

# Scalable Policy-aware Linked Data arChitecture for prlvacy, trAnsparency and compLiance (SPECIAL)

Sabrina Kirrane, WU

29<sup>th</sup> of November 2019

Big Data Value ecosystem (BDVe) Webinar Series

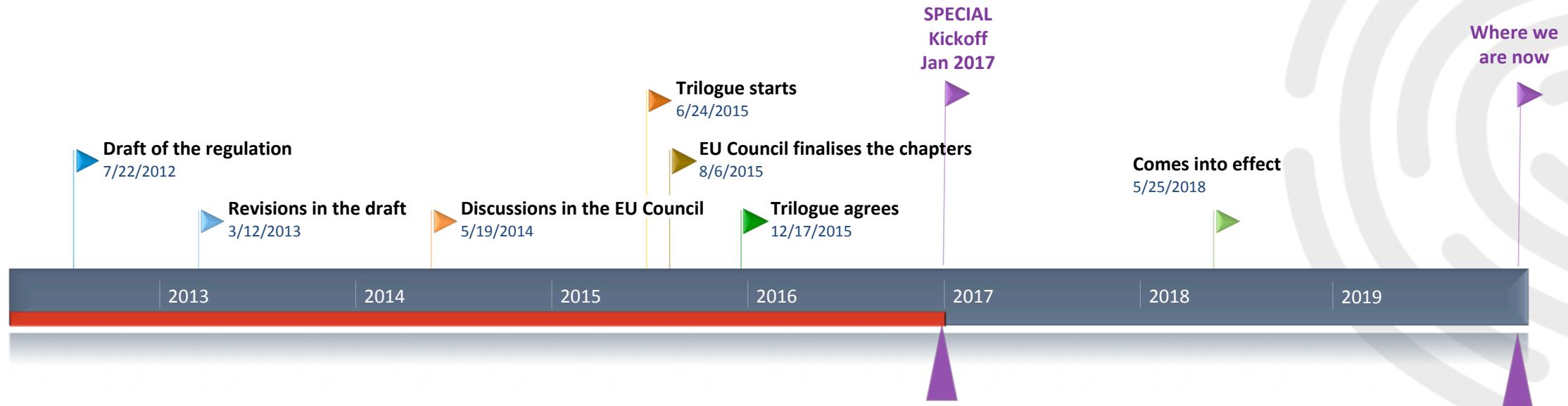


European  
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Horizon 2020  
European Union funding  
for Research & Innovation



# SPECIAL Aims & Stakeholders



**Data subjects** who would like to declare, monitor and optionally revoke their (often not explicit) preferences on data sharing

