

Semantic Interoperability



Sabrina Kirrane, 03.06.2022

Data Spaces & Semantic Interoperability



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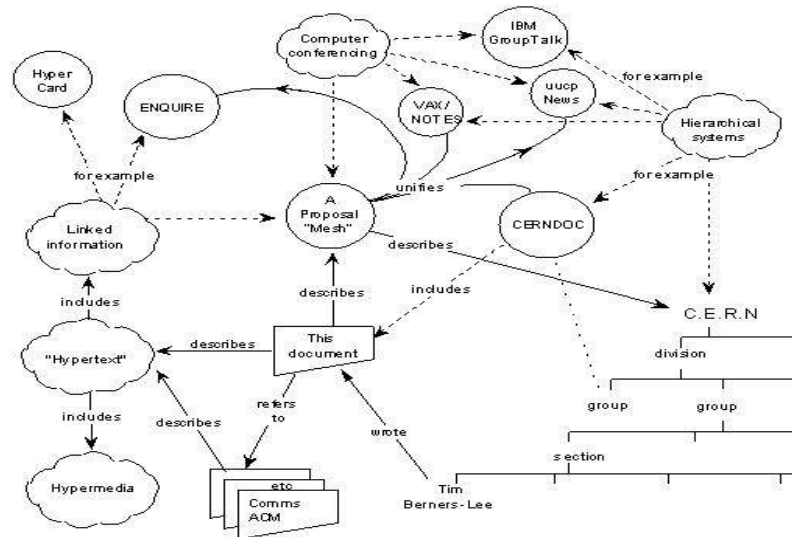


Tim Berners-Lee, CERN

March 1989, May 1990

Overview

It then summarises my short experience with non-linear text systems known as "hypertext", describes what CERN needs from such a system, and what industry may provide. Finally, it suggests steps we should take to involve ourselves with hypertext now, so that individually and collectively we may understand what we are creating.



1989 The original proposal for the Web

<https://www.w3.org/History/1989/proposal.html>








The Semantic Web - 2001



The Semantic Web

A new form of Web content that is meaningful to computers will unleash a revolution of new possibilities

By Tim Berners-Lee, James Hendler and Ora Lassila on May 1, 2001

- Common data model for encoding data (triples) 
- Common ways of serialising data (syntaxes)   
- Well-defined languages for saying what terms mean (semantics)  
- Common ways to query data (query languages) 

Web standards! 

