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Continuation Report

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Introduction

Transfer report 2018:

- Focus on automation of data sharing agreements between data controllers
- Smart contracts
- Transparency
- Semantic web + Blockchain

Now:

- Open, on-demand contract
- Focus on transparency **and** interoperability
- Hybrid approach: BPMN for modelling, semantic web for structure
- XML Schema and Schematron

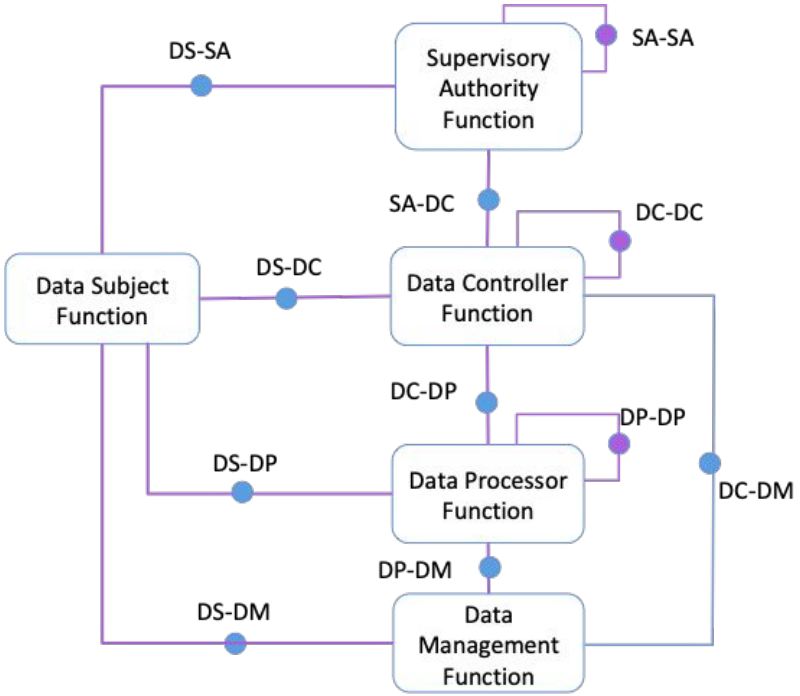
Presentation Roadmap

1. Introduction: Background and motivation
2. State of the art
3. Requirement analysis
4. Interoperability framework
5. Evaluation of GDPR Compliance Validation
6. Conclusion