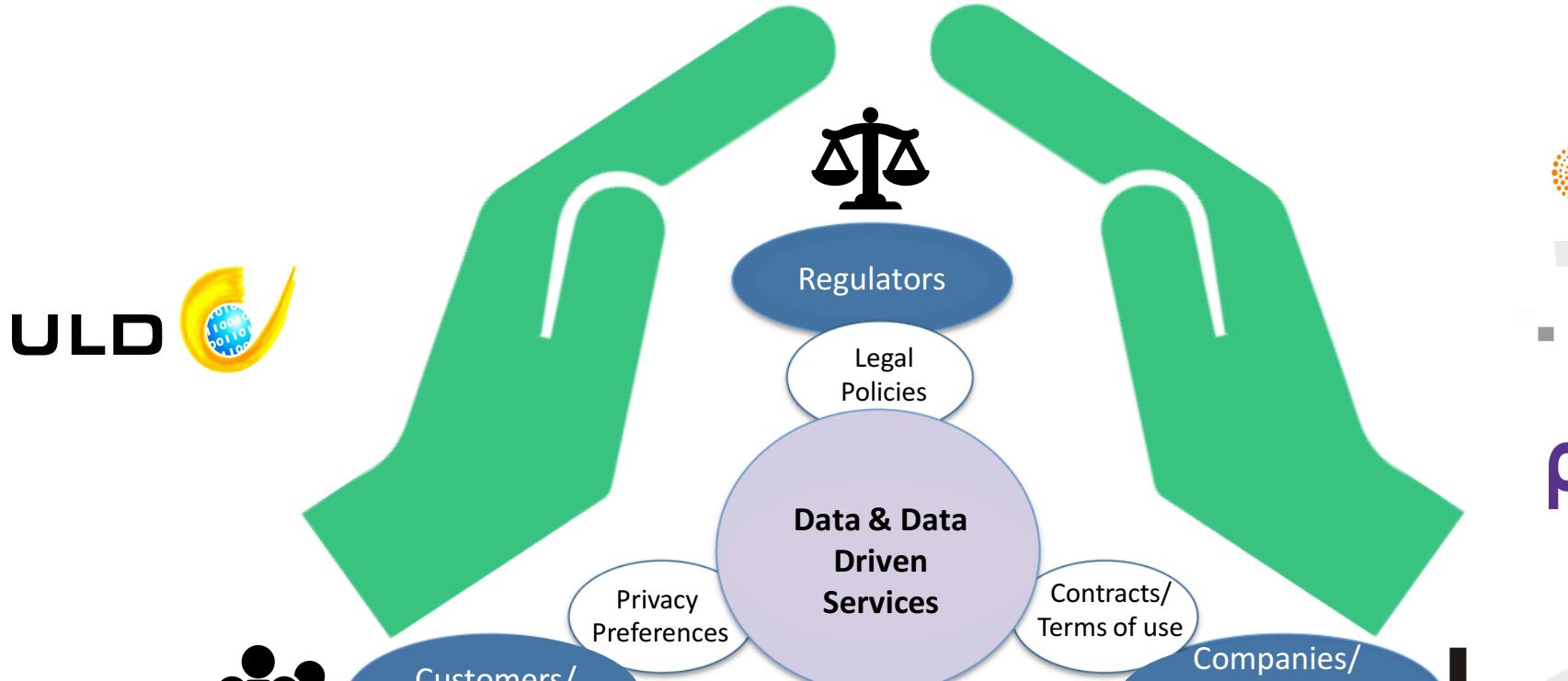


**Regulators** who can leverage technical means to check compliance with the GDPR



**Companies** whose business models rely on personal data and for which the GDPR is both a challenge and an opportunity

# SPECIAL Objectives



# SPECIAL Use Cases



Events at the Belgian Coast at  
your fingertips

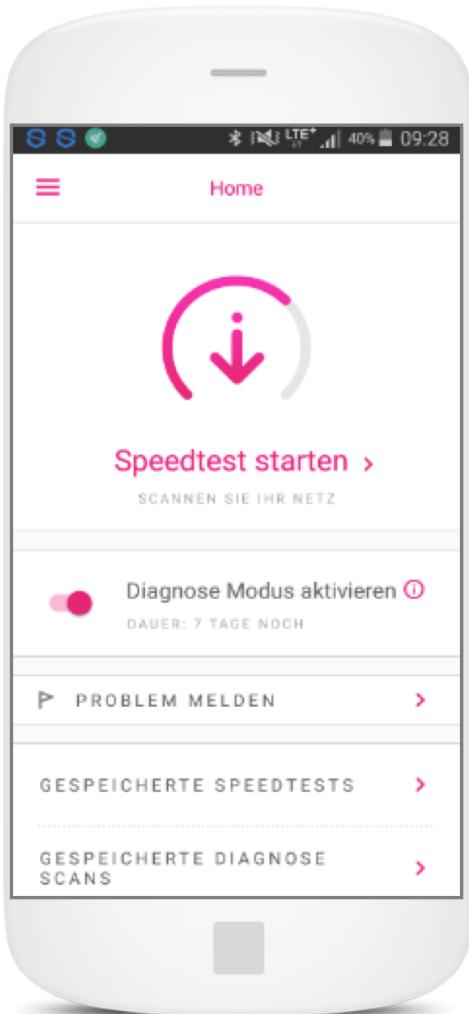
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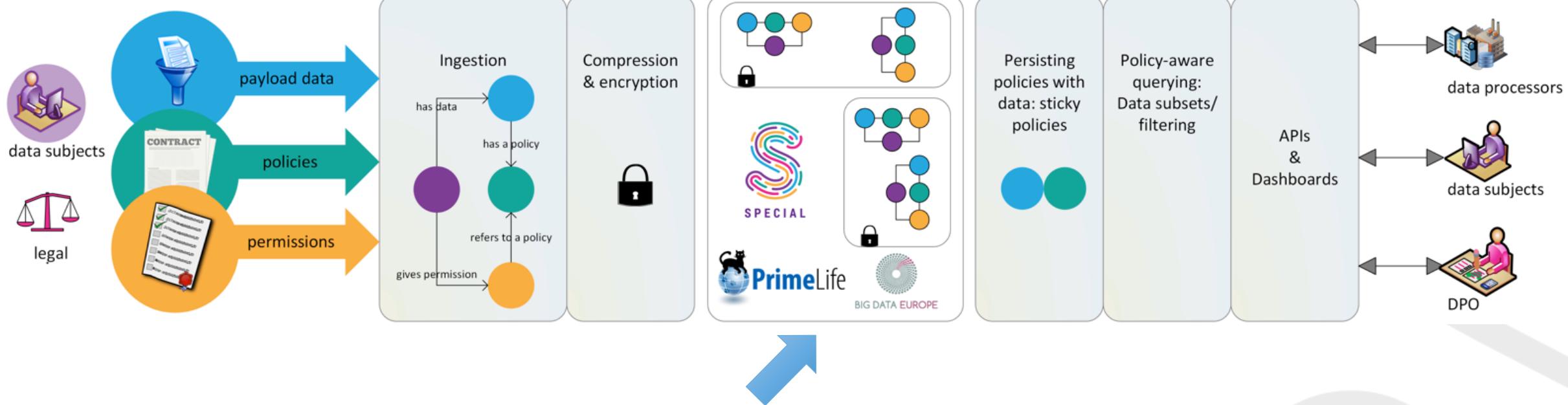
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# SPECIAL Technical Foundations

## Big Data and Privacy Foundations



SPECIAL leverages past infrastructure and lessons learned

- ❖ **Big Data Europe** scalability and elasticity
- ❖ **PrimeLife** policy languages, access control policies, release policies and data handling policies
- ❖ The **Platform for Privacy Preferences Project** (P3P) and the **Open Digital Rights Language** (ODRL) vocabularies

