Using Ontology Design Patterns To Define SHACL Shapes

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that's me!  twitter  email  check out all our work
Scenario

HOW TO VALIDATE???

0. ontologies

1. data graph

2. reuses some concepts & relationships

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WOP 2018 (ISWC 2018); Monterey California, USA; Presented by: Harshvardhan J. Pandit
OWL-based Validation

1. Assumption: Open vs Closed
2. Inference
3. Existence

If I don’t use a concept, do I care about its existence?

declare vs undeclared
completeness

If I don’t use self type a concept, do I care about its existence?
Axioms

● Define a model for data & relationships → **AXIOMS**
● Define constraints → restrictions
● Define ‘correctness’? → by following constraints
● Provide validation? → by testing against constraints
& assessing correctness
Axioms may not be applicable because:

- Not all concepts / relations from ontology are being used in a data graph

- Concepts / relations are used, but their semantic meaning has changed
Enter the ODP

- ODP is more generic than an ontology
  - i.e. abstraction
- ODP can be more specific to the use-case
  - i.e. domain/context specific
- ODP contains only needed axioms
  - i.e. only covering required concepts/relationships
- ODP is modular
  - i.e. can be combined or used individually

Benefits

1. Fits model of data graph → how data is populated in context
2. Modular → reuse! specialise! abstraction!
3. Easier to integrate → into larger patterns & ontologies
Okay… But still how to validate?

SHACL
Shapes and Constraints Language
W3C Recommendation, 20 July 2017
https://www.w3.org/TR/shacl/

“SHALL - CORB”

- closed-world
- defined using RDF
- selectors
- report generation
- like ShEx
Approach

- **Aim:** Automate validation from data model i.e. ODP → SHACL
- **Step 1:** Identify relevant OWL statements within constraint
- **Step 2:** Generate Corresponding SHACL Shape

Requires: Mapping OWL → SHACL
Example

You are at the WOP 2018 workshop
#ODP #ISWC2018
MONTEREY, CA 9 OCT 2018

Tweet has
- exactly 1 user
- exactly 1 content
- exactly 1 date
- 0 or 1 location

SHACL SHAPE

ex: TweetValidator
a sh: NodeShape
targetClass ex: Tweet.

min: 1 max: 1

- type: User
- type: Text
- type: Timestamp

max: 1

- type: GPS coordinates
Can this be extended to an Ontology?

Yes.

But the aim here is to validate the data graph that uses many ontologies, and where only some concepts/relationships are used.

Therefore, if SHACL shapes are generated from an ontology, they will have the same limitation as using the OWL axioms itself.

*argument*: Generate an ontology for data graph vs Generate ODPs for data graph
Another advantage with ODP

- Coherence
- If all constraints (shapes) are satisfied then the data can be said to be validated, and this information can be incorporated back into the data graph
- Validations can thus be ‘layered’ on top of each other
- Can the ODPs also be thus ‘layered’ or combined in this manner to create an ontology for representing the data model of the graph?

open question!
Converse Application

Use the ODP to visualise SHACL Shapes

ex: PresentationShape
   a sh: NodeShape
   targetClass ex: Presentation

sh: Property [ 
   sh: Path ex: presenter
   sh: Class ex: Person
   sh: minCount 1
   sh: maxCount 4
].
Future Work

1. SHACL-SPARQL
2. OWL2SPARQL
3. Recursive Constraints

Target Application:
GDPR Compliance

Modular Obligations → ODP
ODP → validate using SHACL

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