Facilitate semantic interoperability

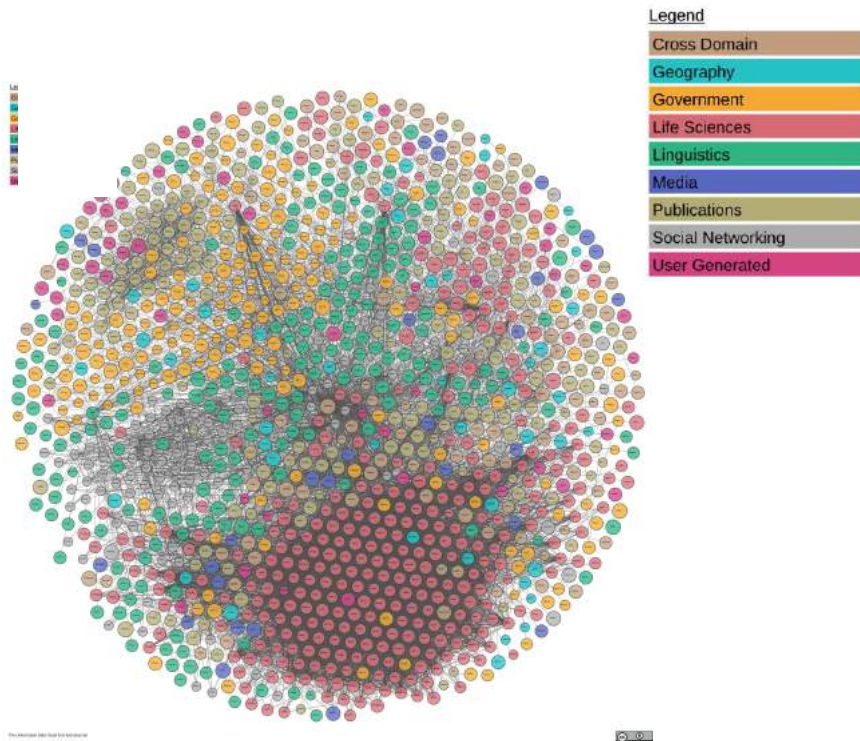
The Semantic Web



PROPELLING THE POTENTIAL OF
ENTERPRISE LINKED DATA IN AUSTRIA



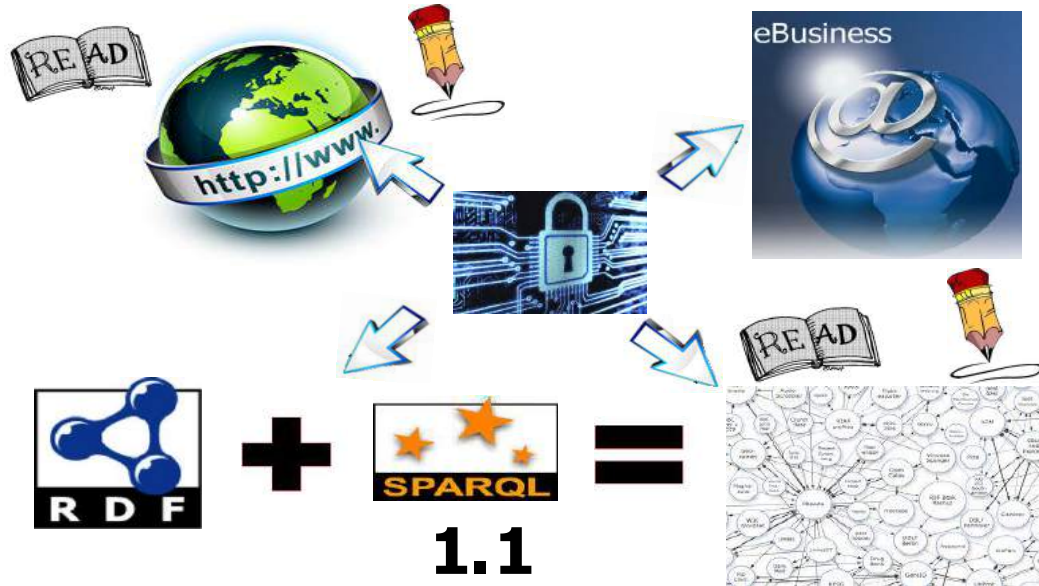
Research Landscape: Core and Marginal topics discussed in the seminal papers. Topics in () were only intuitively mentioned.



	Berners-Lee et al. [1] Future	Feigenbaum et al. [15] Past (2000-2007)	Bernstein et al. [2] Past (2000-2016)	Bernstein et al. [2] Future from 2016
Core topics	knowledge representation languages and standards	knowledge representation languages and standards	knowledge representation languages and standards	representing lightweight semantics
	ontologies and modeling, taxonomies, vocabularies	ontologies and modeling, taxonomies, vocabularies	ontologies and modeling, (PR) knowledge graphs	-
	logic and reasoning	logic and reasoning	logic and reasoning	-
	search and question answering	(ranking)	(PR) question answering systems	-
	(data integration)	(ontology matching)	(PR) needs-based, lightweight data integration	integration of heterogeneous data
	proof & trust	privacy, trust, access control	personal information, privacy	trust & data provenance (representation, assessment)
	databases	semantic web databases	database management systems	-
	decentralization	(decentralization)	vastly distributed heterogeneous data	(decentralization)
	(machine learning, prediction, analysis, automatic report)	knowledge extraction and discovery	latent semantics, knowledge acquisition, ontology learning	-
	-	query language (SPARQL)	developing efficient query mechanisms	-
Marginal topics	-	(linked data, DBpedia)	(PR) linked data (open government data), (social data)	-
	intelligent software agents	-	multilingual intelligent agents	-
	(Internet of Things)	-	-	high volume and velocity of data, e.g., streaming & sensor data
	-	(scalability, efficiency, robust semantic approaches)	-	scale changes drastically
	(semantic web services)	-	-	-
	-	visualization	-	-
	-	change management and propagation	-	-
	-	(social semantic web, FOAF)	-	-
	-	-	-	data quality, e.g., representation, assessment
	-	-	-	-