# SPECIAL Technical Foundations

## Consent, Transparency, and Compliance Checking

Collected data

Purpose of data collection and processing

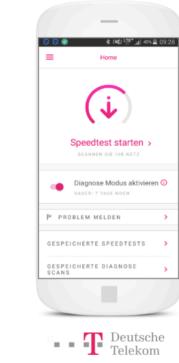
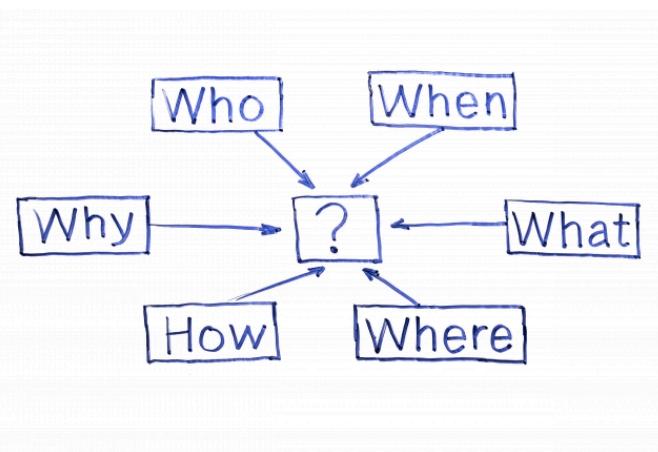
How is data processed

Where are collected data and profiles stored

For how long are the data stored

Disclosure to third parties

### Transparency Ledger



# Usage policy language

## Syntax and expressivity

- Usage policy language, which can be used to express both the data subjects' **consent**, data controllers usage requests, fragments of the **GDPR**, and business policies
- The foundation of the policy language was the **Minimal Core Model (MCM)**
- We propose a new policy language that extensively **re-uses standards** based privacy-related vocabularies
- We are able to **leverage existing Web Ontology Language (OWL) based reasoners** out of the box

