Scalable Policy-awarE Linked Data arChitecture for prIvacy, trAnsparency and compLiance (SPECIAL)

Sabrina Kirrane, WU

5 June 2019

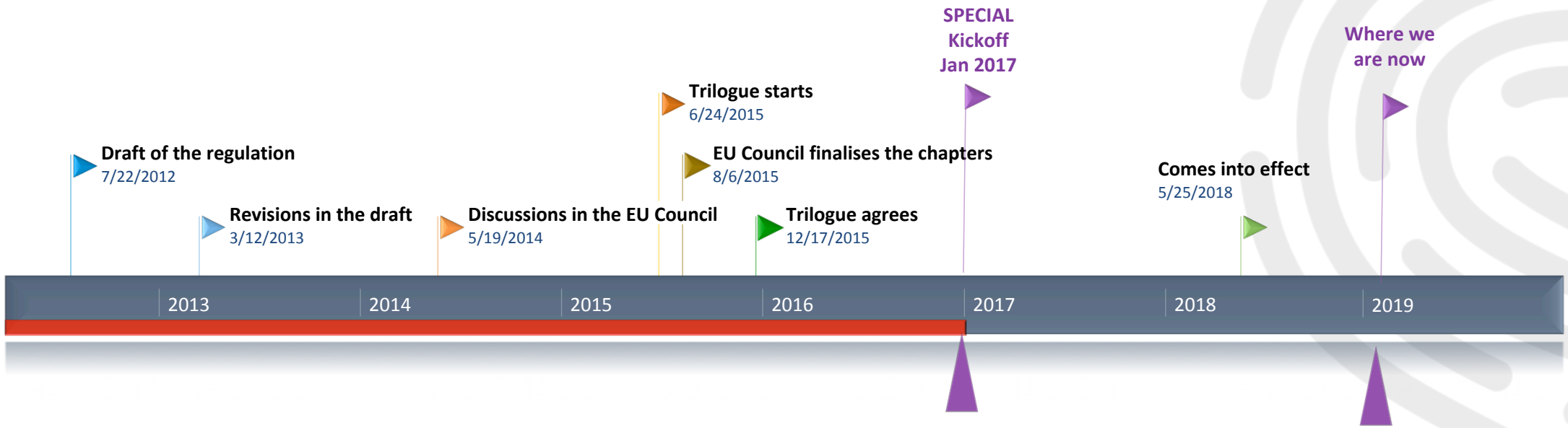
ESWC Project Networking

SPECIAL

European Commission

Horizon 2020
European Union funding
for Research & Innovation

SPECIAL Aims