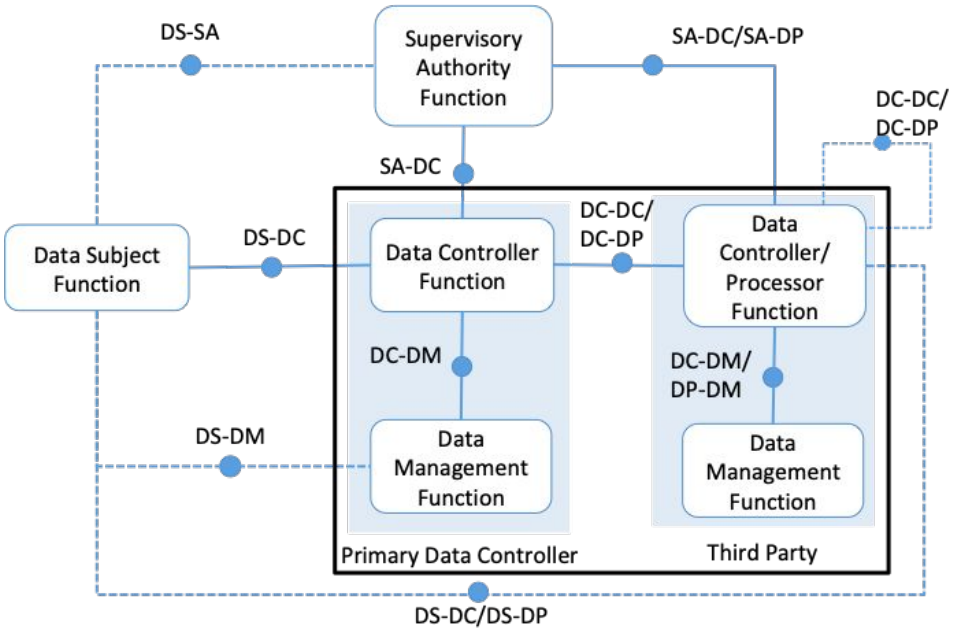
1. Background and motivation: GDPR

- Defined actors in data sharing process
  - Data Subject
  - Data Controller
  - Data Processor
  - Supervisory Authority
- Data Controller duties vs Data Subject rights
- **Interoperability** model: understanding the actors, their relationship; defining the problem scope
- **Transparency** in GDPR: Data Subject has a right to know how the personal data is used, for which purpose and with whom it is shared (Third Party)
- Supervisory Authority should be able to assess the process and procedure at any given time
- Open, on-demand, data protection contract

1. B&M: Interoperability for GDPR Compliance



Interoperability Reference Model for GDPR compliant systems



Boundary of DSA problem scope against the GDPR Interoperability Reference Model

1. B&M: Open data technologies

- Semantic web technologies
  - semantic web ontologies for flexibility
  - (open) linked data - transparent by design
- Business process modelling
  - BPMN - OMG standard
- Human readable
- Data exchange technologies
  - 2-way API
  - standard serialisation (XML, JSON)

Research Question and Hypothesis

Q: To what extent can existing open web data technologies support **interoperable** GDPR compliance for data sharing between parties?

Research Objectives:

1. Establish requirements for interoperable GDPR compliance for data sharing
2. Assess potential open web data technologies against requirements
3. Develop a hybrid architecture that combines open web technologies at the appropriate point
   a. Specifically define: ODRL profile with SHACL using BPMN-defined processes provides **transparently interoperable** GDPR compliance for data sharing.
4. Assess extent that proposed architecture addresses compliant data sharing requirements