Figure 1.1: SPECIAL's Usage Policy Language Grammar

```
UsagePolicy :='ObjectUnionOf' '(' BasicUsagePolicy BasicUsagePolicy { BasicUsagePolicy } ')'  
| BasicUsagePolicy  
  
BasicUsagePolicy :='ObjectIntersectionOf' '(' Data Purpose Processing Recipients Storage ')'  
  
Data :='ObjectSomeValueFrom' '(' 'spl:hasData' DataExpression ')'  
  
Purpose :='ObjectSomeValueFrom' '(' 'spl:hasPurpose' PurposeExpression ')'  
  
Processing :='ObjectSomeValueFrom' '(' 'spl:hasProcessing' ProcessingExpression ')'  
  
Recipients :='ObjectSomeValueFrom' '(' 'spl:hasRecipient' RecipientExpression ')'  
  
Storage :='ObjectSomeValueFrom' '(' 'spl:hasStorage' StorageExpression ')'  
  
DataExpression :='spl:AnyData' | DataVocabExpression  
  
PurposeExpression :='spl:AnyPurpose' | PurposeVocabExpression  
  
ProcessingExpression :='spl:AnyProcessing' | ProcessingVocabExpression  
  
RecipientsExpression :='spl:AnyRecipient' | 'spl:Null' | RecipientVocabExpression  
  
StorageExpression :='spl:AnyStorage' | 'spl:Null' |  
'ObjectIntersectionOf' '(' Location Duration ')'  
  
Location :='ObjectSomeValueFrom' '(' 'spl:hasLocation' LocationExpression ')'  
  
Duration :='ObjectSomeValueFrom' '(' 'spl:hasDuration' DurationExpression ')'  
| 'DataSomeValueFrom' '(' 'spl:durationInDays' IntervalExpression ')'
```

# Usage policy language SPECIAL resources

## The SPECIAL Usage Policy Language

version 0.1

Unofficial Draft 06 April 2018

### Editor:

Javier D. Fernández (Vienna University of Economics and Business)

### Authors:

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Sabrina Kirrane (Vienna University of Economics and

Iliana Mineva Petrova (Università di Napoli Federico I)

Luigi Sauro (Università di Napoli Federico II)

Eva Schleehahn (Unabhängiges Landeszentrum für Da

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## Vocabulary .../langs/usage-policy#

Bert Bos ◎ Last Updated: 17 April 2018

You can [download this ontology as an OWL file.](#)

The following is the formulation in functional syntax of the Usage Policy Language Ontology with identifier

