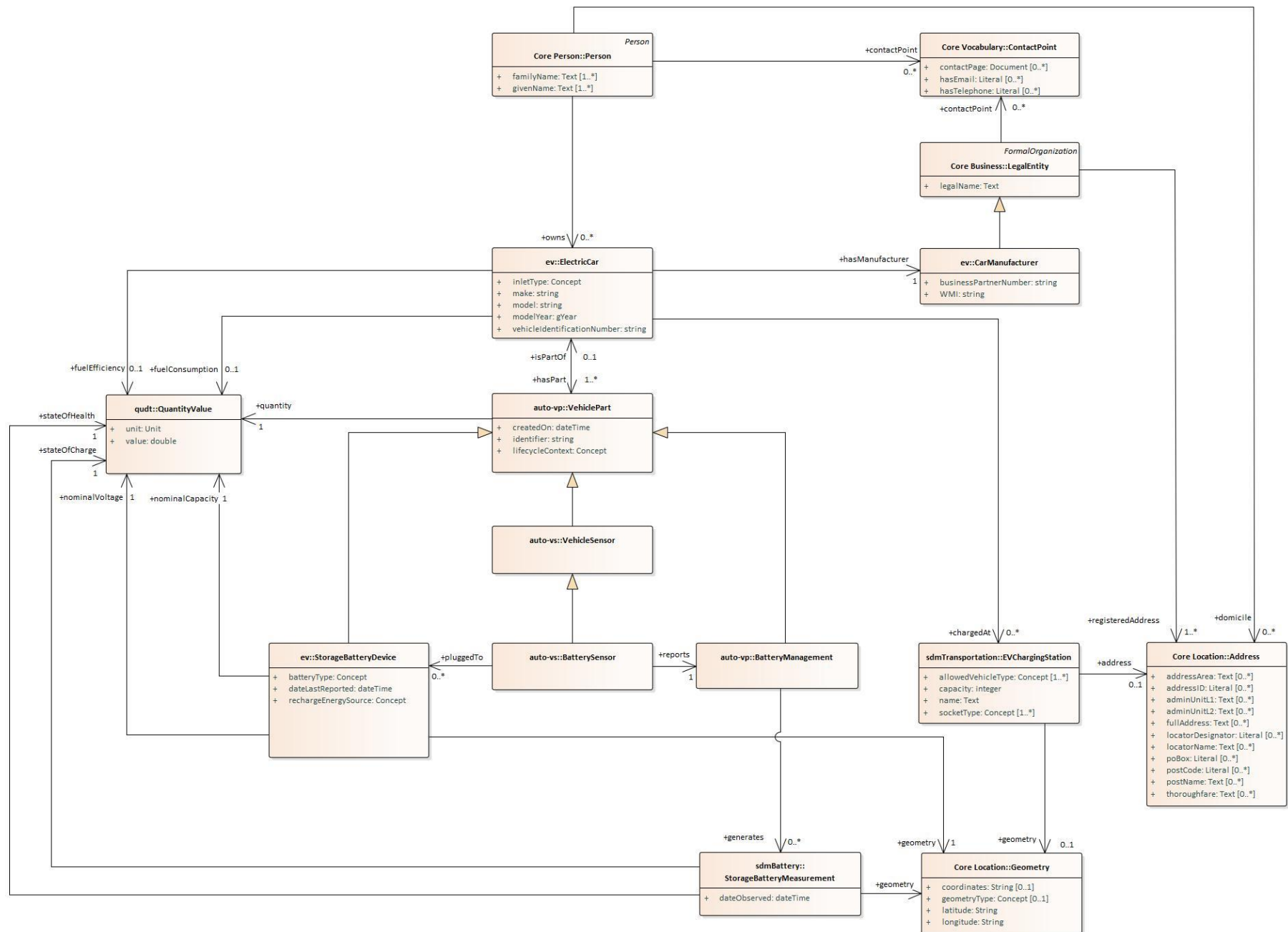
- Data Sovereignty, security, interoperability
- End-to-end semantics
- Policies and services for identification, authorisation..

Facilitate data exchange and interoperability in:

- Smart cities
- Smart Agrifood
- Smart Energy
- Manufacturing
- Environment
- ...

The World Wide Web Consortium (W3C) is an international community that develops open standards to ensure the long-term growth of the Web

Schema.org is a collaborative, community activity with a mission to create, maintain, and promote schemas for structured data on the Internet, on web pages, in email messages, and beyond



[Link to the latest version](#)

Electric Vehicle PoC: Use Cases

Use cases



The app demonstrates how a user can **control** and **share** data collected by their **assets**, with or without involvement of an **intermediary party**.

Before the demo, we highlight two potential use cases:

Use case 1

Charging grid infrastructure
User – Service Provider




To improve the charging grid infrastructure, a **Service Provider** (data receiver) would require **access** to data collected by **Nathalie's** (data subject) **car** stored by a **car manufacturer** (data holder). For this, it would like to know where Nathalie charged her car, at which frequency and which type of charging station she used.

Incentive: Nathalie shares her data with the Service Provider to **contribute to environmental objectives** (data altruism)

Use case 2

Battery lifespan prediction and extension
User – Intermediary – Service Provider



To optimise the EV battery lifespan and facilitate its repurposing, a **Service Provider** (data receiver) would require **access** to data collected by **Nathalie's** (data subject) **car** stored by a **car manufacturer** (data holder), via the manufacturers **car app** (intermediary). For this, it would like to know trends in the number of charging cycles, battery age and battery performance.

Incentive: Nathalie shares her data with the Service Provider to receive **free maintenance** from the car manufacturer (direct rewarding)

Use case 1: Improve charging grid infrastructure

A **Service Provider** would like to **access** and **consolidate** data on the use of **charging grid infrastructure**. Nathalie shares on a voluntary basis: the **data altruism principle**.