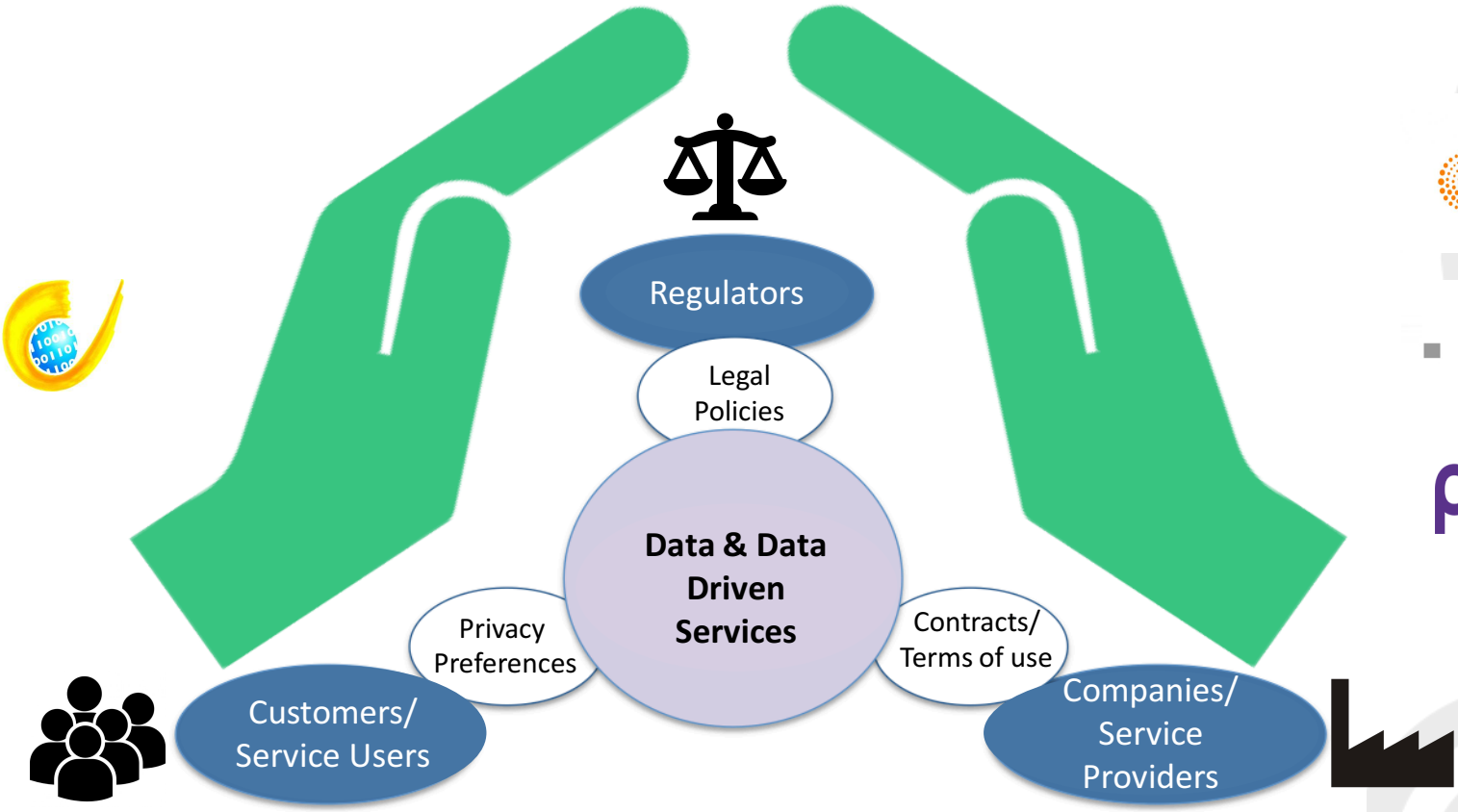


Data subjects who would like to declare, monitor and optionally revoke their (often not explicit) preferences on data sharing

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 Aims



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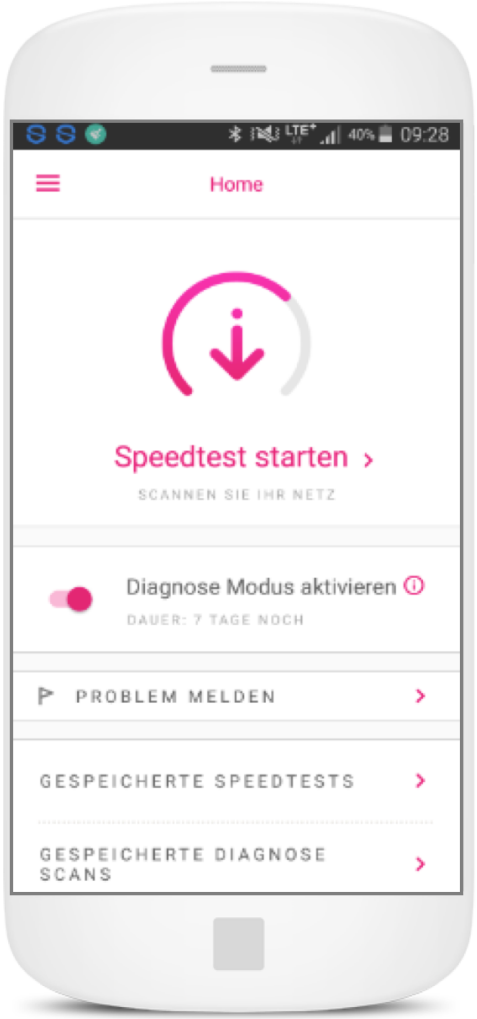