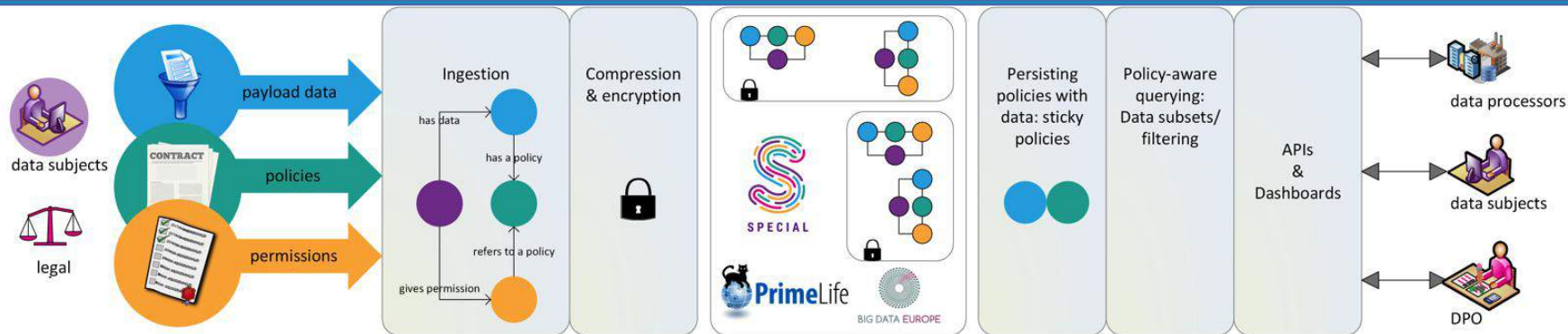
A decade of Semantic Web research through the lenses of a mixed methods approach, Sabrina Kirrane, Marta Sabou, Javier D. Fernández, Francesco Osborne, Cécile Robin, Paul Buitelaar, Enrico Motta, and Axel Polleres, *The Semantic Web Journal*, 2020

Access Control



- Modeling access control policies
- Lifting authorisations from existing enterprise systems
- Enforcement and administration

Usage Control - Consent



The SPECIAL Usage Policy Language

version 1.1

Unofficial Draft 21 March 2022

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- Consent, events, regulatory obligations, and business process modeling
- Compliance checking
- Encryption and compression
- Visualisation
- Big data processing via Apache Kafka and Spark

dalicc
DATA LICENSES CLEARANCE CENTER

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:

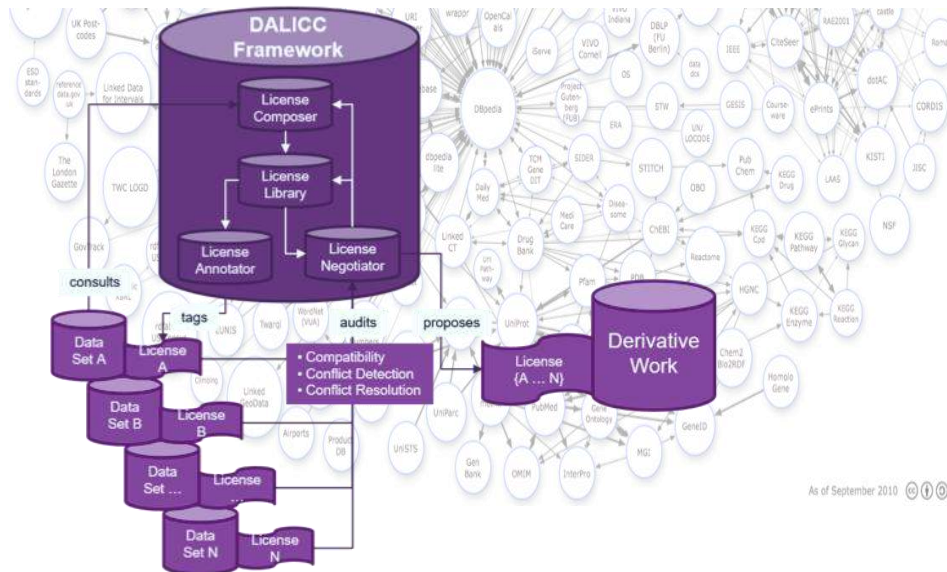
<https://w3c.github.io/poe/model/>

Implementation report:

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

Previous version:

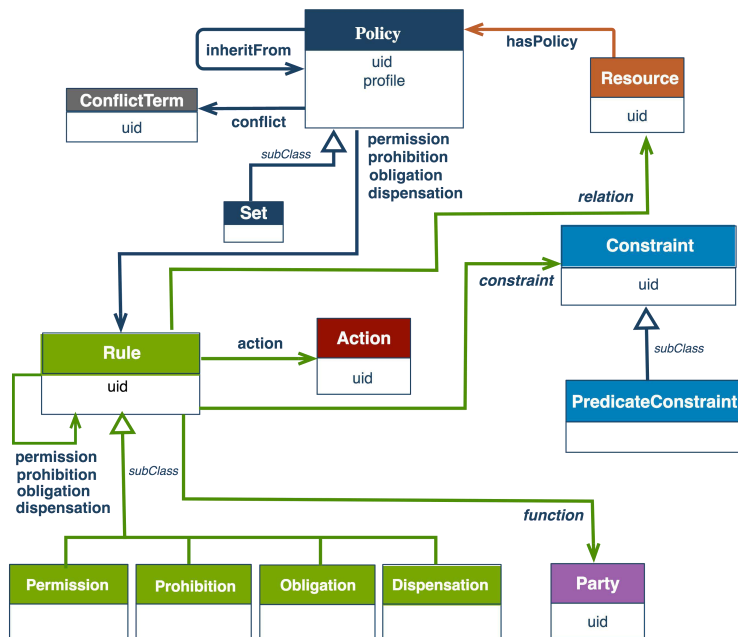
<https://www.w3.org/TR/2018/PR-odrl-model-20180104/>



As of September 2010

- Modeling licenses using the Open Digital Rights Language
- Dependency modeling
- Conflict detection

Usage Control - Regulations



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).