Can happen through different channels:

- A marketing campaign with a QR code
 - Email notification with link
 - Social media with link

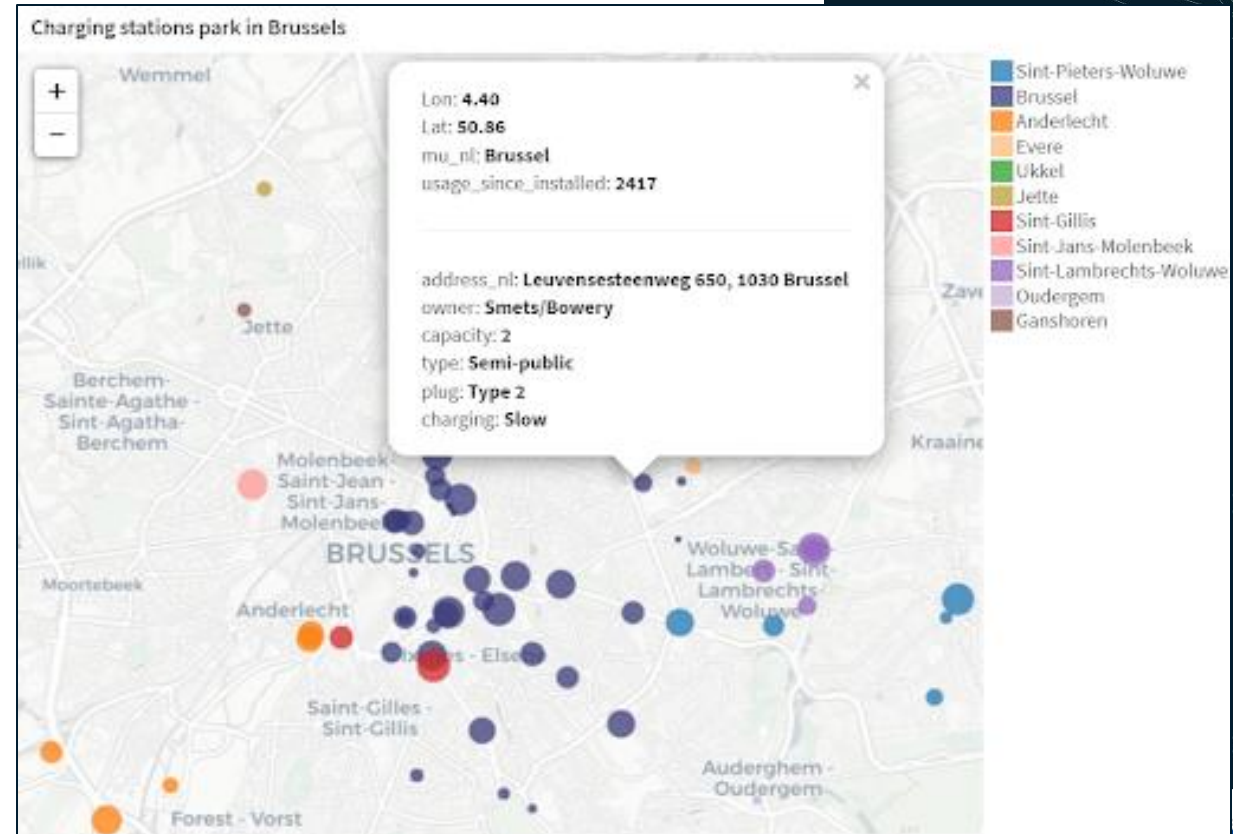
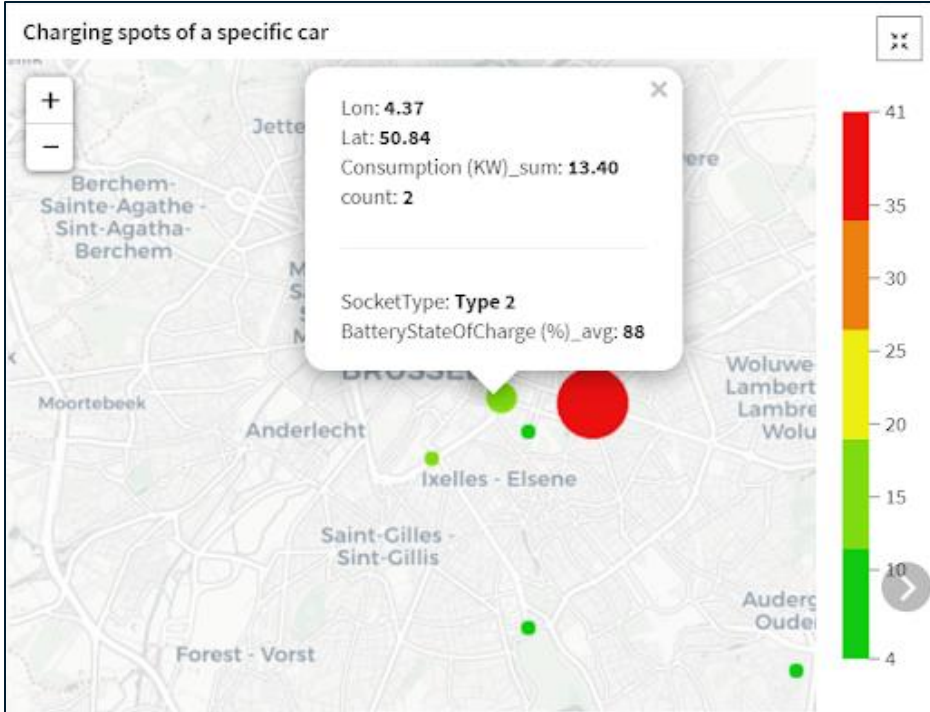
The app and underlying Solid protocol allows Nathalie to safely and efficiently allow the Commission to view data stored in her pod

The app and underlying Solid protocol enables the Service Provider to view data stored in her pod and use it for the targeted purpose



Use case 1: Improve charging infrastructure

The **Service Provider** would like to **access** and **consolidate** data on the use of **charging infrastructure**



Use case 2: Battery Lifespan management

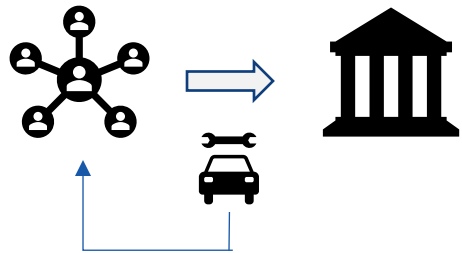
The **Service Provider** would like to **access** and **consolidate** data on the use of **EV batteries**, **rewarding** the citizen.



Nathalie gets a notification in the Car Manufacturer's App with the option to share data with the Service Provider by clicking a button. In return, she receives free maintenance.