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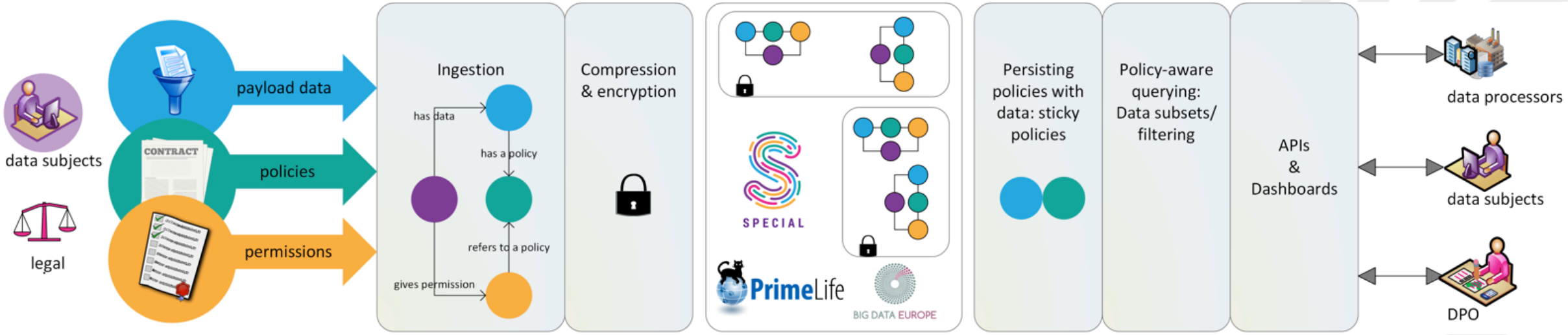
SPECIAL Technical Foundations
Big Data and Privacy Foundations



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

Usage policy language
Syntax and expressivity

- Usage policy language, which can be used to express both the data subjects' consent, data controllers usage requests, fragements 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**

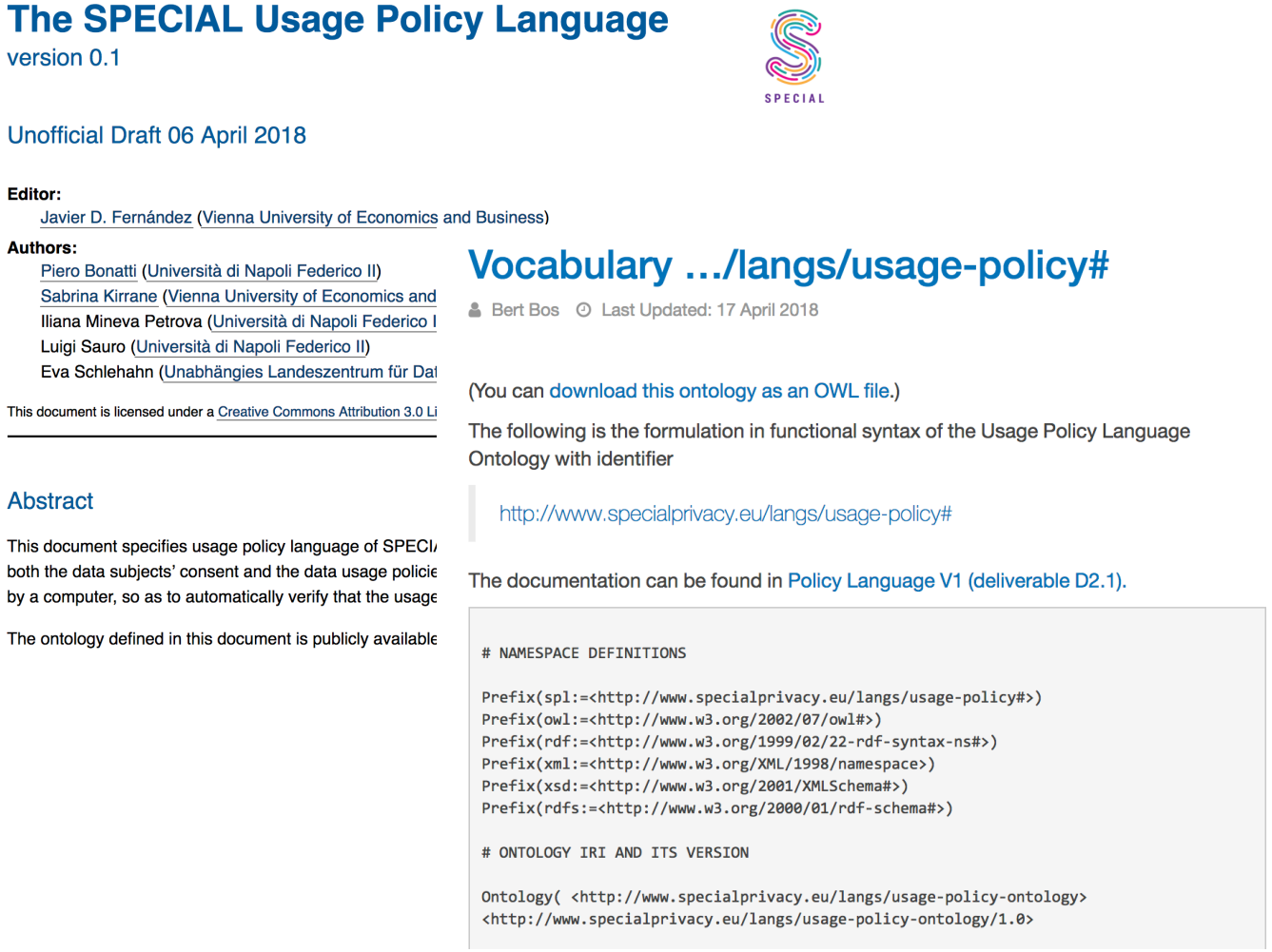
RecipientsExpression :='spl:AnyRecipient' | 'spl:Null' | **RecipientVocabExpression**