2. SotA: Semantic Web

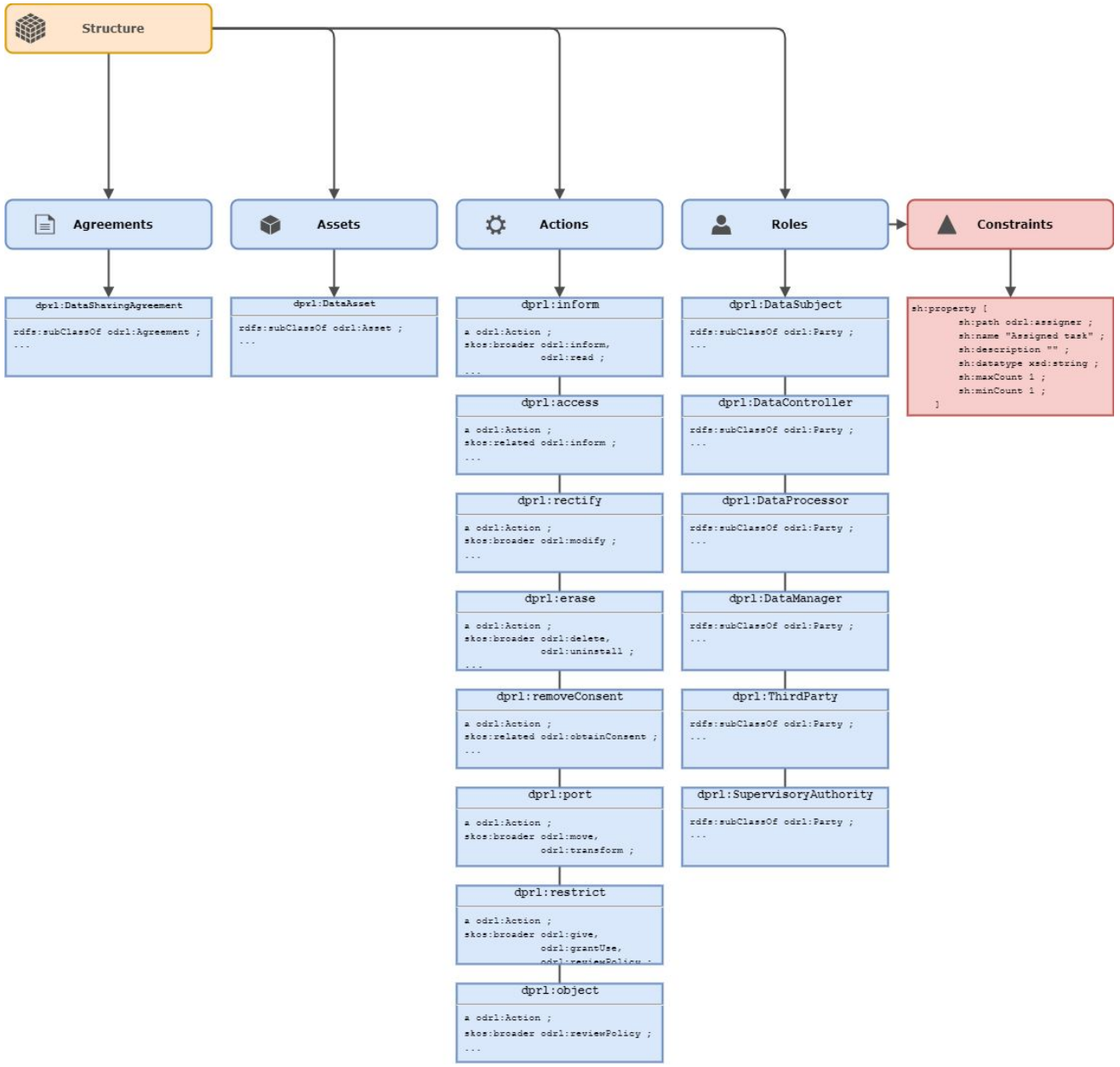
Ontologies and Languages used:

- Open Digital Rights Language (ODRL)
- Linked Data Platform (LDP)
- Dataset Usage Vocabulary (DUV)
- Shapes Constraint Language (SHACL)
- Data Protection Rights Language (DPRL)