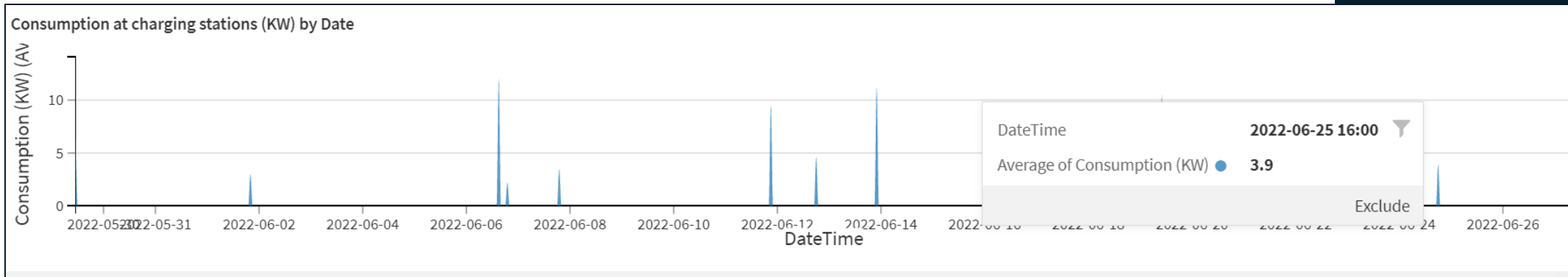
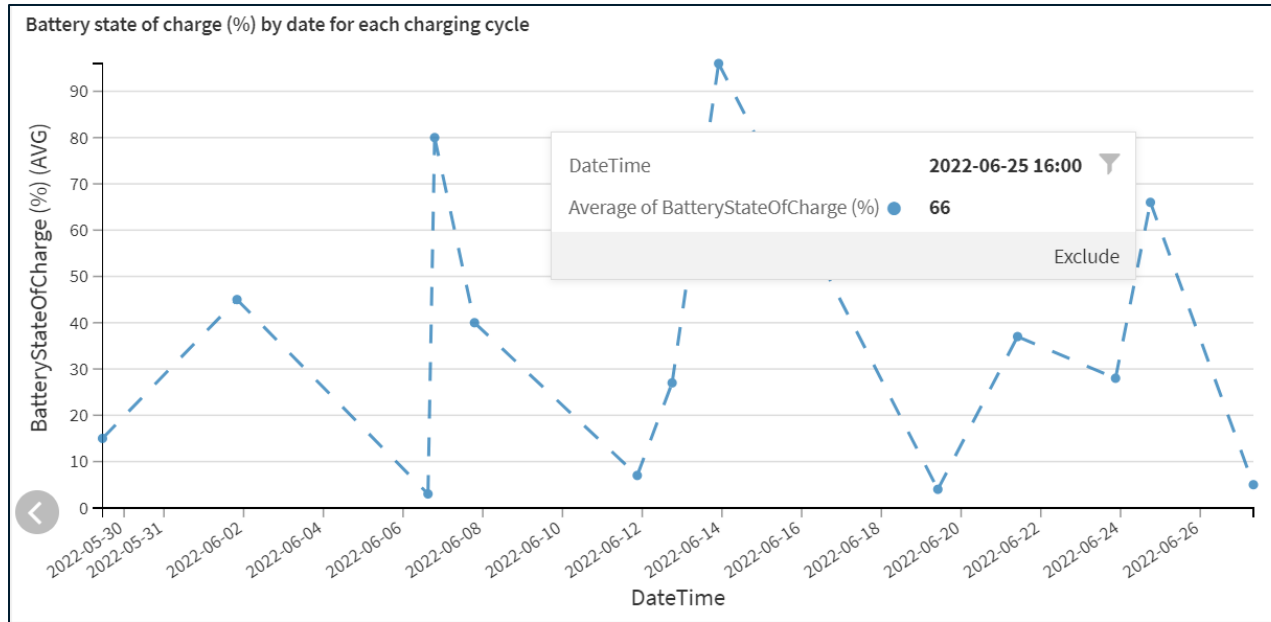
The Car Manufacturer's app and underlying Solid protocol allows Nathalie to safely and efficiently allow the Service Provider to view data stored in her pod. She receives free maintenance, and the Service Provider rewards the Car Manufacturer for the data shared.

The app and underlying Solid protocol enables the Service Provider to view data stored in her pod and use it for the targeted purpose

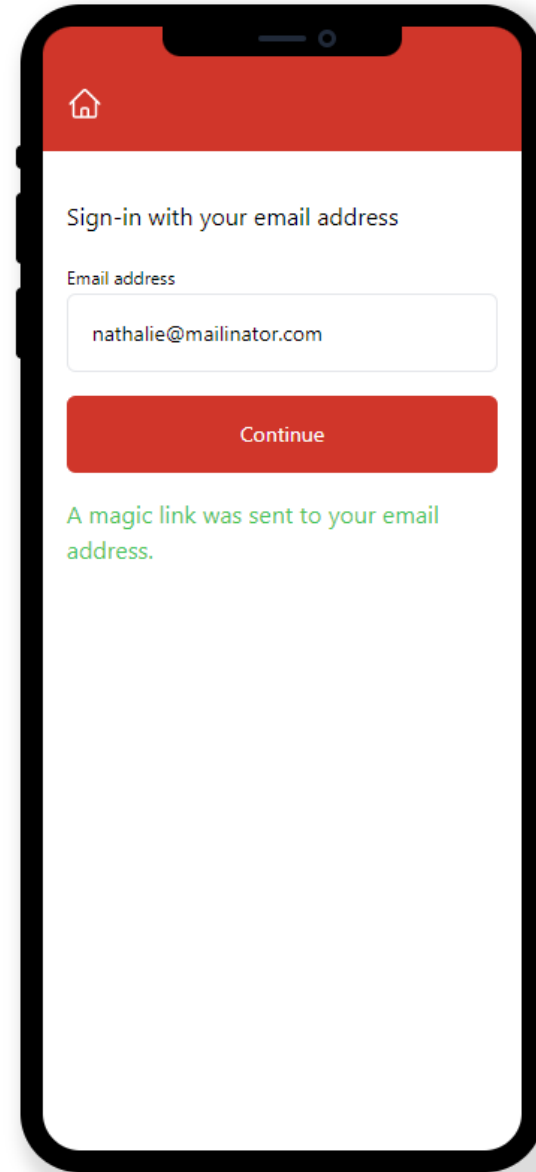
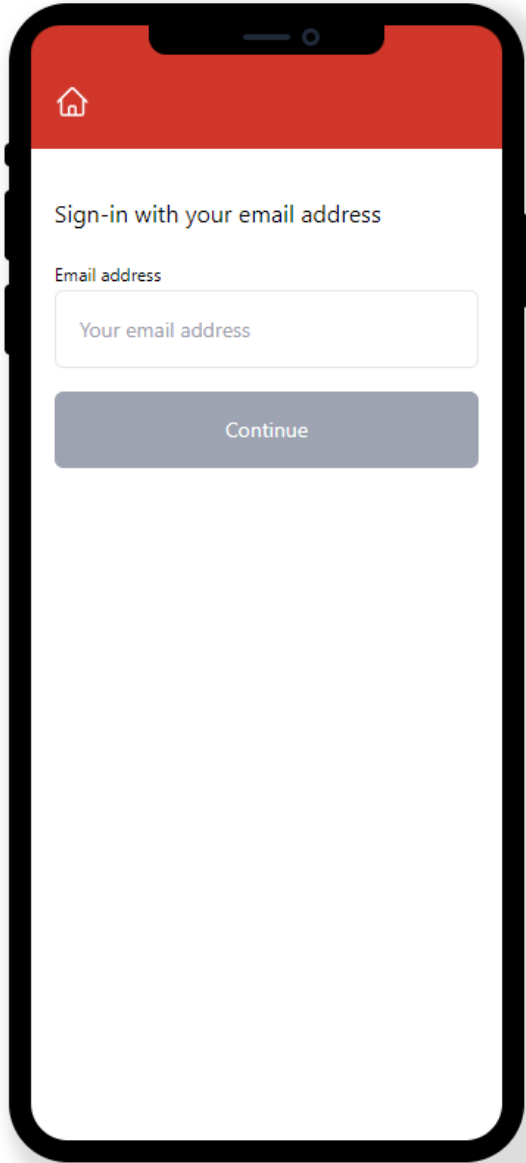