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

SPECIAL

Unofficial Draft 06 April 2018

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Abstract

This document specifies usage policy language of SPECIA
both the data subjects' consent and the data usage policie
by a computer, so as to automatically verify that the usage

The ontology defined in this document is publicly available

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).

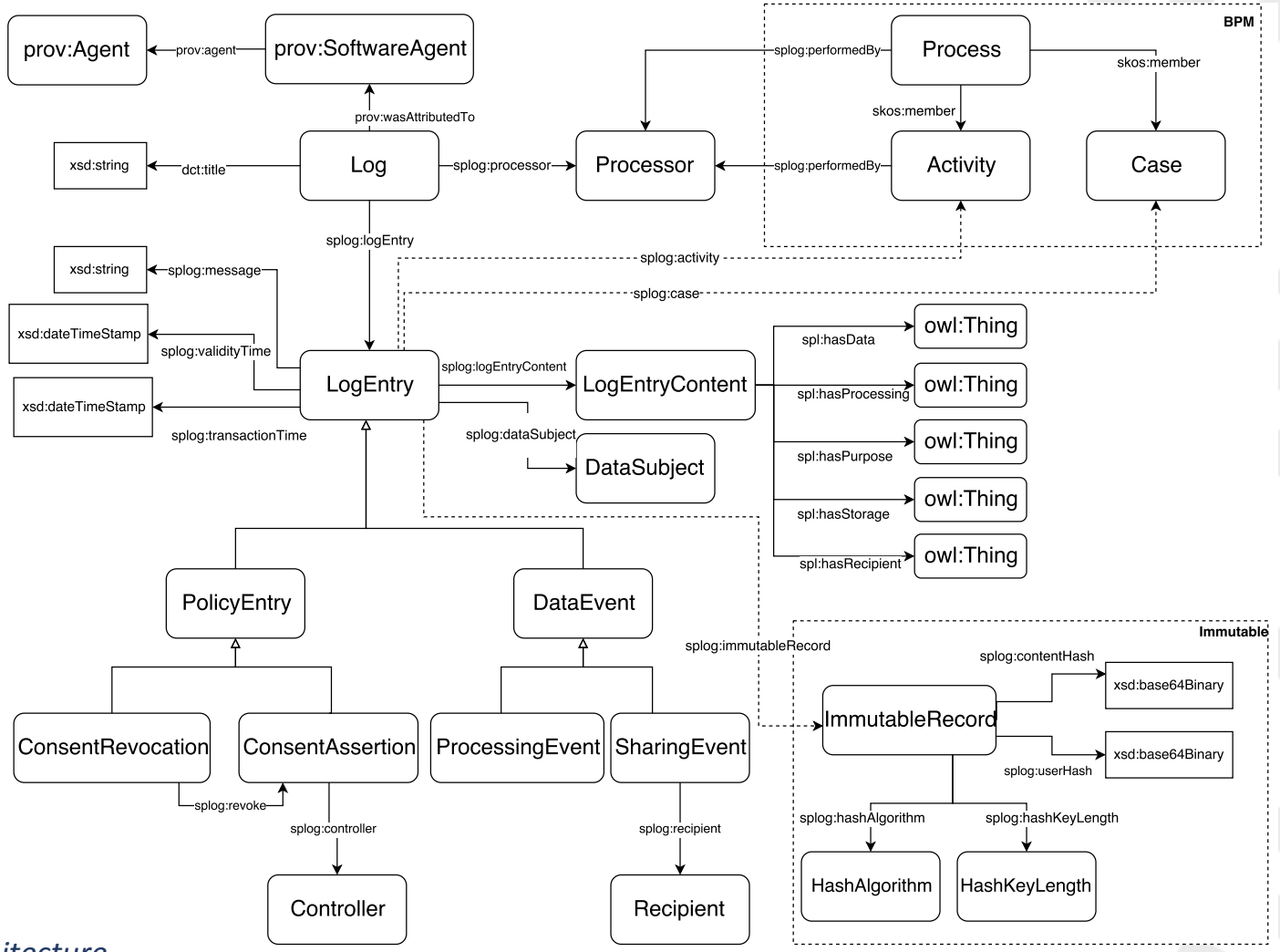
```
# NAMESPACE DEFINITIONS

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 *D2.1 Policy Language V1*
- 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

Piero A. Bonatti, Bert Bos, Stefan Decker, Javier D. Fernández, Sabrina Kirrane, Vassilios Peristeras, Axel Polleres and Rigo Wenning. Data Privacy Vocabularies and Controls: Semantic Web for Transparency and Privacy. Semantic Web for Social Good (SWSG2018) @ ISWC2018.

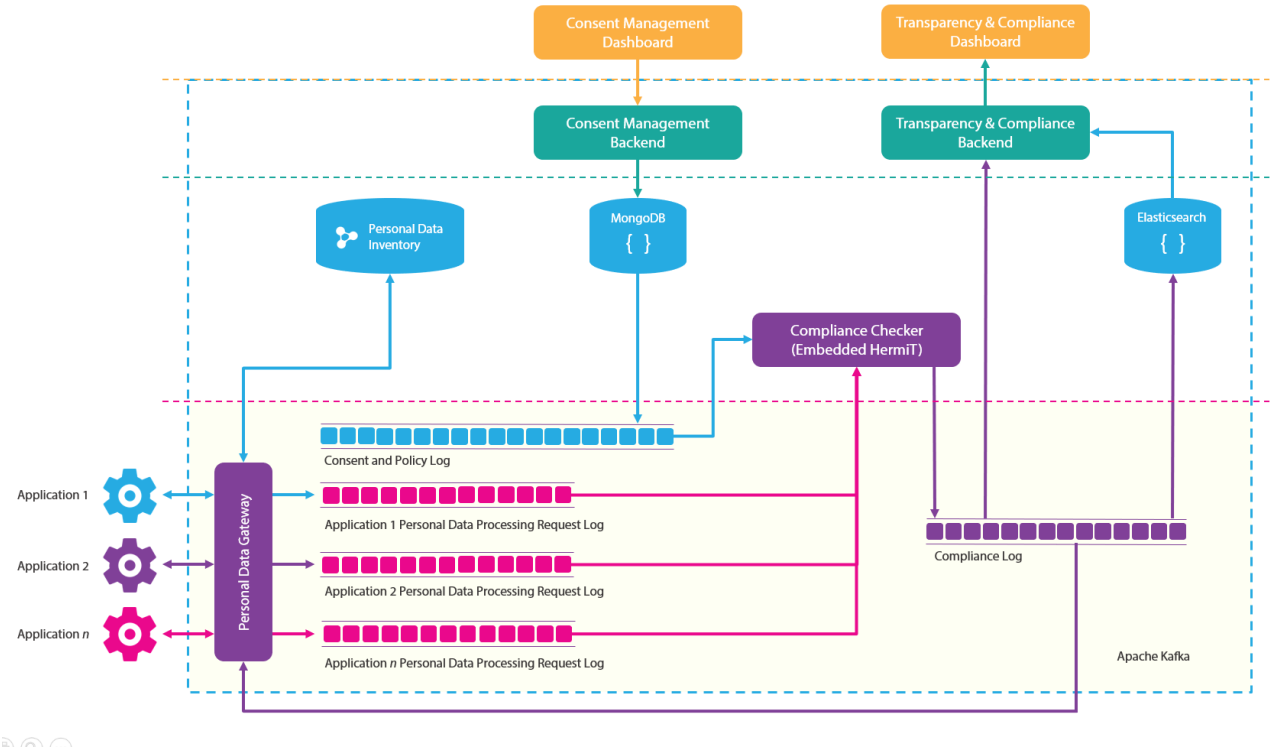
Provenance/event information SPECIAL resources

- 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



A Scalable Consent, Transparency and Compliance Architecture