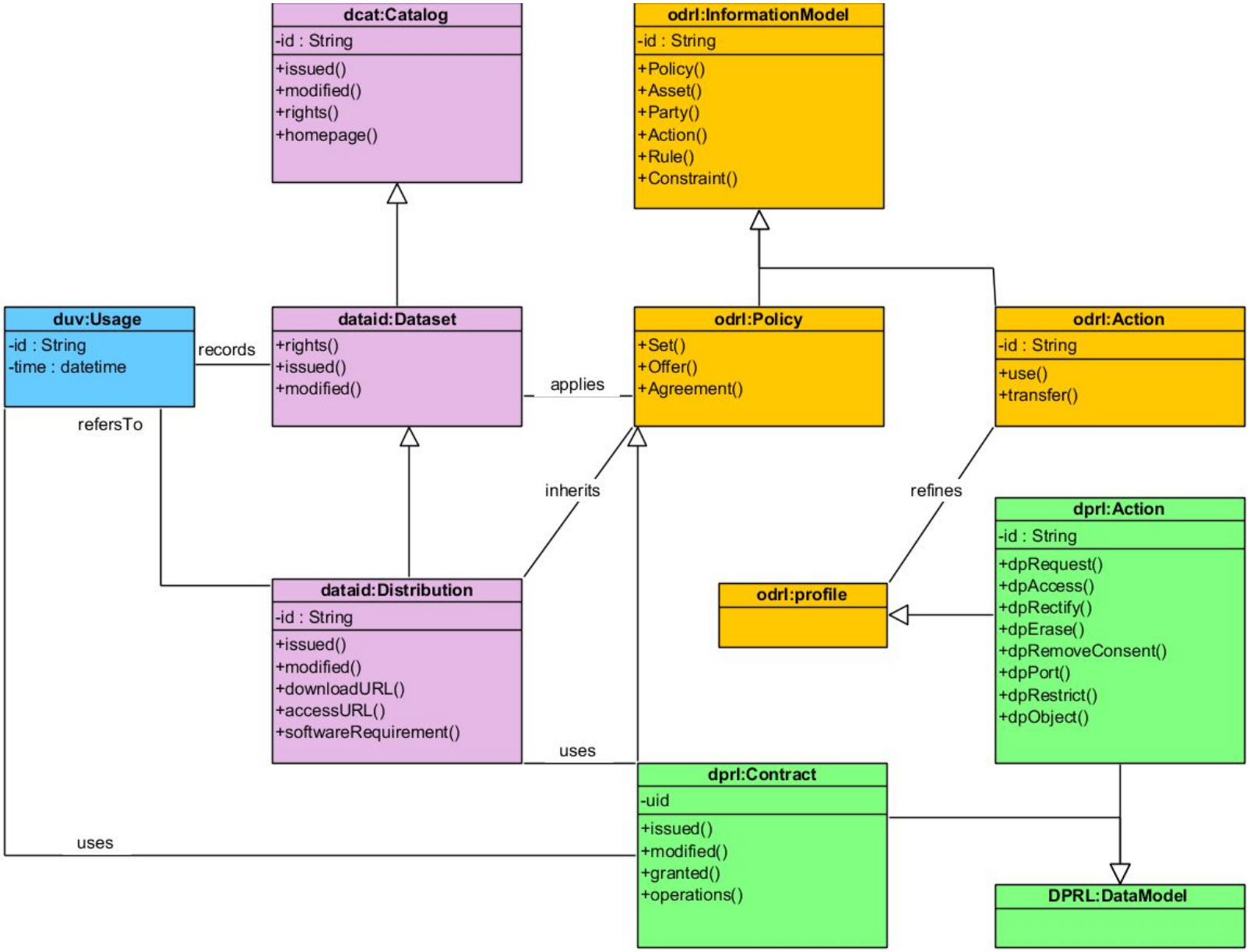
Purpose of Semantic Web Technologies:

- Formally define actors, assets, rights, obligations, prohibitions (ODRL)
- Use related technology to define the rules of data exchange - RESTfull interface (LDP)
- Keep reliable track record following best practices on the web (DUV)
- Tackle the issue of cardinality of the elements (SHACL)
- Have all the above under one umbrella (DPRL)