<http://www.specialprivacy.eu/langs/usage-policy#>

The documentation can be found in [Policy Language V1 \(deliverable D2.1\).](#)

```
# NAMESPACE DEFINITIONS

Prefix(spl:=<http://www.specialprivacy.eu/langs/usage-policy#>)
Prefix(owl:=<http://www.w3.org/2002/07/owl#>)
Prefix(rdf:=<http://www.w3.org/1999/02/22-rdf-syntax-ns#>)
Prefix(xml:=<http://www.w3.org/XML/1998/namespace>)
Prefix(xsd:=<http://www.w3.org/2001/XMLSchema#>)
Prefix(rdfs:=<http://www.w3.org/2000/01/rdf-schema#>)

# ONTOLOGY IRI AND ITS VERSION

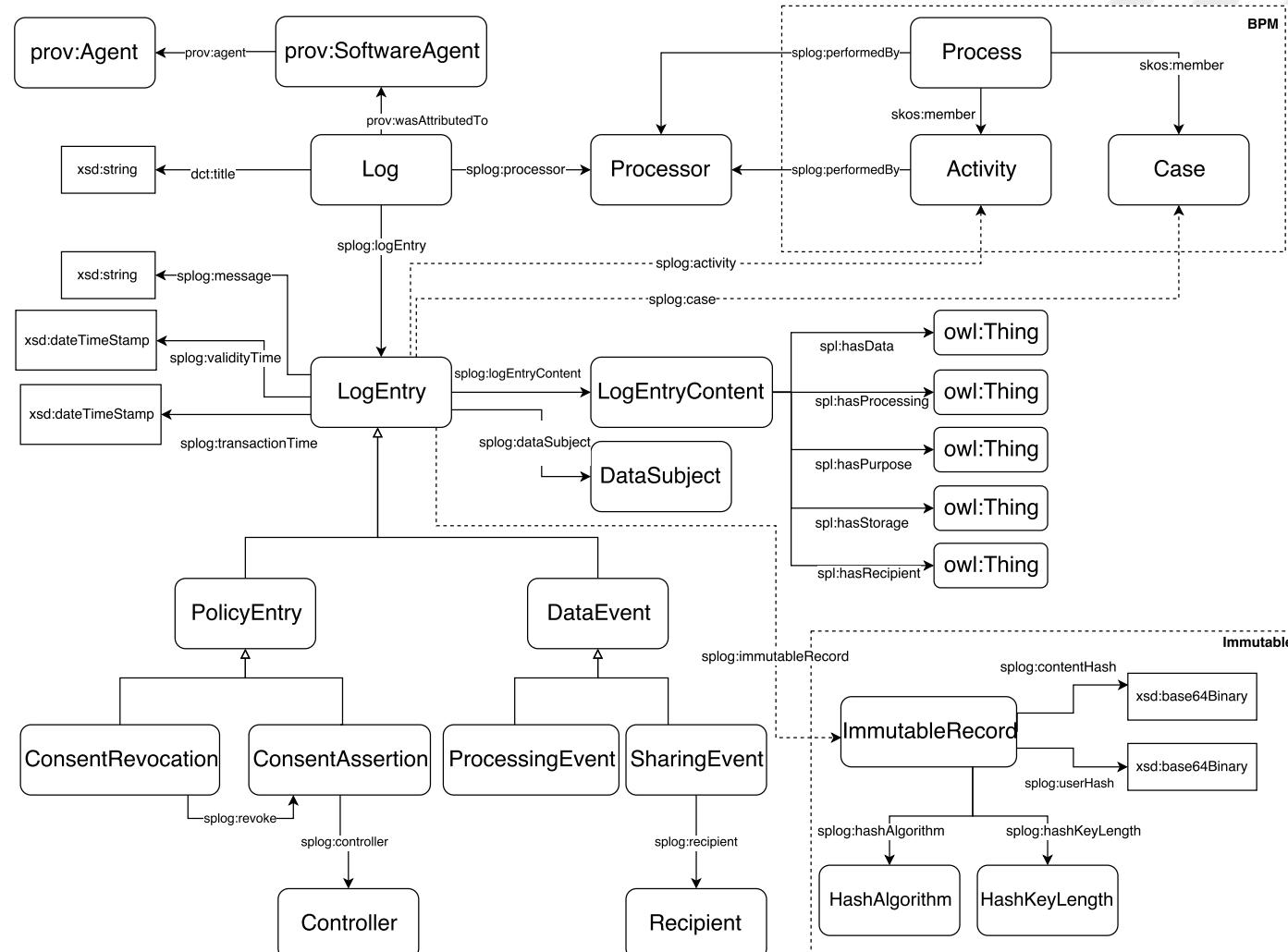
Ontology( <http://www.specialprivacy.eu/langs/usage-policy-ontology>
<http://www.specialprivacy.eu/langs/usage-policy-ontology/1.0>
```

- Detailed in [D2.5 Policy Language V2](#)
- Available for download via the SPECIAL website  
<https://www.specialprivacy.eu/langs/usage-policy>
- An unofficial *draft specification* has been published online  
<http://purl.org/specialprivacy/policylanguage>
- Feeds into the standardisation efforts conducted in the [W3C Data Privacy Vocabularies and Controls Community Group](#)

# Provenance/event information

## Syntax and expressivity

- Development of a **log vocabulary** that reuses well-known vocabularies such as **PROV** for representing provenance metadata
- Demonstrate how provenance can be used to support transparency in data value chains