Use case 2: The battery lifecycle

The **Service Provider** would require to **access** and **consolidate** data on the use of **EV batteries**



Demo



To	nathalie
From	no-reply@use.id
Sending IP	198.2.132.19
Received	2023-04-24 15:34:47

HTML TEXT JSON RAW LINKS ATTACHMENTS

Hi,

Follow this link to proceed to EvGovApp with your use.id/nathalie WebID:

https://sandbox.op.use.id/passwordless/verify_redirect?scope=openid&response_type=code&redirect_uri=https%3A%2F%2Fsandbox.idp.use.id%2Fredirect&locale=sandbox.eu_auth0.com%2Fapi%2Fv2%2F&state=ed3912e0-fab8-437a-9720-6fc23c54fcbd&username=nathalie&client-name=EvGovApp&verification_code=718650&connection=email&client_id=6kna3HIvt8XtH2b9LxZwPNXFd7715keo&email=nathalie%40mailinator.com

If you didn't ask for this email, you can safely ignore it.

Thanks,
The use.id team

What is a WebID, why do I have one and what is use.id?
[Our FAQ provides answers to questions like these.](#)



Q&A

What is Solid?

Introduction to Solid

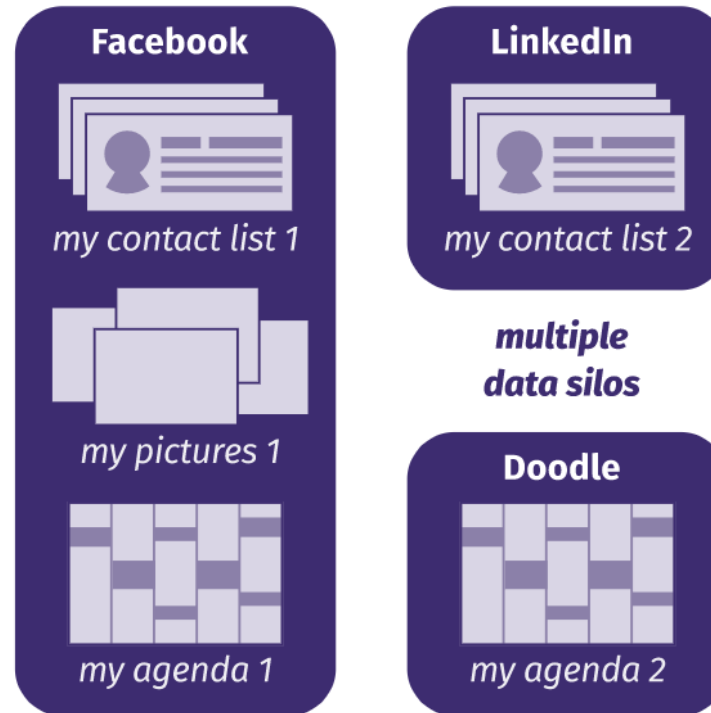


Solid is a specification that lets people store their data **securely** in **decentralized** data stores called **Pods**.

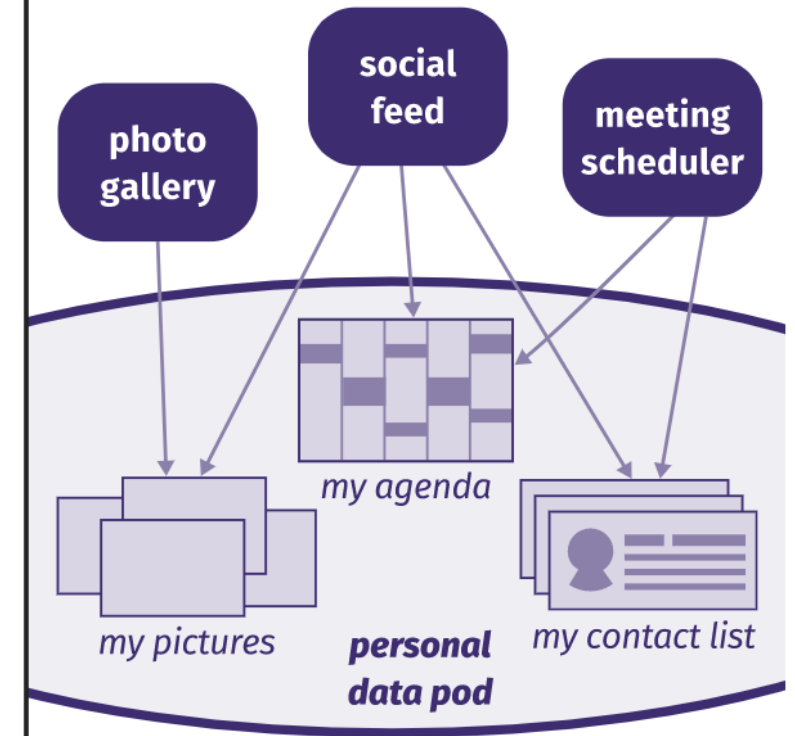
- Any kind of information can be stored in a Solid Pod
- Access is controlled by the individual
- Use of standard, open and interoperable data formats