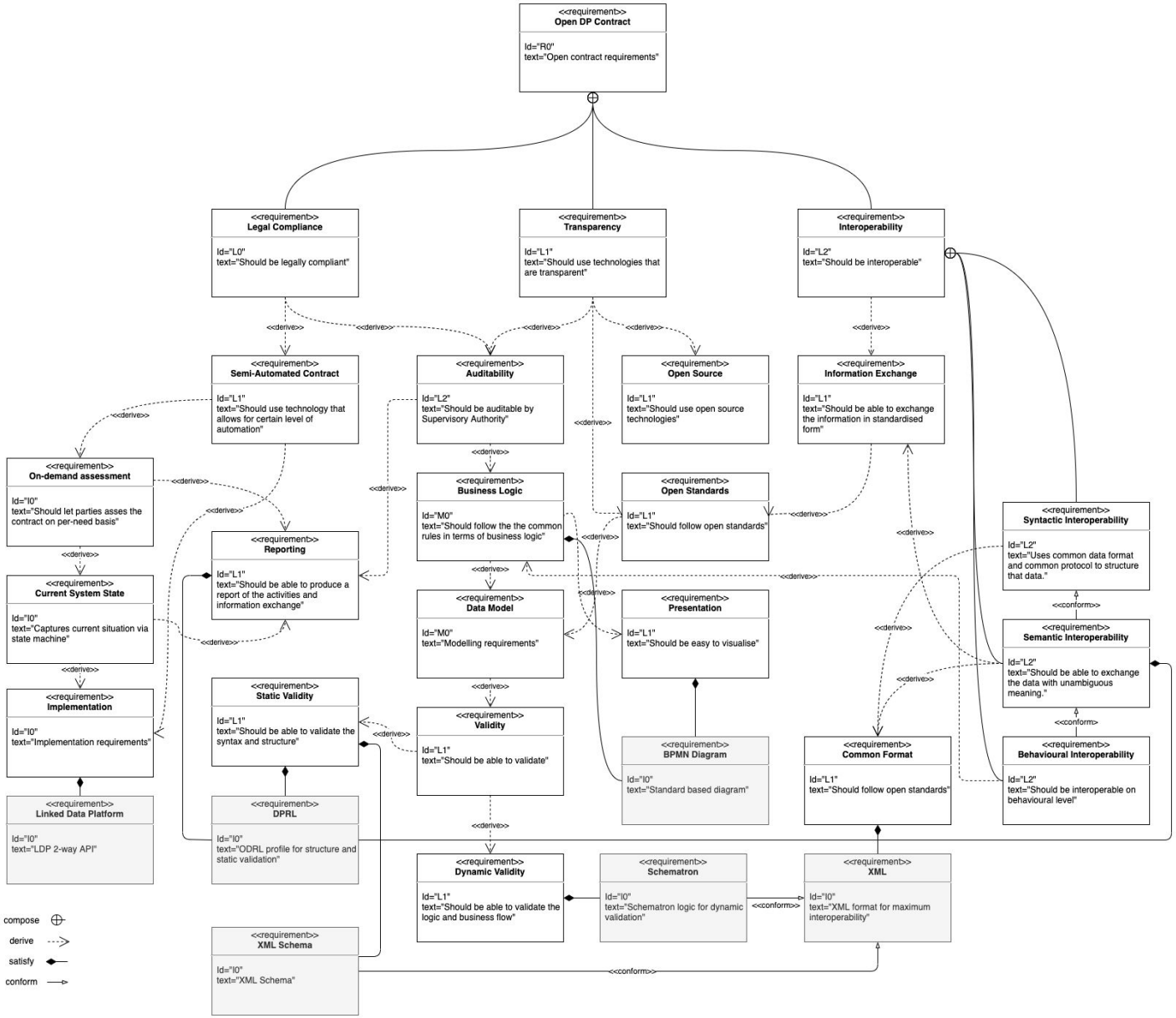
4. Interoperability Framework: DPRL Profile