Sabrina Kirrane, Javier D. Fernández, Wouter Dullaert, Uros Milosevic, Axel Polleres, Piero Bonatti, Rigo Wenning, Olha Drozd and Philip Raschke
Proceedings of the Posters and Demos Track of the Extended Semantic Web Conference (ESWC 2018)

Transparency and compliance checking platforms



- Data processing and sharing event logs are stored in the **Kafka** distributed streaming platform, which in turn relies on Zookeeper for configuration, naming, synchronization, and providing group services.
- We assume that consent updates are infrequent and as such usage policies and the respective vocabularies are represented in a **Virtuoso triple store**.
- The compliance checker, which includes an embedded
- A **HermiT reasoner** uses the consent saved in Virtuoso together with the application logs provided by Kafka to check that data processing and sharing complies with the relevant usage control policies.
- As logs can be serialized using JSON-LD, it is possible to benefit from the faceting browsing capabilities of **Elasticsearch** and the out of the box visualization capabilities provided by **Kibana**.

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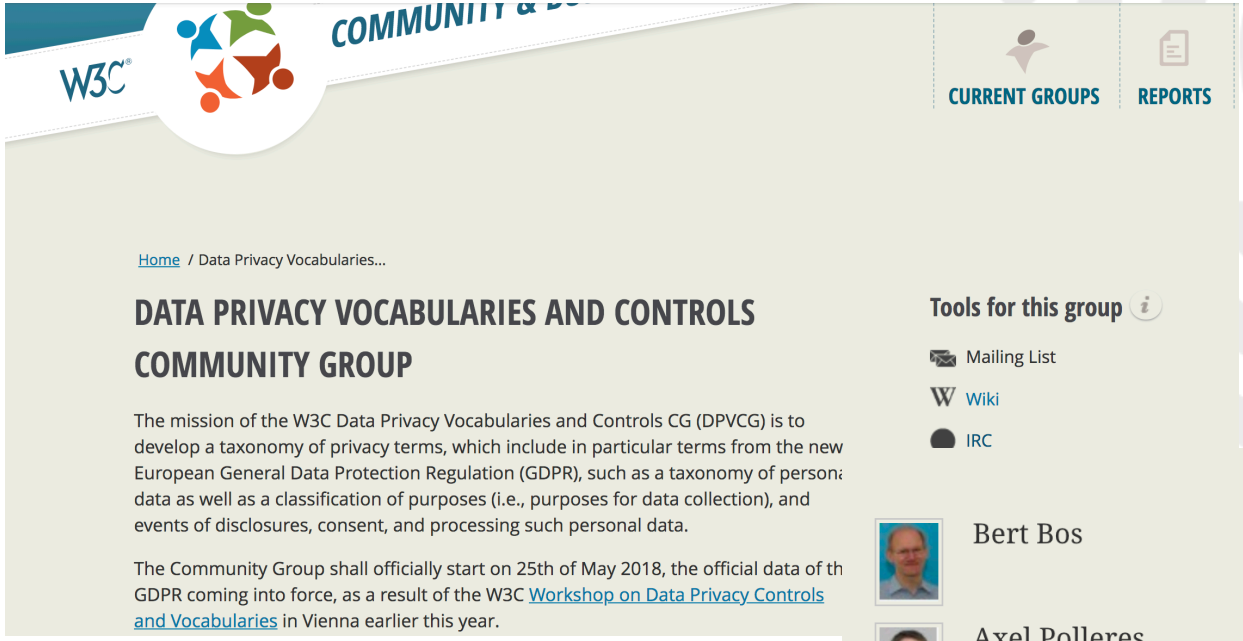
Data Privacy, Vocabularies and Controls Community Group (DPVCG)

- Launched on the 25th of May 2018
- Presentation at MyData on the 31st of August-2018
- F2F in Vienna on the 3rd and 4th of December
- The current goal is to agree on first public drafts of minimal sets of vocabularies with first stable working drafts being reached latest on **25 May 2019**.



https://www.w3.org/community/dpvcg/

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/splog
- *SPECIAL Ex-Post Compliance Checking*
  - ❖ Demonstrates how usage policies together with event logs can be used to perform ex-post compliance checking
- *SPECIAL Consent and Transparency Interfaces*
  - ❖ Various consent user interfaces and the transparency dashboard
  - ❖ Guidelines for legally compliant consent retrieval


The SPECIAL Policy Log Vocabula
A vocabulary for privacy-aware logs, transparency and co
version 0.3
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Abstract
This documents specifies splog, a vocabulary to log data processing and sharing ev
a given consent provided by a data subject. We also model the consent actions rela
revocation