Solid aims to restore choice by separating data from apps. Applications become views on data, they don't contain them. They are merely visitors.

centralized Web applications



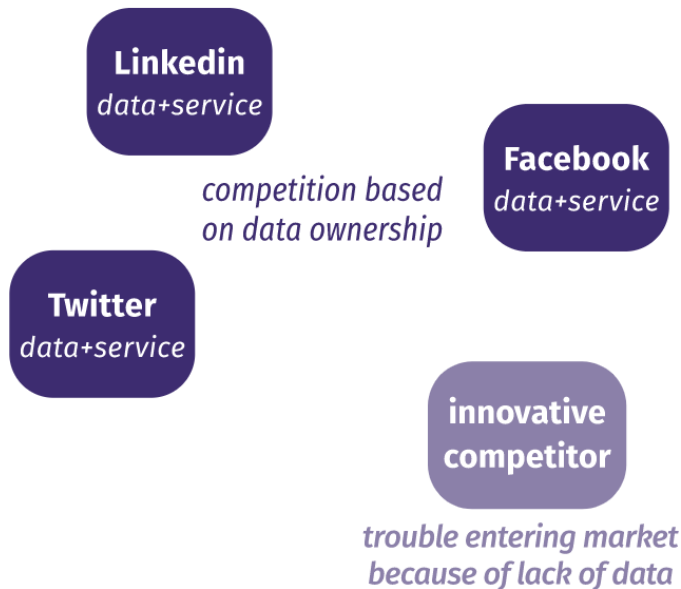
decentralized Web applications



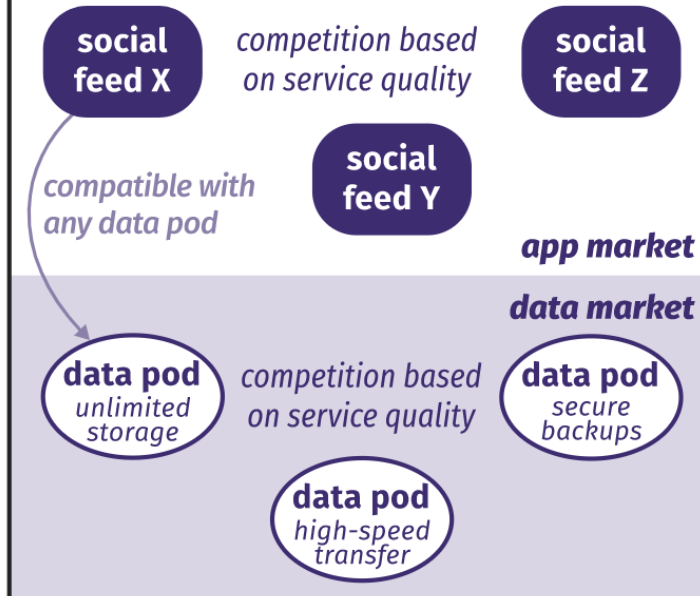
Introduction to Solid

Within the interoperable Solid ecosystem, different applications can access the same data instead of requiring separate data silos specifically for the applications