4. Interoperability Framework: DPRL Model



3. Requirements: SysML Diagram



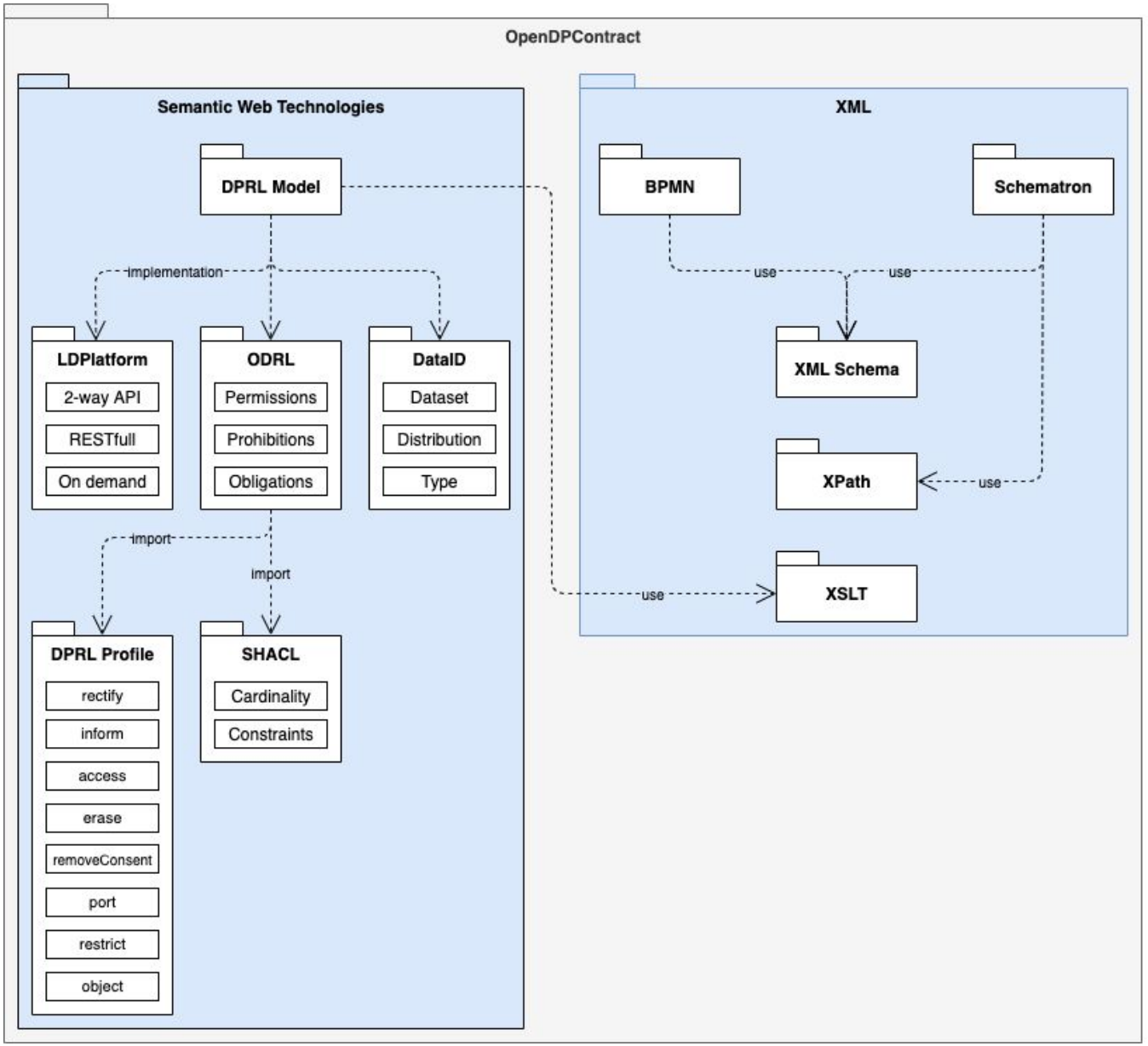
3. Requirements: Top Level

- Legal compliance
- Transparency
- Interoperability

In short, the model should:

- Be presentable
- Follow predefined business logic
- Have a possibility to be dynamically validated
- Follow open standards