# Provenance/event information SPECIAL resources

## The SPECIAL Policy Log Vocabulary

A vocabulary for privacy-aware logs, transparency and compliance -  
version 0.3



Unofficial Draft 06 April 2018

### Editor:

Javier D. Fernández (Vienna University of Economics and Business)

### Authors:

Piero Bonatti (Università di Napoli Federico II)

Wouter Dullaert (Tenforce)

Javier D. Fernández (Vienna University of Economics and Business)

Sabrina Kirrane (Vienna University of Economics and Business)

Uros Milosevic (Tenforce)

Axel Polleres (Vienna University of Economics and Business)

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### Abstract

This document specifies *sblog*, a vocabulary to log data processing and sharing a given consent provided by a data subject. We also model the consent actions revocation

## Vocabulary .../langs/sblog#

Bert Bos Last Updated: 17 April 2018

(You can [download this ontology as an OWL file](#).)

This is the SPECIAL Policy Log Vocabulary, with identifier

<http://www.specialprivacy.eu/langs/sblog#>

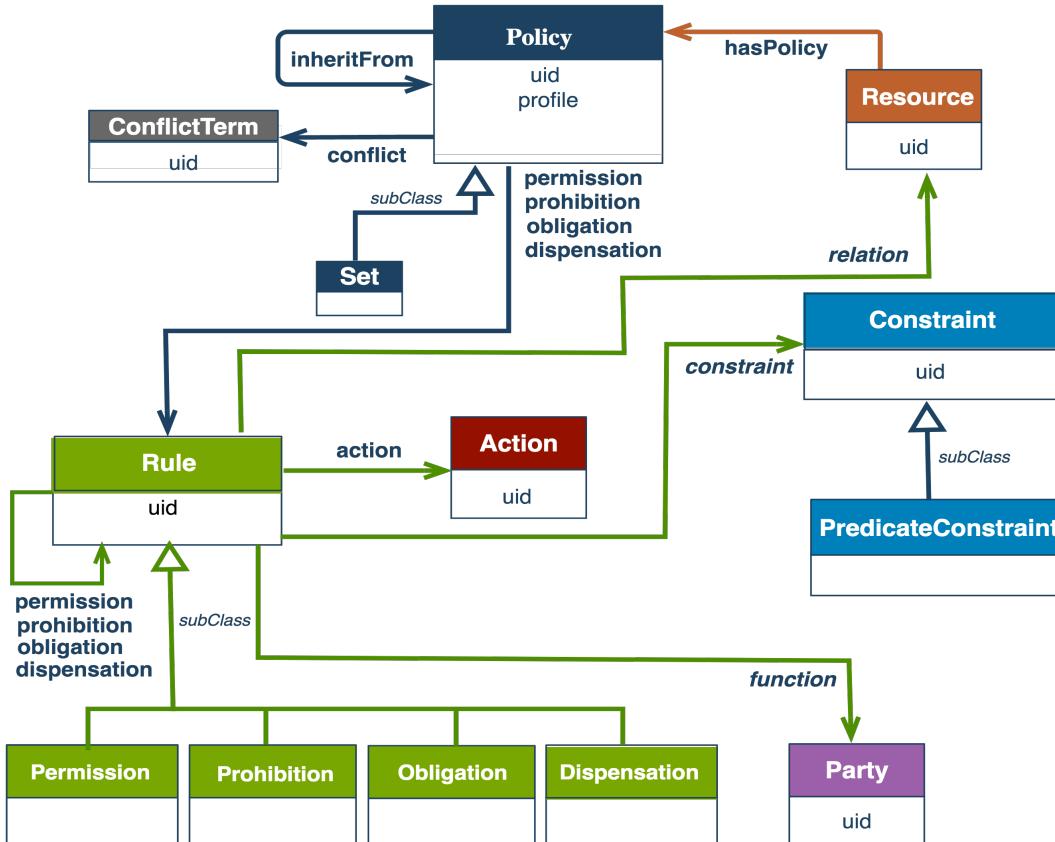
For the documentation, see the upcoming Deliverable D2.3.

```
@prefix : <http://www.specialprivacy.eu/langs/sblog#> .  
@prefix dct: <http://purl.org/dc/terms/> .  
@prefix owl: <http://www.w3.org/2002/07/owl#> .  
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix spl: <http://www.specialprivacy.eu/langs/usage-policy#> .  
@prefix xml: <http://www.w3.org/XML/1998/namespace> .  
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .  
@prefix prov: <http://www.w3.org/ns/prov#> .  
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .  
  
<http://www.specialprivacy.eu/langs/sblog> a owl:Ontology ;  
    rdfs:seeAlso "https://aic.ai.wu.ac.at/qadlod/policyLog/" ;  
    owl:versionInfo "0.3"@en .
```