single market for centralized apps



separate data and app markets



This separation fuels competition and thereby innovation

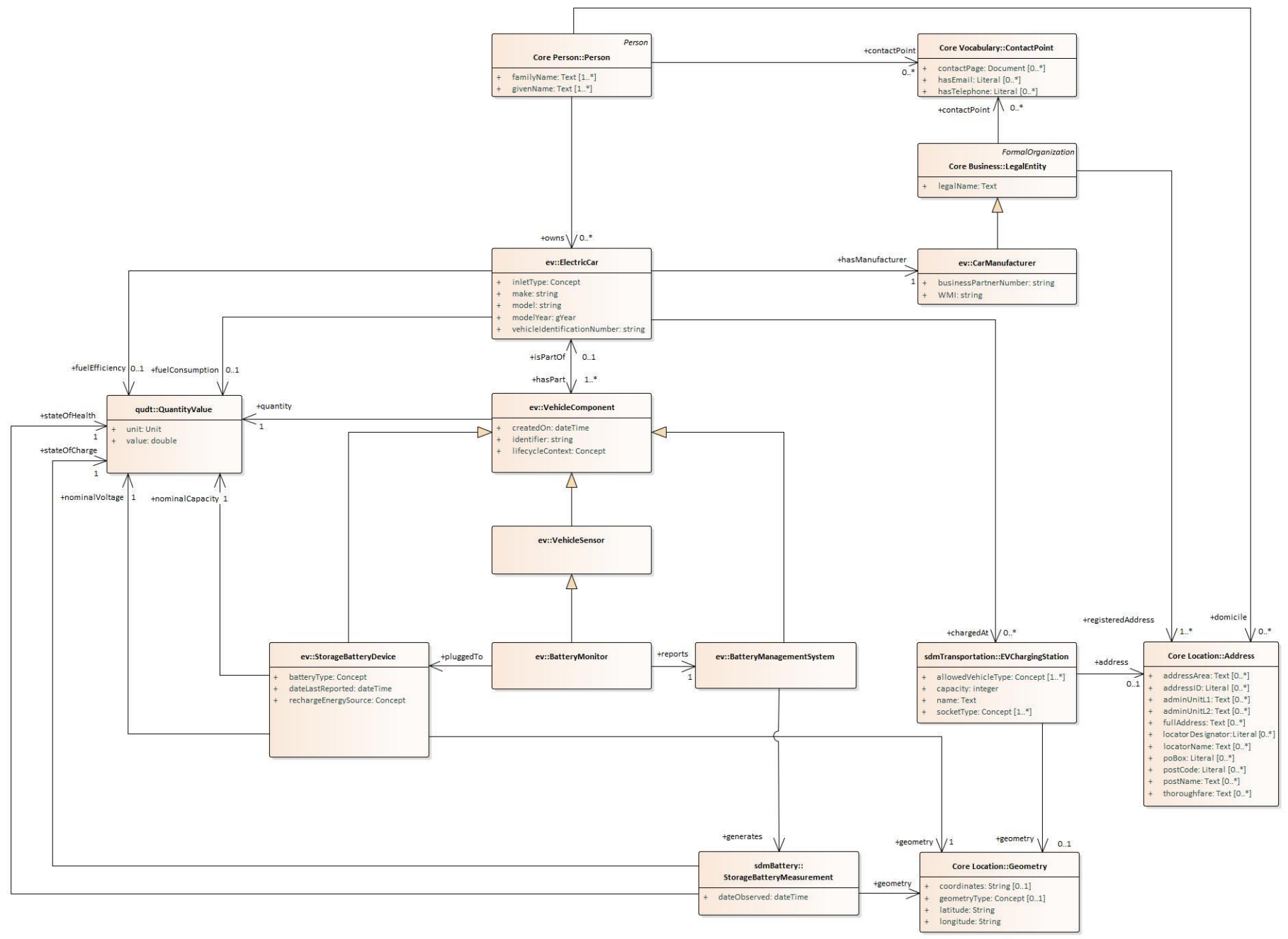


Data model and synthetic data

Data model: Electric Vehicles Energy Systems

Application profile created in the context of the EV PoC

- Uses SEMIC internal policies
- Reuses existing data models on vehicles
 - Catena-X Assembly parts, Semantic Model Vehicle Product Description
 - Smart Data Models: Battery and Transportation
 - VSS Core and VSSO Ontology
 - Schema.org Vehicle
- Reuses generic data models and types
 - SEMIC Core Vocabularies
 - Dublin Core Terms
 - ...
- Reuses existing databases and open APIs
 - Data itself and semantics



[Link to the latest version](#)

Data model – Synthetic data (.xlsx)

Example: Electric Car class in .xlsx

Class URI	http://example.com/electricCar/									
PREFIX	cv	http://data.europa.eu/m8g/								
PREFIX	ec	http://example.com/electricCar/								
PREFIX	con	http://example.com/concept/								
PREFIX	dct	http://purl.org/dc/terms/								
PREFIX	sbm	http://example.com/storageBatteryMeasurement/								
PREFIX	sbd	http://example.com/storageBatteryDevice/								
PREFIX	cm	http://example.com/carManufacturer/								
Examples of electric car as described in the EV data model: https://github.com/SEMICEu/uri.semic.eu-generated/blob/master/doc/application-profile/ev-ap/html/overview.jpg										
URI	rdf:type	cv:inletType	cv:make	cv:model	cv:modelYear^^xsd:gYear	cv:vehicleIdentificationNumber	dct:hasPart(separator=",")	cv:hasManufacturer	cv:canChargeAt(separator=",")	
ec:EC_1	cv:ElectricCar	con:CON_INT_1	AUDI	e-tron GT/RS e-tron GT	2023	WA1DKBFP4BA675336	sbd:SBD_1, sbm:SBM_1	cm:CM_1	cst:CS_1, cst:CS2, cst:CS_10	
ec:EC_2	cv:ElectricCar	con:CON_INT_1	AUDI	Q4 e-tron quattro	2023	2G61V5S88F9944555	sbd:SBD_2, sbm:SBM_2	cm:CM_1	cst:CS_2, cst:CS_4, cst:CS_7, cst:CS_10	
ec:EC_3	cv:ElectricCar	con:CON_INT_1	AUDI	Q4 e-tron Sportback	2023	2G4GT5GR4D9092633	sbd:SBD_3, sbm:SBM_3	cm:CM_1	cst:CS_3	
ec:EC_4	cv:ElectricCar	con:CON_INT_1	BMW	i4 eDrive40 Gran Coupe	2023	WBS3U9C56FJ346076	sbd:SBD_4, sbm:SBM_4	cm:CM_2	cst:CS_4	
ec:EC_5	cv:ElectricCar	con:CON_INT_1	BMW	i4 M50 Gran Coupe	2023	4T1BF1FK8FU952330	sbd:SBD_5, sbm:SBM_5	cm:CM_2	cst:CS_7, cst:CS_8, cst:CS_3	
ec:EC_6	cv:ElectricCar	con:CON_INT_1	BMW	iX xDrive 50	2023	1D7RE3BK4BS204015	sbd:SBD_6, sbm:SBM_6	cm:CM_2	cst:CS_8, cst:CS_2	
ec:EC_7	cv:ElectricCar	con:CON_INT_2	HYUNDAI	Kona Electric 64 kWh	2023	2C3CDYAG2CH528249	sbd:SBD_7, sbm:SBM_7	cm:CM_5	cst:CS_5, cst:CS_3	
ec:EC_8	cv:ElectricCar	con:CON_INT_2	PORSCHE	Taycan AWD	2023	1VWAS7A3XFC027940	sbd:SBD_8, sbm:SBM_8	cm:CM_3	cst:CS_9	
ec:EC_9	cv:ElectricCar	con:CON_INT_2	PORSCHE	Taycan GTS Sport Turismo	2023	5NPDH4AE7EH229958	sbd:SBD_9, sbm:SBM_9	cm:CM_3	cst:CS_9, cst:CS_5, cst:CS_8	
ec:EC_10	cv:ElectricCar	con:CON_INT_2	VOLKSWAGEN	ID.4 AWD Pro S	2023	1ZVBP8AN5A5724037	sbd:SBD_10, sbm:SBM_10	cm:CM_4	cst:CS_2, cst:CS_5, cst:CS_1, cst:CS_9	
ec:EC_11	cv:ElectricCar	con:CON_INT_2	VOLKSWAGEN	ID.4 S	2023	5N1ANONU6BC719770	sbd:SBD_11, sbm:SBM_11	cm:CM_4	cst:CS_9, cst:CS_6, cst:CS_1	