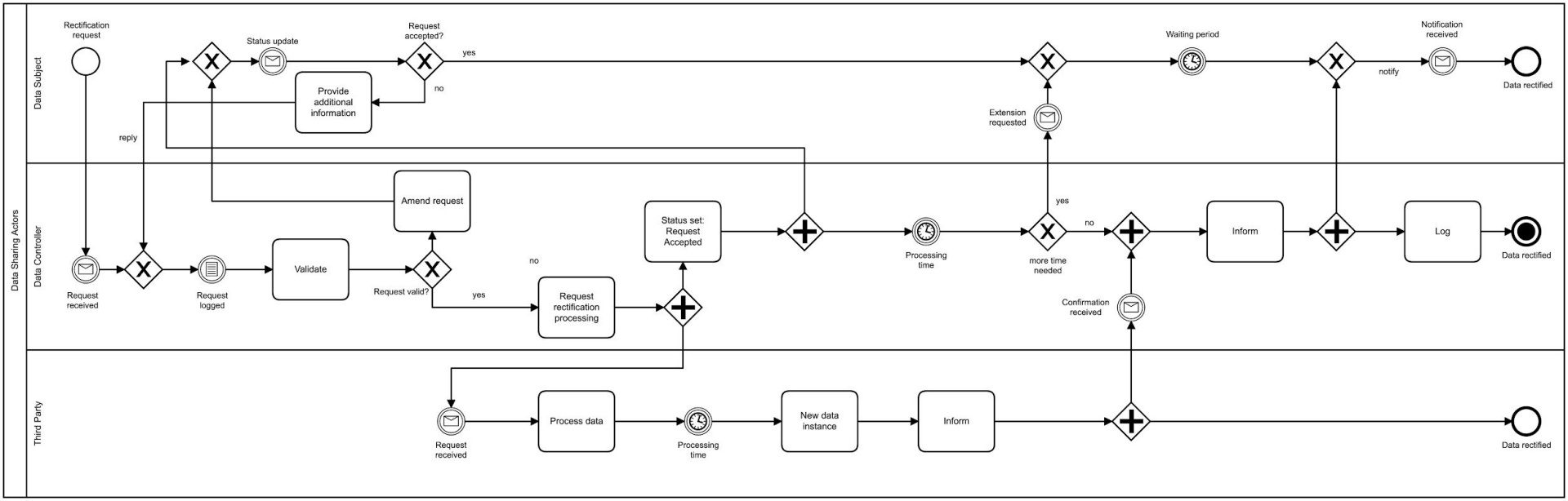
3. Requirements: Package Diagram



3. Requirements: Rectify Usecase: CRUD Matrix

CRUD Matrix	C	R	U	D
GDPR Terminology DS Actions in GDPR	Initiate request	Access	Modify	Erase
Inform	Y	Y	N	N
Subject Access	Y	Y	N	N
Rectify	Y	Y	Y	Y
Erase	Y	N	Y	Y
Remove the consent	Y	Y	N	N
Port	Y	Y	N	Y
Restrict access	Y	Y	N	N

4. Interoperability Framework: BPMN



5. Evaluation: Separation of Concerns

- Hybrid model brings different technologies together, semantic web ontologies, business process modelling, data exchange and validation standards
- Challenge of mapping the terms
- Separation of concerns requires us to find the commonalities and use consistent wording between different domains

5. Evaluation: Separation of Concerns Table

DPRL Entities	BPMN	ODRL	Schematron
Message	Event	Action	Element body
Decision	Gateway	Rule	Rule
Action	Task	Action	Assert/Report
Flow	Flow	Asset⇒Relation	Pattern

- Messages
  - triggers
  - reactions
- Decisions
  - inclusive
  - parallel

- Actions
  - in response to message
  - in response decision making
- Flows
  - connect other elements
  - define directions of decisions

5. Evaluation: Validity

- Static validation - **Syntax and structure**
  - XML Schema
  - Semantic web ontology rules
  - SHACL constraints

- Dynamic validity - **Business logic** - flow and rules
  - Schematron

5. Evaluation: XML Schema Languages

- DTD (W3C)
- **XML Schema** (W3C)
- **RELAX NG** (ISO - DSDL)
- **Schematron** (ISO - DSDL)
- NVDL (ISO - DSDL)

DTD , XML Schema, and Relax NG are grammar-based schema languages. Schematron is a rule-based schema language.

5. Evaluation: Schematron - Quick Facts

- Does not define the document's schema / specify the structure
- Checking the structure of a document through assertions
- Used to express operational and business rules
- Uses XPath for rules, assertions and messages
- Verifies data interdependencies (co-constraints)
- Checks data cardinality
- Performs algorithmic checks

Current work/contributions and future

- Interoperability and transparency using open data technologies
- Not just compliance checking, but on-demand open contract tool
- Hybrid approach: addressing the needs of both data managers and legal professionals
- Following the industry standards: semantic web ontologies and business process modelling

- Conceptual research
- Use cases
- Practical implementation
- Benchmarking

4. Interoperability Framework: Informal Map