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```

graph LR
    DC[Data Consumer] -- "1 Request" --> DM((Data Market))
    DP[Data Provider] -- "1 Request" --> DM
    DP -- "2 Check applicable policies" --> PS[(Policy Store)]
    DM -- "3 Compose & Offer contract" --> DC
    DC -- "4 Accept contract" --> DP
  
```


SOcial LInked Data (SOLID)



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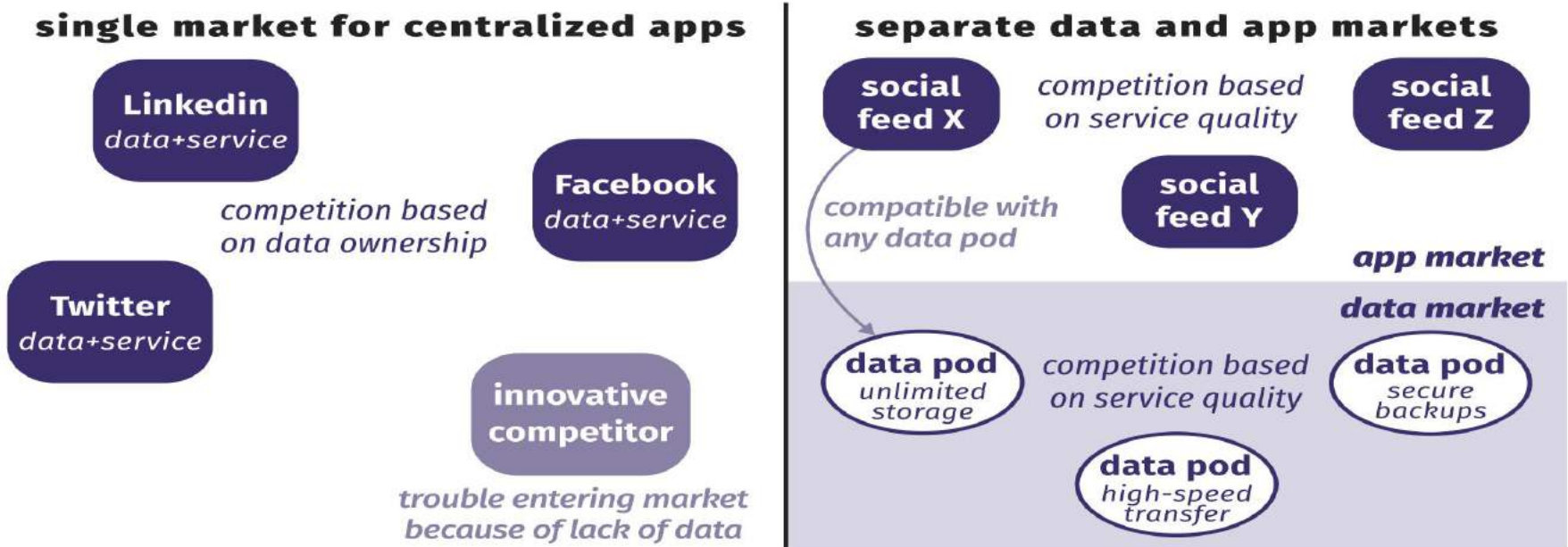
What is Solid?

Solid is an exciting new project led by Prof. Tim Berners-Lee, inventor of the World Wide Web, taking place at MIT. The project aims to radically change the way Web applications work today, resulting in true data ownership as well as improved privacy.

<https://solid.mit.edu/>

Social Linked Data (SOLID)

Separating app and storage competition drives permissionless innovation.



Usage Control - SOLID



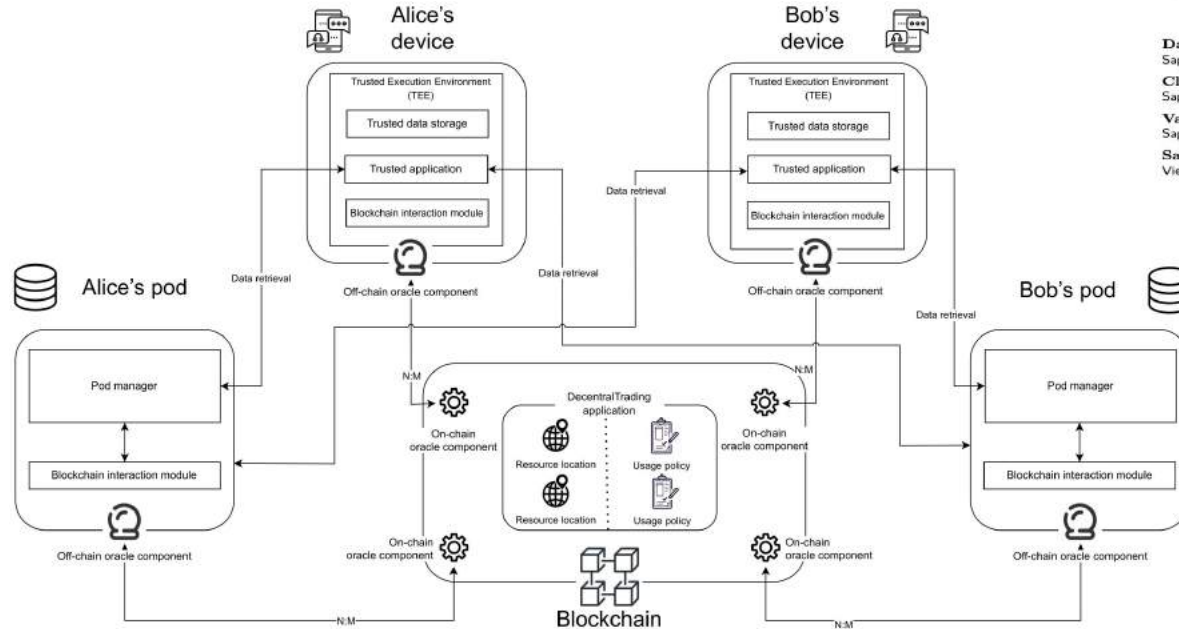
A Usage Control Architecture for Solid Data Stores

Davide Basile
Sapienza University of Rome, Italy

Claudio Di Ciccio
Sapienza University of Rome, Italy

Valerio Goretta
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- Social Linked Data
- Blockchain Oracles
- Trusted Execution Environment

Thank you / contact details



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