Data model – Synthetic data (rdf)

```
prs:PERS_10 a pers:Person;  
cv:contactPoint cp:CP_10;  
cv:owns ec:EC_10, ec:EC_11;  
foaf:familyName "Michel"@fr;  
foaf:givenName "Nathalie"@fr .
```

```
qtyv:SOC_11 a qudt:QuantityValue;  
qudt:unit unit:PERCENT;  
qudt:value "12" .
```

```
qtyv:NC_21 a qudt:QuantityValue;  
qudt:unit unit:A-HR;  
qudt:value "234" .
```

```
qtyv:NV_22 a qudt:QuantityValue;  
qudt:unit unit:V;  
qudt:value "850" .
```

```
ec:EC_11 a cv:ElectricCar;  
cv:canChargeAt cst:CS_1, cst:CS_6, cst:CS_9;  
cv:hasManufacturer cm:CM_4;  
cv:inletType con:CON_INT_2;  
cv:make "VOLKSWAGEN";  
cv:model "ID.4 S";  
cv:modelYear "2023"^^xsd:gYear;  
cv:vehicleIdentificationNumber "5N1AN0NU6BC719770";  
dct:hasPart sbd:SBD_11, sbm:SBM_11 .
```

```
cm:CM_4 a cv:CarManufacturer;  
cv:businessPartnerNumber "1783";  
cv:contactPoint cp:MA_4;  
cv:registeredAddress adr:AD_14;  
cv:wmi "WVG";  
legal:legalName "VOLKSWAGEN AG"@en .
```

```
sbd:SBD_11 a cv:StorageBatteryDevice;  
cv:batteryType con:BAT_7;  
cv:createdOn "2013-08-30T09:00:00";  
cv:dateLastReported "2023-08-30T09:00:00";  
cv:lifecycleContext con:LCC_1;  
cv:nominalCapacity qtyv:NC_21;  
cv:nominalVoltage qtyv:NV_22;  
cv:quantity qtyv:Qty_1;  
cv:rechargeEnergySource con:RES_1;  
dct:identifier "sbd_11";  
dct:isPartOf ec:EC_11;  
locn:geometry geo:GEO_11 .
```

```
sbm:SBM_11 a "sdmbt:StorageBatteryMeasurement";  
cv:stateOfCharge qtyv:SOC_11;  
dct:isPartOf ec:EC_11;  
locn:dateObserved "2022-03-12T05:19:01";  
locn:geometry geo:GEO_11 .
```

```
geo:GEO_11 a locn:Geometry;  
cv:coordinates "50.842367, 4.384978";  
cv:geometryType con:GEOT_1;  
cv:latitude "50.842367";  
cv:longitude "4.384978" .
```

```
cst:CS_9 a sdmtr:EVChargingStation;  
cv:address adr:AD_9;  
cv:allowedVehicleType con:CON_AV_3;  
cv:capacity 2;  
cv:socketType con:CON_10, con:CON_17;  
rdfs:label "Nord"@fr;  
locn:geometry geo:GEO_19 .
```

```
cst:CS_1 a sdmtr:EVChargingStation;  
cv:address adr:AD_1;  
cv:allowedVehicleType con:CON_AV_3;  
cv:capacity 2;  
cv:socketType con:CON_17;  
rdfs:label "Schuman"@fr;  
locn:geometry geo:GEO_11 .
```

```
adr:AD_9 a locn:Address;  
locn:fullAddress "Avenue Louise 125"@fr, "Louizalaan 125"@nl;  
locn:postCode "1000"^^rdfs:Literal;  
locn:postName "Brussel"@nl, "Bruxelles"@fr .
```

```
geo:GEO_19 a locn:Geometry;  
cv:coordinates "50.830044, 4.360621";  
cv:geometryType con:GEOT_1;  
cv:latitude "50.830044";  
cv:longitude "4.360621" .
```

```
con:CON_17 a skos:Concept;  
skos:inScheme <http://example.com/conceptscheme>;  
skos:prefLabel "Type2"@en;  
skos:topConceptOf <http://example.com/conceptscheme> .
```

```
adr:AD_1 a locn:Address;  
locn:fullAddress "Rue de la Loi 238"@fr, "Wetstraat 238"@nl;  
locn:postCode "1000"^^rdfs:Literal;  
locn:postName "Brussel"@nl, "Bruxelles"@fr .
```

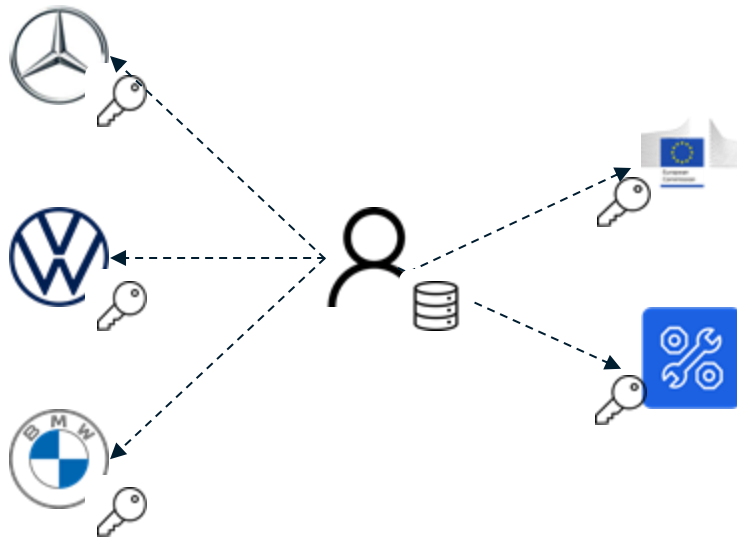
```
geo:GEO_11 a locn:Geometry;  
cv:coordinates "50.842367, 4.384978";  
cv:geometryType con:GEOT_1;  
cv:latitude "50.842367";  
cv:longitude "4.384978" .
```

Architecture

Hub-and-spoke architecture

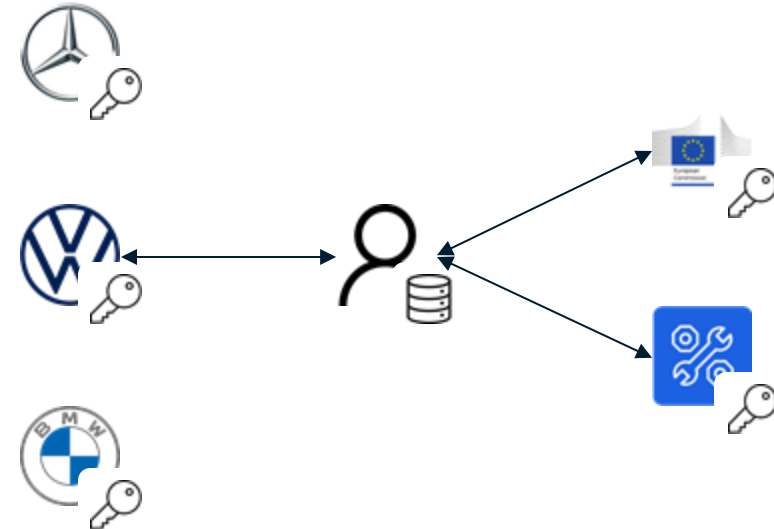
Granting access

- User stores the data
- User grants read+write access to data holder to 'update' the data
- User grants access to the recipient



Sharing data

- Data is transmitted to the user's vault/pod
- User transmits to the recipient



Legal framework

Legal framework



Data act

- Terminology included (product, data provider, user, data recipient)

The PoC is relevant according to the principles of the Data act.