- Detailed in *D2.7 Transparency Framework V1*
- Available for download via the SPECIAL website  
<https://www.specialprivacy.eu/langs/sblog>
- An unofficial *draft specification* has been published online  
<https://www.specialprivacy.eu/platform/ontologies-and-vocabularies>

# SPECIAL ODRL Regulatory Compliance Profile

## Syntax and expressivity



- Modeling regulatory obligations using an adaption of the Open Digital Rights Language
- Automated compliance checking for business policies

Derived from the W3C Open Digital Rights Language Specifications

W3C Recommendation

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## ODRL Information Model 2.2

W3C Recommendation 15 February 2018

This version:  
<https://www.w3.org/TR/2018/REC-odrl-model-20180215/>

Latest published version:  
<https://www.w3.org/TR/odrl-model/>

Latest editor's draft:  
<https://w3c.github.io/poe/model/>

Implementation report:  
<https://w3c.github.io/poe/test/implementors>

Previous version:  
<https://www.w3.org/TR/2018/PR-odrl-model-20180104/>

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Renato Iannella, Monegraph, [r@iannel.la](mailto:r@iannel.la)  
Serena Villata, INRIA, [serena.villata@inria.fr](mailto:serena.villata@inria.fr)

Issue list:  
[Github Repository](https://github.com/w3c/odrl-model/issues)

Please check the [errata](#) for any errors or issues reported since publication



<https://www.w3.org/TR/odrl-model/>

# SPECIAL ODRL Regulatory Compliance Profile

## SPECIAL resources

### ODRL Regulatory Compliance Profile

version 0.1

Unofficial Draft 29 May 2019

#### Editor:

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#### Abstract

The Open Digital Rights Language (ODRL) is a policy expression language that provides a flexible and interoperable information model, vocabulary, and encoding mechanisms for representing statements about the usage of content and services.

This document constitutes an ODRL profile that adapts the ODRL Core Model and Vocabulary with concepts and terms to support regulatory compliance checking of business policies.

In essence, ODRL Regulatory Compliance Profile policies are used to represent regulatory permissions, prohibitions, obligations, and dispensations, which may be limited by constraints (e.g., temporal, spatial).

- Preliminary Analysis Detailed in [\*D2.6 Formal Representation of the legislation V2\*](#)
- Available for download via the SPECIAL website:  
<https://www.specialprivacy.eu/publications/public-deliverables>
- An unofficial [\*draft specification\*](#) has been published online  
<https://www.specialprivacy.eu/platform/ontologies-and-vocabularies>

# Data Privacy, Vocabularies and Controls Community Group (DPVCG)

- 24<sup>th</sup> May 2018: Presentation of this initial charter draft to initial stakeholders
- 25<sup>th</sup> May 2018: Launch of Community Group
- 26<sup>th</sup>-30<sup>th</sup> May 2018 until 30 June 2018: feedback on the draft charter.
- 29<sup>th</sup>-31<sup>st</sup> August 2018: 1st Face-2-face meeting co-located at MyData2018 in Helsinki, Finland.
- 12<sup>th</sup>-14<sup>th</sup> November 2018: 2nd Face-2-face meeting co-located with the European Big Data Value Forum 2018 in Vienna, Austria.
- 26<sup>th</sup> of July 2019: published a first public CG draft report on its "Data Privacy Vocabulary v0.1" <https://www.w3.org/ns/dpv>

The screenshot shows the homepage of the W3C Data Privacy Vocabularies and Controls Community Group (DPVCG). At the top, there's a navigation bar with the W3C logo, a colorful circular icon, and the text 'COMMUNITY >'. Below the navigation, there's a banner with the group's name. The main content area includes a 'Home' link, a breadcrumb trail ('Data Privacy Vocabularies...'), and a section titled 'DATA PRIVACY VOCABULARIES AND CONTROLS COMMUNITY GROUP'. It describes the mission of developing a taxonomy of privacy terms related to the GDPR. A 'JOIN OR LEAVE THIS GROUP' button is visible. On the right, there's a 'Chairs' section featuring profile pictures of Bert Bos and Axel Polleres. Below that is a 'Participants (59)' section showing a grid of small profile pictures. At the bottom right, there's a 'View all participants' button. The URL <https://www.w3.org/community/dpvcg/> is also present.

# Exploitable Results

- Resources
  - ❖ The SPECIAL Usage Policy Language  
<http://purl.org/specialprivacy/policylanguage>
  - ❖ The SPECIAL Vocabularies  
<https://www.specialprivacy.eu/vocabs>
  - ❖ The SPECIAL Policy Log Vocabulary  
<http://purl.org/specialprivacy/sblog>
  - ❖ ODRL Regulatory Compliance Profile  
<https://www.specialprivacy.eu/platform/ontologies-and-vocabularies>
  - ❖ Data Privacy, Vocabularies and Controls Community Group (DPVCG)  
<https://www.w3.org/ns/dpv>
- *SPECIAL Compliance Checking*
  - ❖ Demonstrates how usage policies together with event logs can be used to perform both ex-ante and ex-post compliance checking
- *SPECIAL Consent and Transparency Interfaces*
  - ❖ Various consent user interfaces and the transparency dashboard
  - ❖ Guidelines for legally compliant consent retrieval

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This document specifies *sblog*, a vocabulary to log data processing and sharing events that should comply with a given consent provided by a data subject. We also model the consent actions related to consent giving and revocation

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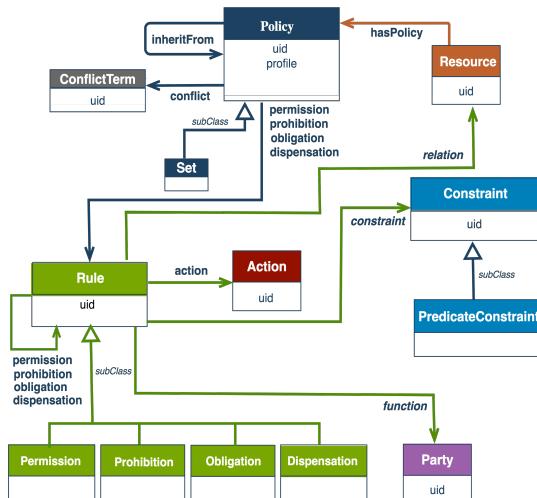
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• Bert Bos ◎ Last Updated: 17 April 2018

(You can [download this ontology as an OWL file](#).)

This is the SPECIAL Policy Log Vocabulary, with identifier

<http://www.specialprivacy.eu/langs/sblog#>



[Home](#) / Data Privacy Vocabularies...

## DATA PRIVACY VOCABULARIES AND CONTROLS COMMUNITY GROUP

The mission of the W3C Data Privacy Vocabularies and Controls CG (DPVCG) is to develop a taxonomy of privacy terms, which include in particular terms from the new European General Data Protection Regulation (GDPR), such as a taxonomy of personal data as well as a classification of purposes (i.e., purposes for data collection), and events of disclosures, consent, and processing such personal data.

The Community Group shall officially start on 25th of May 2018, the official date of the GDPR coming into force, as a result of the W3C [Workshop on Data Privacy Controls and Vocabularies](#) in Vienna earlier this year.

- Tools for this group
  - Mailing List
  - Wiki
  - IRC
  - Tracker
  - RSS
  - Contact This Group