- Users has the right to access and use* data (art.3, art. 4, pp.40-41)
- Data is made available by the data holder to the user (art 4.5, p.41)
- Upon exceptional request, a data holder makes data available to a public sector body (art 14.1, p.48)
- The data holder won't keep any information on the user's access beyond what is necessary for authentication (art 4.2, p.41)

*see and share

Legal framework



Battery act

- the “battery passport” of the EV battery and related information are handled, accessible and sharable (art. 64, art. 65, pp.92-95)

Data Governance Act

- It allows both architectures (art. 2.7, p.23).



Within our PoC, Data intermediary Service is transparent

- Data sharing services may include bilateral exchanges of data (art. 9, p.29)
- Neutrality and transparency of data intermediaries (key element n°26, p.18)
- data intermediation service (data manager platform) are independent from commercial use (key element n°26, p.18)

Within our PoC, Data altruism is one of our main UC

- Individuals and companies grant access to make data available – voluntarily and without reward (art. 2.7 , p.23)

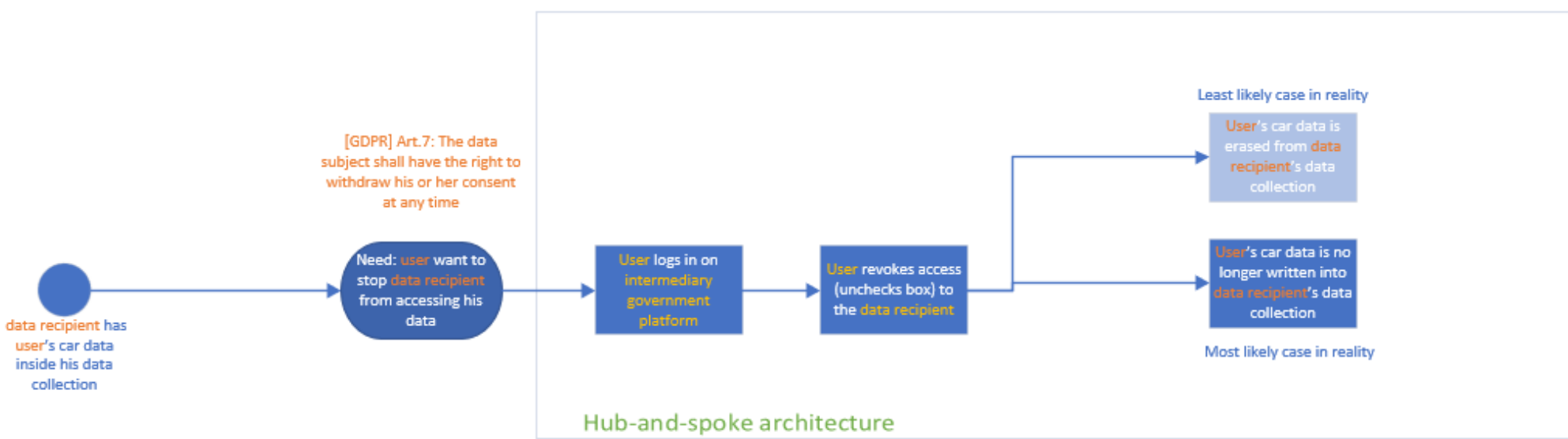
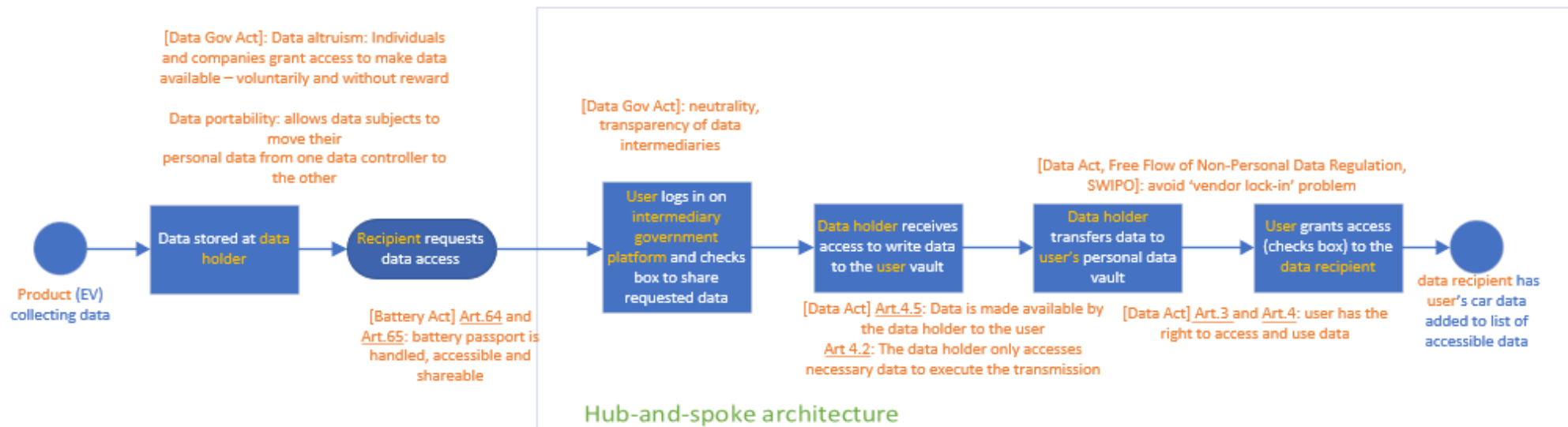
Legal framework



General Data Protection Regulation (GDPR)

- The data subject shall have the right to withdraw his or her consent at any time. The withdrawal of consent shall not affect the lawfulness of processing based on consent before its withdrawal. Prior to giving consent, the data subject shall be informed thereof. It shall be as easy to withdraw as to give consent (Art7.3).

User journeys



A network visualization on a dark blue background. A central hub of orange and yellow lines radiates outwards, connecting to a dense web of thinner lines in shades of green and blue. The overall shape is roughly circular with many points extending to the edges.

Thank
you



interoperable europe

innovation ∞ govtech ∞ community

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